UNIVERSITY MISSION

Case Western Reserve University’s mission is to serve society as a leading center for undergraduate, graduate, and professional education, for research that adds to society’s store of knowledge and addresses its priorities, and for active, responsible world and community citizenship. The students, faculty, staff, volunteers, alumni, and others who constitute the university community pursue and represent this mission through their teaching, research, professional activities, and public service, all marked by a commitment to continuous learning.

UNIVERSITY VISION

Case Western Reserve University strives to be the most powerful learning environment in the world. We seek to have transformational impact on all who teach, learn, discover, and work here so they are prepared and engaged to serve humanity. As a great research university, we must embrace responsible risk-taking in pursuit of bold aspirations for national and global leadership.

• We will combine experiential learning with rigorous scholarship in our undergraduate and all educational programs to produce educated learners who are awake to new possibilities.
• We will invest in the arts, humanities, and social sciences as important areas of scholarship and as an essential foundation for preparing morally and socially responsible lifelong learners.
• We will build on our existing strengths, including engineering, biomedical sciences, and professional education, and pursue productive partnerships with other outstanding institutions.
• We will be guided by our values at every level to promote a diverse, challenging, supportive, entrepreneurial, and interdisciplinary environment of openness, respect, accountability, and academic freedom.

PHILOSOPHY STATEMENT ON EDUCATIONAL OUTCOME ASSESSMENT

Because Case Western Reserve University seeks to have transformational impact on all students, we commit to a comprehensive educational outcome assessment program, wherein we measure how our students have changed, what knowledge has been learned, and what competencies have been developed. Our educational outcome assessment programs will not only provide information on how well we are achieving our objectives, but also identify what types of programs and experiences have the most powerful impacts. The ultimate goal is to incorporate continuous evaluation into the educational culture for the improvement of programs and for enhancing the distinctiveness of our university.

Education outcome assessments will be based on the core vision and mission of each school and the university as a whole. The faculty, empowered by adequate resources and support to carry out assessment activities, accepts that educational outcome assessment is a part of academic duties. Outcome assessment is embraced as a means that can lead to improvements in teaching and learning, plus provide evidence of teaching effectiveness for institutional purposes.

ACCREDITATION

Case Western Reserve University is accredited at the institutional level by the Higher Learning Commission and is a member of the North Central Association, 30 North LaSalle Street, Suite 2400, Chicago, Illinois 60602-2504; 312-263-0456; 800-621-7440; Fax 312-263-7462; Web www.ncahigherlearningcommission.org. In addition, several of the university’s individual programs are accredited by nationally recognized professional associations, including:

• AACSB International - Association to Advance Collegiate Schools of Business (accountancy and business)
• Accreditation Board for Engineering and Technology, Computing Accreditation Commission (computer science)
• Accreditation Board for Engineering and Technology, Engineering Accreditation Commission (engineering programs)
• Accreditation Council for Cooperative Education (cooperative education programs)
• American Association of Nurse Anesthetists (nurse anesthesia)
• American Bar Association (law)
• American Board of Genetic Counseling (genetic counseling)
• American Chemical Society (chemistry)
• American Council of Nurse Midwives (nurse midwifery)
• American Dental Association (dental medicine)
• American Medical Association and Association of American Medical Colleges, Liaison Committee on Medical Education (medicine)
• American Psychological Association (clinical psychology)
• American Speech-Language-Hearing Association (speech pathology)
• Association of American Law Schools (law)
• Commission on Accreditation for Dietetics Education of the American Dietetic Association (dietetic internship)
• Commission on Accreditation of Allied Health Education Programs (anesthesiologist assistant)
• Council on Social Work Education (applied social sciences)
• National Association of Schools of Music (music)
• National League for Nursing (nursing)
• Ohio Department of Education, Division of Teacher Education and Licensure (art education and music education)

The university is chartered as an educational institution under the laws of the State of Ohio and holds a Certificate of Authorization from the Ohio Board of Regents.

For further information, contact the university’s Center for Institutional Research.
Case Western Reserve University is one of the nation’s leading independent research universities, with programs that encompass the arts and sciences, engineering, the health sciences, law, management, and social work.

Although its origins date to 1826, the university in its present form is the result of the 1967 merger of Case Institute of Technology and Western Reserve University. The two institutions had shared adjacent campuses since the late nineteenth century, and were involved in cooperative efforts for many years. Western Reserve College was founded in 1826 in Hudson, Ohio, a town 26 miles southeast of Cleveland. The College took its name from that of the region, which at the time of the American Revolution, was known as the Western Reserve of Connecticut. In 1882, renamed Western Reserve University and boasting a medical school in addition to its undergraduate programs, the institution moved to the Cleveland site that later became known as University Circle. There it joined the Case School of Applied Science, founded in 1880 through the bequest of Leonard Case, Jr., a leading citizen of Cleveland. The name Case Institute of Technology was adopted in 1947 to reflect the institution’s growing stature in the sciences and engineering.

**ACADEMIC PROGRAMS**

The academic programs of the university are administered through the College of Arts and Sciences and seven professional schools, including applied social sciences, dental medicine, engineering, law, management, medicine, and nursing, with coordination provided by the president and the provost. The major academic divisions of the university are described below, along with a listing of their principal offerings. These units cooperate to offer programs leading to joint degrees.

*The College of Arts and Sciences* (est. 1992, but tracing its origins to 1826) offers courses of study leading to B.A. and B.S. degrees in a full range of disciplines in the humanities, arts, social sciences, and natural sciences. Departmental faculty also conduct research and offer instruction leading to master’s and doctoral degrees in these fields. The college is also the academic home for some undergraduates pursuing major fields of concentration in disciplines included in the faculties of management and medicine.

*The Case School of Engineering* (est. 1992, but tracing its origins to 1880) offers curricula leading to the B.S. degree in a wide range of engineering disciplines. Departmental faculty also offer advanced instruction leading to the M.S. and the Ph.D. in these fields, conduct a substantial body of research, and maintain close ties to industry as well. The school also offers a practice-oriented degree, the Master of Engineering, tailored for employed engineers seeking to advance their knowledge. The Institute for the Integration of Management and Engineering, a joint venture of the Case School of Engineering and the Weatherhead School of Management, offers the Master of Engineering and Management degree.

*The School of Graduate Studies* (est. 1892) confers M.A., M.S., M.F.A., M.P.H., and Ph.D. degrees upon students who have completed advanced study in the arts and sciences and various professional fields. The school is an administrative unit, working closely with the deans and faculty in the university’s colleges and professional schools, who provide instruction and mentoring for graduate students.

*The Mandel School of Applied Social Sciences* (est. 1916) offers curricula leading to the M.S.S.A. (Master of Science in Social Administration) degree in social work, and to the Ph.D. degree in social welfare. In collaboration with the schools of law and management, the school administers the Mandel Center for Nonprofit Organizations. The Mandel School also operates a continuing education program for social-work practitioners in the community. Through the Mandel Center, the Mandel School and the School of Management offer a joint program leading to the degree of Master of Nonprofit Organizations (M.N.O.).

*The School of Dental Medicine* (est. 1892) offers a curriculum leading to the D.M.D. degree and postdoctoral training in several dental specialties leading to the M.S.D. degree. In conjunction with its curriculum, the school also operates a dental clinic on campus where students provide faculty-supervised dental service to area residents.

*The School of Law* (est. 1892) offers a broad range of courses leading to the J.D. degree. The school also offers graduate instruction leading to the LL.M. in U.S. legal studies. As part of its curriculum, the school operates a legal clinic in which law students, under faculty supervision, provide services to clients from the community. The school administers the Law-Medicine Center, the Canada-United States Law Institute, the Frederick K. Cox International Law Center, and a seminar for federal judges sponsored by the Federal Judicial Center and participates in the Mandel Center for Nonprofit Organizations.

*The Weatherhead School of Management* (est. 1967) offers curricula leading to the B.S., M.S., M.Acc., M.B.A., E.D.M. (Executive Doctor of Management), and Ph.D. degrees in management, accounting, organizational behavior, operations research, and other areas of business administration. Members of the school’s faculty also provide instruction in economics for undergraduate students enrolled in the College of Arts and Sciences. The school offers a wide range of educational programs for professional managers and participates in the Mandel Center for Nonprofit Organizations and the Institute for the Integration of Management and Engineering.
Nursing (est. 1923) offers curricula leading to professional degrees in nursing: the Bachelor of Science in Nursing (B.S.N.) degree, with an emphasis on acute care, and the Doctor of Nursing (N.D.) degree, a professional degree for students who already have baccalaureates in the liberal arts or sciences. The school also offers instruction leading to the M.S.N. degree in several nursing specialties and to the Ph.D. in nursing. The school’s faculty members maintain an active research program.

The Frances Payne Bolton School of Nursing (est. 1923) offers curricula leading to professional degrees in nursing: the Bachelor of Science in Nursing (B.S.N.) degree, with an emphasis on acute care, and the Doctor of Nursing (N.D.) degree, a professional degree for students who already have baccalaureates in the liberal arts or sciences. The school also offers instruction leading to the M.S.N. degree in several nursing specialties and to the Ph.D. in nursing. The school’s faculty members maintain an active research program.

CLEVELAND

From a settlement that began nearly two centuries ago on the banks of the Cuyahoga River, Cleveland has grown into a metropolis of more than 2 million people. The heritage of this Great Lakes port includes industrial achievement as well as cultural and scientific advances. The Cleveland area is headquarters for many a number of the nation’s major corporations. The city is also a major banking center; the Fourth District Federal Reserve Bank, one of 12 in the nation, is located here.

Health care is another thriving Cleveland industry. Dozens of hospitals and medical centers are concentrated in the area. University Hospitals of Cleveland, the Cleveland Clinic, the MetroHealth Medical Center, and others are internationally recognized for outstanding patient care and contributions to medical research.

Greater Cleveland is dotted with shopping malls, theaters, and opportunities for sports and amusement. The latter include Lake Erie; the 17,000-acre Metropark system; professional teams in baseball, football, basketball, soccer, and hockey; and facilities for softball, skiing, hiking, cycling, picnics, and other activities. More than 60 ethnic groups are represented in Cleveland; summer festivals continue traditions brought to the region from throughout the world.

UNIVERSITY CIRCLE

Case Western Reserve University is located in University Circle, a 550-acre concentration of more than 40 cultural, medical, educational, religious, and social service institutions located at the eastern edge of the city. In addition to Case, which is the largest institution in University Circle, the community includes Severance Hall, home of the world-famous Cleveland Orchestra; the Cleveland Museum of Art; the Cleveland Institute of Music; the Cleveland Institute of Art; University Hospitals of Cleveland; the Western Reserve Historical Society; the Cleveland Botanical Garden; the Cleveland Museum of Natural History; and many others. All are within walking distance of the university.

University Circle attracts visitors from throughout the region to its concerts, theater performances, athletic events, art shows, public lectures, exhibits, and restaurants. Housing, shopping, and recreational facilities are all located in the area.

UNIVERSITY FACILITIES AND SERVICES

UCITE
(University Center for Innovation in Teaching and Education)
101 Allen Memorial Library Building
Phone 216-368-1224; Fax 216-368-0197
e-mail: ucite@case.edu
Mano Singham, Director

The purpose of UCITE is to support and encourage change and innovation in teaching. It does this through a combination of informal seminars and workshops on topics in education and learning (about 50 per year) led by UCITE personnel and campus faculty; special programs with invited outside speakers of renown and expertise; and individualized services (such as learning to use the web, class videotaping, class visitation, mentoring, and consultation) to faculty who request them. UCITE also serves as a research, planning, and implementation resource for the many education-related initiatives undertaken on campus.

UCITE also conducts programs for new faculty, and these serve an important function in the faculty member’s development and socialization to the university culture, as well as to the growth of their teaching skills.

UCITE administers grants programs that are designed to encourage faculty members to develop and experiment with their teaching and education activities. The grants are funded in two different ways. The Glennan Fellows Program provides five stipends of $6,500 annually from the income of an endowment provided by the Glennan family. Selected Fellows must be tenure-track but untenured faculty members who exhibit outstanding talent as both teachers and scholars. Glennan fellows are nominated by their peers, and awards are made on the basis of proposals which they submit following nominations. It is a significant honor to serve as a Glennan Fellow, and these junior faculty become recognized as leaders and role models for other junior faculty.

Other grants programs are not endowed but instead are supported by annual donations. For example, the family of Walter Nord has given $50,000 for each of the past five years for innovative courses, and this has provided support for five grants annually under that name. Additional support in the form of gifts and donations by alumni and friends is continually being sought. These funds are used to provide additional teaching grants to university faculty members.

UCITE is administered by a director and an associate director. The center has a full-time secretary.
INFORMATION TECHNOLOGY SERVICES

Information Technology Services (ITS) stewards, manages, and protects the University’s extensive technology resources and supports innovative, state-of-the-art technology applications, tools, and services to enrich learning, teaching, and research at Case.

Services managed include:

• The University’s high speed network which provides switched gigabit Ethernet to each and every student, faculty and staff computers
• Wireless (802.11g) deployment with over 1300 access points to the campus community and beyond
• The Software Center which provides personal productivity and general purpose software packages, including email, calendaring and other applications
• Help Desk and support services to assist users in maximizing use of technology resources
• Deployment and operation of academic and instructional systems such as Blackboard
• Operation of application software such as Email and group calendaring
• Delivery of telephone services, including Voice over IP
• Delivery of audio/video services (including cable TV and videoconferencing)
• Development and operation of internal administrative systems
• University archives and records.

ITS Services

Help Desk

The Help Desk, powered by PerceptIS, provides computing support to the university community. It is open seven days a week. Services include:

• Troubleshooting and technical assistance through email, telephone and walk-ins
• Dispatching, if necessary, of technical assistants to residence halls to resolve user problems
• Case management record to track problems and ascertain satisfactory closure of technical issues
• Technical support for television and video users
• Management of networked high speed laser printers in Wade and Fribley Commons.

Instructional Technology and Academic Computing (ITAC)

ITAC supports current technologies that enhance teaching and learning at Case. Through technology support and professional development, ITAC supports the university community in its endeavor to experience, explore, collaborate and extend learning beyond its traditional bounds. Services include:

• MediaVision-Streaming media, video conferencing, online
• Courseware and IP Television
• New Media Studio - digital technology to create interactive learning environments
• 3D experiences and innovative multimedia
• Faculty Support - Provides support for faculty in using teaching technologies.
• Student Technology Consultants- Employs students to assist faculty.

Software Services

Faculty, staff and registered students are eligible to download a variety of software packages that the university has purchased and made available through site licenses with software manufacturers. Packages and tools include:

• Personal productivity and general purpose software packages, including:
  • Microsoft Office Suite
  • E-mail
  • Spam controls
  • Enterprise calendaring
  • Virus protection
• Operating systems
• Desktop publishing
• Drawing and painting systems
• CAD
• Mathematical and statistical packages and tools, and
• Programming languages
• Courseware and collaborative tools providing online assessments and simulations (e.g., notes, exam keys, syllabi, text, and reference materials), scanned images and digital movies
• On-line databases providing reference works, access to library holdings, locator materials, and a wide variety of both general purpose and specific databases.

Telephone Services

Telephone Services offers phone service, cell service, and to be gradually phased in, voice over IP. Services include:

• On-campus, local and long-distance service
• Highly competitive and student oriented long distance rates and discounts
• Electronic access to account information, billing, and payment services
• Voicemail notification via email and audio access to voicemail via computer
• Caller ID and other optional features
• Sprint cellular service at preferential and discounted university rates.

Television Services

ITS Television Services provides on-campus users, including students in residence halls, who have cable-ready televisions and video receivers to access the following services:

• 40 channels, including two on-campus channels with local original programming
• The University’s enterprise streaming media solution and production facilities architected and deployed by ITS Television Services.
University Archives

University Archives manages university records and publications to ensure the preservation of a reliable institutional memory. The office, which manages a collection of over 11,000 linear feet (approximately 22.5 million pages) that document the University’s life from 1826 to 2004, offers the following services:

- Research and reference services to help discover the who, what, where, when, how, and why of Case’s history and development
- Duplication services (digital, xerographic and fax copies) of most documents
- Records services to assist in managing active records and guidance in transferring records to the Archives
- Digitization of select high demand materials for ease of access and use

UNIVERSITY LIBRARIES

The University’s libraries are an integrated system comprised of the University Library, the Cleveland Health Sciences Library, the School of Law Library, and the Mandel School of Applied Social Science’s Lillian F. & Milford J. Harris Library. All Case Western Reserve libraries support the university’s undergraduate, graduate, and professional programs. Combined, their collections contain more than two million volumes. The libraries maintain individual World Wide Websites to facilitate communication of their unique services to the university community. Collections of electronic databases and electronic journals are shared and available for all university faculty, staff, and students through the campus network or authorized remote access.

University Library is open to all members of the university community, with collections and services supporting the faculty, staff, and graduate students of the College of Arts and Sciences, the Case School of Engineering, and the Weatherhead School of Management. The main collection of the University Library, numbering approximately 1.5 million volumes, is housed in the Kelvin Smith Library in the center of campus. The Astronomy and Music Libraries are branches of the University Library and are housed within their respective departments. The University Library currently subscribes to more than 11,000 serials and periodicals and has a large retrospective collection. Its collection also includes audiovisual materials, government documents, special collections, and digital collections. Over 7,000 serials are in electronic formats and may be accessed via the campus network and authorized remote access.

The Mandel School of Applied Social Sciences has the distinction of being one of the few schools of social work that maintains a professional library for the use of its students, staff, faculty and alumni, as well as the general university community. The Lillian F. and Milford J. Harris Library contains over 41,000 volumes and subscriptions to some 260 periodicals and about 850 video and audio items to support these academic programs. The library also has a variety of electronic media and other materials, which are available for classroom use by faculty. This library’s website provides information resources for social work students, faculty, practitioners, and other human service workers in the greater Cleveland area.

The Cleveland Health Sciences Library operates in two locations, the Allen Memorial Medical Library and the Health Center Library. The Cleveland Health Sciences Library collections support programs in the biological sciences, medicine, nursing, and dentistry and are open to all university students, faculty, and staff. The CHSL total collections number approximately 400,000 volumes. The collection consists of books, over 2,400 subscriptions to journals, theses, government documents, audiovisual items, and electronic resources. The collection in the Dittrick Medical History Center contains archives, rare books, and artifacts for research in the history of medical technology.

The Law Library is located in the School of Law, and has more than 290,000 volumes including complete collections of statutory and case law, law reviews, the National Reporter System, state reports, administrative reports, and current law services. There is also an extensive British collection and special collections in taxation, labor law, and foreign investments. The Law Library’s website provides core links to legal information resources, government agencies, and legislative history resources.

EuclidPLUS is the university’s comprehensive online, public-access catalog, and also has holdings of the Cleveland Institute of Music, Cleveland Institute of Art, and the Siegal College of Judaic Studies. EuclidPLUS has search and display functions for the cataloging records of all volumes in the campus libraries and is accessible through the World Wide Web. EuclidPLUS also provides quick links to the libraries’ websites, research databases, electronic journals, consortium materials, and major local libraries. Computer workstations are located in each university library to facilitate use of all digital library information resources. Network access allows researchers to search the resources of the university’s libraries and the state consortium catalog from any port on the campus network, from the Kelvin Smith Library wireless network, or through university-authenticated remote access.

Case Western Reserve University is a founding member of the OhioLINK consortium, which provides a shared, unified catalog for 83 colleges and universities, as well as the State Library of Ohio. OhioLINK provides access to many electronic journals, media resources, and online databases. Authorized faculty, students, and staff enjoy automated online borrowing and renewals of book and media materials, as well as onsite borrowing privileges at OhioLINK member libraries.

Case Western Reserve University students may apply for a Cleveland Public Library CLEVNET card, which expands access to many local city and county libraries in the area. Other libraries in University Circle include the Cleveland Institute of Art, the Cleveland Institute of Music, the Cleve-
land Museum of Art, the Western Reserve Historical Society, the Cleveland Museum of Natural History, and the Cleveland Botanical Garden Library.

The university is a member of the Association of Research Libraries (ARL) comprised of 123 North American research libraries. University Library is an OCLC library, and a member of Scholarly Publishing and Resource Coalition (SPARC).

**University Library**
http://library.case.edu

**Cleveland Health Sciences Library**
http://www.cwru.edu/chsl/homepage.htm

**Law Library**
http://www.law.case.edu/tech_library/index.asp

**MSASS Mandel Library**
http://msass.cwru.edu/library/

**OhioLINK**
http://www.ohiolink.edu

**ARL**
http://www.arl.org

**UNIVERSITY FARM**

The University Farm, consisting of the Squire Valleevue and Valley Ridge properties, is located on Fairmount Boulevard about ten miles east of campus in the Village of Hunting Valley. It is a beautiful, university-owned, 389-acre property that includes within its boundaries forest, ravines, waterfalls, meadows, ponds, and a self-contained natural watershed. It is the site of several buildings designed for educational, research, and recreational purposes and seven residences. The buildings accommodate research and instructional laboratories, classrooms, a large greenhouse, and in the Sheep Barn, Pink Pig (a lodge with overnight accommodations), and Manor House, facilities for conferences, retreats, and recreation. There is also a five-mile running (or cross country skiing) trail, a nature trail, several picnic areas, and playing fields for volleyball and softball.

Case Western Reserve activities, including academic courses, research, intercollegiate athletic events, picnics, continuing education, and retreats, take advantage of this facility. The University Farm is open and available to all students, faculty, staff, and alumni. Utilization of the buildings and large picnic shelters must be in accordance with Farm policies and is secured by reservation through the Farm office.

**DENTAL CLINIC**

Phone 216-368-3200
School of Dental Medicine, Emergency Drive

The School of Dental Medicine of Case Western Reserve University maintains a clinic that provides complete dental services to students and faculty as well as the general public.

**UNIVERSITY BOOKSTORE**

Thwing Center
Phone 216-368-2650
Fax 216-368-5205
http://www.cwru.bkstore.com/cwru/
David Johncock, Manager

The University Bookstore, located in Thwing Center, serves as the source for all required and recommended course materials that include new and used textbooks and CaseNotes (custom produced course packets designed by faculty for their classes). In addition to course books, the University Bookstore features complete reference sections and a large general book department, quality school and office products, the latest in computer software and accessories, a broad selection of clothing and gift items, and a variety of convenience foods and beverages. The University Bookstore also offers special book orders and custom orders of clothing and gift items for groups and organizations.

The Health Sciences bookstore has merged its operation with the University Bookstore, which offers a complete medical department. In addition to all the textbooks for medical, dental, and nursing programs, the department features a complete medical reference section, medical equipment, and supplies.

The University Bookstore is open 8:30 a.m. to 5:30 p.m. Monday to Thursday, and 8:30 a.m. to 5:00 p.m. on Friday. Saturday hours are 10 a.m. to 2 p.m.

Hours are subject to change at the start of each semester, for summer, breaks, and special events. Please check the website for current hours of operation.

http://www.cwru.bkstore.com/cwru/

The bookstore accepts cash, checks, major credit cards, CaseCash, Case charge, and department requisitions.

**PRINTING SERVICES**

Thwing Center, Basement level
Business Office, Bindery
Phone 216-368-2550
Fax 216-368-5205
http://welcome.to/CWRUprint

**Hours of Operation**

Kelvin Smith Library Rm. LL11c
8:30 a.m. to 5:00 p.m.
Peter B. Lewis Building Rm. 23
8:30 a.m. to 5:00 p.m.

University Printing Services is a full-service print facility, designed to serve the printing needs of faculty, staff, and students. With two convenient copy centers, full service bindery department, and a centrally located business office, we can service any of your photocopying, printing or finished document needs. Specific amenities include: black & white photocopying, color copying, standard University items – business cards, letterhead, envelopes, offset printing, scanning, cd burning, foil stamping, thesis/hardcover binding, wide format printing, campus mail envelopes, promotional items, full finishing capabilities, specialty papers, passport photos, and much more.

We offer free pick-up and delivery from all campus locations and can also set you up so that you can print directly from your desktop to our black and white and color copiers.

Please check our website for a full range of products and services.
http://welcome.to/CWRUprint

**TRANSPORTATION**

A free shuttle bus system that runs on a continual schedule throughout the week serves the 550-acre University Circle area.
In the evenings, a loop bus runs every 20 minutes over a specific campus route. Bus schedules are available in the Access Services Office, Thwing, and several other buildings. In addition, Regional Transit Authority bus routes run through the heart of University Circle, linking the campus with the greater community. Rapid Transit trains run directly from the campus to Cleveland Hopkins International Airport.

CAMPUS PARKING

The privilege of parking on campus is granted first to students who must drive cars to reach the campus and to students who require cars because of physical disability or the special needs of their curricula. Parking privileges are then granted, as space permits, to other students. Students living in residence halls and fraternities must obtain parking permits if they maintain cars while in residence. Resident student parking is granted on a confirmed housing assignment, class seniority basis. Parking on campus is not allowed except by permit and then only in the areas for which the permit is valid.

Students may apply for fall parking permits in the previous spring. To the extent that space is available, full-time students who meet the above qualifications are eligible to purchase parking permits. Part-time students attending classes for fewer than 12 credit hours (undergraduate) or 9 credit hours (graduate) are eligible to purchase permits on the same basis as above at a lower cost. Graduate students registered for 651 or 701 courses must purchase full-time permits. Current proof of part-time registration is required when a request for a part-time parking permit is made. Summer session permits are also available.

Questions about the cost of permits may be directed on or after May 1 to Access Services, Crawford Hall, 10900 Euclid Avenue, Cleveland, Ohio 44106-7084 (216-368-2273).

Maps detailing the complete parking inventory of UCI will be issued with each permit.

All students registered at the university must abide by the parking rules of University Circle, Inc. (UCI). Complete copies of the rules are available at the University Circle Parking Department and at Access Services.

Violators are subject to fines and, if fines are not paid, to towing. A person charged with a violation has the opportunity for a first written appeal to the University Circle Parking Department. In the event of an unsuccessful first written appeal, the alleged violator has the opportunity of reappealing in person with counsel, if desired, before the UCI Parking Appeals Committee. Failure to pay a fine will ultimately result in the withholding of transcripts.

UNDERGRADUATE ADMISSION

Admission to Case Western Reserve University is competitive. All applicants are evaluated on the basis of high school performance, including class rank, level of courses completed, grades, recommendations, and personal accomplishments. Scores from the SAT I or the ACT are also an important consideration. Students are encouraged, but not required, to take three of the College Board SAT II Subject Tests. An admission interview is recommended. Students who have been out of high school several years may wish to consult the Office of Undergraduate Admissions about entrance requirements.

First-Year Applicants

Application Dates and Notification of Admission

First-year applicants are students who have not enrolled in course work at a college or university after graduation from high school. Students seeking to enroll in the fall may use any of three application plans. Those who wish to receive early notification of their admission status should indicate their preference for Early Action and meet the November 15 application deadline. They will be notified of the Admission Committee’s decision by January 15. Early Action admission is non-binding; students admitted under this plan are free to apply to other colleges and, if admitted, have until May 1 to accept an offer of admission. Students who wish to be considered for the university’s Pre-Professional Scholars Program (PPSP) must submit their applications by November 15. They will be notified of the university’s decision on their admission in early March and PPSP results by April 15. The regular application deadline is January 15. Students indicating an interest in Regular Decision by this deadline will be notified of their admission by March 1 and will be expected to indicate whether or not they will accept the university’s offer by May 1.

Case Western Reserve University does not admit First Year students for the spring or summer sessions. If unusual circumstances apply, prospective students should contact the admission office to discuss options.

Enrollment is contingent upon successful completion of secondary school work and graduation. Students must arrange to have final semester grades sent to the Office of Undergraduate Studies.

Secondary School Preparation

All entering first-year students are expected to have completed 16 units of full-credit academic work in secondary school, including four years of English, three years of mathematics, and two years of laboratory science. A fourth year of mathematics is expected of students planning to concentrate in mathematics, science, or engineering. Students planning to pursue pre-medical studies or concentrations in mathematics, science, or engineering should have three years of laboratory science, including biology, chemistry, and physics. All students are encouraged to have completed two to four years of a foreign language.

Tests

Applicants must submit scores from either the ACT or the SAT I. It is recommended that these tests be taken no later than December of the senior year.
For students planning to pursue degrees in engineering and science, the score in the mathematical part of the ACT or SAT I is of particular importance. The curriculum in science and mathematics is based on a student's capacity to analyze and reason by means of mathematical logic. The university recommends that applicants for admission take three College Board SAT II tests by December of their senior year. Students interested in science or engineering should take subject tests in English Writing (if the SAT I is taken prior to the inclusion of the writing section), Mathematics Level I or II, Chemistry and/or Physics. Others should take English Writing (if the SAT I is taken prior to the inclusion of the writing section) and two other tests of their choice. Applicants for the Pre-Professional Scholars Program must submit either the SAT I and three SAT II test scores, including English Writing, or the ACT.

Interview

An interview is recommended as part of the admission process, but it is not required. Prospective students should schedule an interview appointment in advance. Parents are welcome. Guided tours of the campus and visits to classes are also arranged upon request. The Office of Undergraduate Admission is open for interviews by appointment from 9 a.m. to 5 p.m. on weekdays and for group information sessions from noon to 3 p.m. on selected Saturdays during the school year. The office is closed on holidays. Students may arrange appointments at our website or by writing, calling, or e-mail:

Case Western Reserve University
Office of Undergraduate Admission
103 Tomlinson Hall
Cleveland, Ohio 44106-7055
216-368-4450
admission@case.edu
http://admission.case.edu

A campus map with directions will be sent with the appointment confirmation.

Application Process

Before an admission decision can be made, the applicant must submit the following:

1. An application form, completed and signed, including the writing sample. A $35.00 application fee is required (fee waivers are available). The $35.00 fee is waived for online applications.
2. The secondary school report, including class rank, courses and grades from school years 9 through 11, and senior year courses in progress. If class rank is not available, this should be noted on the high school transcript. It is the applicant's responsibility to have the guidance counselor prepare and send the secondary school record to the Office of Undergraduate Admission.
3. Scores from the ACT or SAT I. Scores may be reported either through the testing agency or on the official high school transcript.
4. Written recommendations from a high school counselor (required) and a teacher (optional).

To aid the Admission Committee in its decision, applicants should submit, whenever possible, the following supporting materials: SAT II subject test results as noted above and grades for the first semester of the senior year.

Notification of Admission

All admission decisions will be mailed by March 1. Enrollment is contingent on successful completion of secondary school work and graduation. Students must arrange to have final semester grades sent to the Office of Undergraduate Studies.

Acceptance of Admission

Case Western Reserve University subscribes to the College Board Candidate’s Reply Date Agreement. Under this agreement, accepted candidates have until May 1 to accept or decline the offer of admission.

Note: Applicants who have been offered admission by a college or university that requires a response before May 1 (except when applying under a binding Early Decision plan) should contact that college or university to ask for an immediate extension of its deadline until all the colleges applied to have responded. They should also contact the Office of Undergraduate Admission to inform the Admission Committee of the problem.

Case Western Reserve University subscribes to the National Association of College Admission Counselors’ Statement of Principles of Good Practice.

Enrollment Deposit

Students who accept the offer of admission must submit a non-refundable enrollment deposit of $300.00 to reserve a place in the entering class. If a student does not respond to the offer of admission by May 1 or does not make the appropriate deposit, the Office of Undergraduate Admission may release the student’s place to another applicant.

Advanced Placement and Proficiency Examinations

Case Western Reserve University grants degree credit and placement in advanced courses on the basis of the College Board Advanced Placement Examinations and the International Baccalaureate (IB) Diploma or the International Baccalaureate higher level examinations. The determination of credit and placement is made by the appropriate academic departments. Advanced Placement scores of 4 or higher or an IB higher level examination score of 5, 6, or 7 may receive favorable consideration. Students who are enrolled in high schools that do not offer Advanced Placement courses but who wish to take the examinations should contact their high school counselors for registration information. It is the student’s responsibility to have Advanced Placement scores sent to the Office of Undergraduate Admission. Students may also receive college credit on the basis of proficiency examinations administered by individual departments.

Transfer Applicants

Transfer applicants (any student who has enrolled in a college or university after graduation from high school is consid-
vided for admission for the fall semester, spring semester, or summer session. In order to provide adequate time for evaluation, applications should be completed as early as possible and by the appropriate deadline (deadlines are posted on our website and subject to change). The degree requirements for all students are established by the undergraduate colleges. For specific requirements for transfer students, please see the appropriate section under “Undergraduate Studies.” It is generally expected that the final two academic years will be taken in residence at the university.

Each transfer applicant is asked to submit:

1. An application form, completed and signed, including the personal statement. An application fee of $35.00 is required (fee waivers are available). The $35.00 fee is waived for online applications.
2. An official transcript of the high school record.
3. Official transcripts from each college attended.
4. The Statement of Good Standing completed and signed by a school official.
5. Typed or printed descriptions of each course completed in college, including those in which the student is currently enrolled, as well as those the student will complete before transferring. Such descriptions should include the name of the department offering the course, course number, number of credit hours, and, when possible, course syllabus and title and author of text.
6. If available, College Board SAT I and SAT II test scores or ACT scores. The scores may be included with the high school transcript or sent directly to the university from the testing service. The applicant will be notified of the admission decision as soon as the file is complete. Admitted students who accept the offer of admission must respond by submitting the same reservation deposits as those listed for freshmen (see above). Offers of admission are contingent upon satisfactory completion of work in progress at another college or university.

In order to evaluate transfer credit, the Office of Undergraduate Admission must receive a complete official transcript of all work taken and course descriptions.

Binary (3-2) Program

In cooperation with a number of liberal arts colleges, Case Western Reserve University offers the Binary (3-2) Program in engineering, in which students complete three years of study in the liberal arts college and two years in engineering at the Case School of Engineering and receive degrees from both colleges. For further details, consult the program description found under “Undergraduate Studies.”

Special Admission Programs

Students seeking admission to one of the university’s joint programs with the Cleveland Institute of Art or the Cleveland Institute of Music should consult the appropriate program descriptions elsewhere in this Bulletin. For information regarding admission as a transient student or adult non-degree student, admission to the Pre-Professional Scholars Program and Six-Year Dental Program, admission to the PreCollege Scholars Program, or admission to the Minority Engineers Industrial Opportunity Program, consult the appropriate section of this bulletin.

REGISTRATION

(Summer, Fall, and Spring)

Students register at the time indicated on the University Registrar’s website or at the time indicated by individual graduate/professional school registrars. Undergraduate student registration for fall begins in April and continues through the beginning of classes in August; undergraduate student registration for spring begins in November and continues through the beginning of classes in January. Only those students who have no outstanding financial obligations to the university are eligible to register. The University Controller bills those who register early for the next semester, with payment due by the specified deadline before the start of the next semester. At registration just prior to the beginning of classes, students must have paid all previous charges and be able to pay or have financial aid equal to one-half of that semester’s tuition and fees. Each student must have an ID number on record in the student information system. The social security number is used as the student ID number, and it appears on all documents and records. Students from other countries who do not have social security numbers are issued student ID numbers.

The “Schedule of Classes” is published once per semester, and an electronic version is updated routinely to indicate changes and is available through the University Registrar’s website at: http://www.case.edu/provost/registrar/registrar.html. The University Registrar’s website includes the academic calendar, the dates for late registration and drop/add, and a complete listing of courses offered. Students are encouraged to use the on-line registration system (SOLAR) if available through their school. Alternatively, students may obtain course selection forms and instructions in their deans’ or registrars’ offices. If not using SOLAR, completed schedule forms are to be signed by the student’s advisor and/or dean, before the student goes to the registrar’s office. No zero credit only registrations (e.g. zero credit physical education courses) are allowed unless approved as part of ongoing degree programs. During any semester, students may not register in more than one school or college of the university.

Courses of Instruction

All courses at the university, except courses in the Medical School, Law School, School of Dentistry, and School of Nursing, are numbered according to the following plan:

• 100-199 Elementary courses
• 200-299 Intermediate courses
• 300-399 Advanced undergraduate courses
• 400-499 Lower level graduate courses
Roman numerals (I, II, etc.) after course titles indicate segments of a multi-course sequence. Arabic numerals in parentheses after course titles indicate the semester credit hours for each course.

Veterans' Coordinator

The Veterans' Coordinator, housed in the Office of the University Registrar, 110 Yost Hall, administers the regulations governing the educational benefits and opportunities open to veterans under various federal laws. The office maintains close contact with the Veterans Administration and is the only office authorized to verify veterans' attendance. For information call 216-368-4310.

Grading System

The following grading system is used at Case Western Reserve University:

**Letter Grade Meanings and Quality Points**

<table>
<thead>
<tr>
<th>Letter</th>
<th>Meaning</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>Fair</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Passing</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>Failure</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Withdrawal from a class</td>
<td></td>
</tr>
<tr>
<td>WD</td>
<td>Withdrawal from all classes for a particular semester</td>
<td></td>
</tr>
<tr>
<td>WF</td>
<td>Withdrawn under Academic Regs. 5 &amp; 6 (law school)</td>
<td></td>
</tr>
<tr>
<td>AD</td>
<td>Successful audit</td>
<td></td>
</tr>
<tr>
<td>NG</td>
<td>Unsuccessful audit</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>Passing in a pass/no pass course</td>
<td></td>
</tr>
<tr>
<td>NP</td>
<td>Not passing in a pass/no pass course</td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>Commendable (School of Medicine only)</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Honors in a pass/no pass course (nursing, law, medical school only)</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>For courses that extend for more than one semester</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Satisfactory (for master’s or doctoral thesis, E.M.B.A. seminar courses, and medicine only)</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>Unsatisfactory (for master’s or doctoral thesis, E.M.B.A. seminar courses, law school and medical school only)</td>
<td></td>
</tr>
<tr>
<td>RPT</td>
<td>Repeated Course</td>
<td></td>
</tr>
</tbody>
</table>

**First Year Undergraduates:** For the first two semesters of full-time enrollment students who are beginning their college studies will earn credit and grades only for those courses completed with a grade of D or higher. Any courses for which a grade of F, W or NP is assigned will not be included in the computation of the grade point average and will not be posted on the official transcript. This grading policy is not applicable to part-time or transfer students and does not apply to the summer session.

**Explanation of Grades**

The responsibility for assigning grades rests exclusively with the instructor of a course or section, who must announce the general method of grading to his/her class at the beginning of the course. Grades in all courses are reported to the University Registrar at the end of each semester for all students and at midterm for undergraduates (midterm grades are not considered part of the student’s permanent academic record). Changes to student grades must be reported on grade change cards and have all required signatures.

**I (Incomplete)**

The grade of I is assigned at the discretion of an instructor provided that:

1. There are extenuating circumstances, explained to the instructor before the assignment of the grade, which clearly justify an extension of time beyond the requirements established for other students in the class. It is the student’s responsibility to notify the instructor of the circumstances preventing completion.

2. The student has been passing the course and only a small segment of the course remains to be completed, such as a term paper, for which the extenuating circumstances justify a special exception.

An Incomplete grade may not be assigned if a student is absent from a final examination, unless the dean has authorized the absence. Unauthorized absence from a final examination will result in a failing grade. When the student completes the work, the Incomplete is changed to an A, B, C, D, P, F, or NP. (Note: not all schools award all of these grades, see first paragraph of “Grading System” above.)

**For undergraduate students:** All work for the Incomplete grade must be made up and the change of grade recorded in the Office of the University Registrar, by the date specified by the instructor, but no later than the 11th week of the session following the one in which the Incomplete grade was received. In certain cases (such as students on probation or graduating students), the dean may establish an earlier date for completion of courses with Incomplete grades. When a student fails to submit the work required for removing the Incomplete by the date established, the instructor shall transmit to the Registrar a final grade that assumes a failing performance for the missing work. In the absence of the assignment of a grade by the instructor, the Registrar will convert the I to F when the deadline for making up Incomplete grades from a previous semester has passed. Failure to meet this deadline for removing the Incomplete will result in a failing grade. An instructor may elect to give the grade of F or NP if the Incomplete is not removed within the specified time limit. For students in the graduate and professional schools: In order to receive credit for a course marked Incomplete, the student must complete the work by the date specified by the instructor and in no event later than the end of the next regular semester (fall or spring). If the student fails to remove the Incomplete within the specified time, he or she forfeits the privilege of completing the course for credit, and the grade...
becomes a permanent Incomplete unless the instructor elects to give a grade of F.

S (Satisfactory)

The grade of S given graduate students in the School of Graduate Studies indicates satisfactory progress in evaluating exclusively thesis and dissertation research. The grade S is not counted in determining quality averages. The alternative to a grade of S is U (Unsatisfactory). The grade of I (Incomplete) may not be used in evaluating thesis and dissertation research. In other graduate/professional schools, the grade of S may indicate passing performance in designated courses and advanced seminars.

R (Conditional)

The grade of R is used for work, such as undergraduate thesis and project laboratories, that extends more than one semester and, upon completion of the thesis or project, will be changed to the letter grade awarded for the completed work. The R grade assigned in ENGL 148 indicates that a student must re-enroll in ENGL 148. In the following semester; the R grade in ENGL 148 remains on the student’s record and is not subject to replacement by the final grade earned in ENGL 148.

AD (Audit) and NG (Unsuccessful Audit)

The grade of AD (audit) will be given when a student has officially registered to audit a course and has satisfied the requirements specified by the instructor for this grade. The grade of NG (unsuccessful audit, graduate, and professional schools only) will be given when a student has officially registered to audit a course and has not satisfied the requirements specified by the instructor for this grade.

Undergraduate Students

A student may audit a course with the dean’s or advisor’s approval and the consent of the instructor of the course. An auditor receives no credit for the course. Registration in a course cannot be changed from audit to credit or the reverse after the end of the drop/add period. At the beginning of the course, the student and instructor should reach agreement regarding the requirements to be met for a grade of AD. The grade of AD is entered on the student’s transcript if approved by the instructor of the course. If the instructor does not approve the grade AD, the enrollment is not posted on the transcript. A student may take for credit a course he or she audited in an earlier semester.

Graduate/Professional Students

Dental students: Courses towards degree programs in the dental school may not be audited.

The following statements apply to the schools of Graduate Studies and Management: The instructor may designate that the student has not completed all requirements for auditing the course and that NG (Unsuccessful Audit) be recorded on the student’s transcript. A course once audited may not be repeated for credit, nor may any course for which credit has been given be repeated for credit toward degree requirements. Students will be permitted to change their registration in a course from credit to audit (AD), or the reverse, with written consent of their advisor and the instructor only if the change is officially made on or before the date specified in the academic calendar for the given term.

Other graduate and professional schools: Please refer to individual school sections of this publication, or to individual school student handbooks.

W (Partial Withdrawal)

The grade of W will be given if a student officially withdraws from a course on or before the date specified in the academic calendar for the given term. This procedure necessitates completion of a form that must be signed by the dean and/or faculty advisor and submitted to the University Registrar. After this date, the grade as determined by the instructor will be posted.

WD (Complete Withdrawal)

The grade WD is assigned by the University Registrar for complete withdrawal from all course work for the semester. All withdrawal forms are to be submitted to the University Registrar prior to the last day of class.

Grade-Point Averages

Grade-point averages are calculated by multiplying the number equivalent of the letter grade by the number of credit hours for the course. The semester grade-point average is computed by dividing the total number of grade points earned at the university during a given semester by the sum of the credit hours for all courses in which the student received letter grades of A, B, C, D, or F taken at the university during that same semester. (Not all of these grades are given by all schools.) For the purpose of semester grade calculations, grade points earned when a grade of Incomplete is replaced by the appropriate course grade are credited to the semester in which the incomplete grade was received, but status action (separation, probation, or restoration to good standing) taken at the end of that semester is not affected unless the grade change occurs by the first day of classes of the following semester. Qualification for honors is based on the same terms.

The cumulative grade-point average is computed by dividing the total grade points earned at the university by the sum of the credit hours for all courses included in the grade-point calculation.

Pass-No Pass

See specific colleges and schools for information about courses that may be taken on a pass-no pass basis and similar options.

STUDENT RECORDS

The Family Educational Rights and Privacy Act of 1974 (FERPA) contains several provisions that are important to students. First, the university may not release personally identifiable student
FERPA. The information below is pre-
has adopted to meet the requirements of
student may obtain from the Registrar a
he or she believes to be the university's
Education a complaint concerning what
The university is permitted a reasonable
time, not to exceed 45 days, to respond
A student may request, in writing, an
opportunity to inspect and review the stu-
dent's official files and records maintained
by the university and may, if appropriate,
challenge the accuracy of those records.
The university permitted a reasonable
time, not to exceed 45 days, to respond
to such a request. Third, a student may
file with the Family Policy and Regula-
tions Office of the U.S. Department of
Education a complaint concerning what
he or she believes to be the university's
failure to comply with FERPA. Finally, a
student may obtain from the Registrar a
copy of this policy, which the university
has adopted to meet the requirements of
FERPA. The information below is pre-
andered in compliance with the provisions
of FERPA, which require the university
to notify students annually of their rights
and the university's policies and pro-
cedures. Specific procedures may vary
slightly among the schools and colleges of
the university, and each student is encour-
gaged to inquire at his or her own dean's
office if any question arises.
Access to Files
A student may request, in writing, an
opportunity to review the contents of the
student's educational file. Certain materi-
als are excluded from review as specified
in FERPA. Among these are:
• Records kept in the sole possession
of faculty, staff, and other personnel,
used only as a personal memory aid,
and not accessible to any other person
except a temporary substitute for the
maker of the record.
• Records created and maintained by
law enforcement units solely for law
enforcement purposes that are not
maintained by persons other than law
enforcement officials.
• Records created and maintained by
a physician, psychiatrist, psychologist,
or other professional or paraprofes-
sional acting in that capacity in con-
nection with the provision of treat-
ment to a student. Such records can,
of course, be reviewed by a physician
or other appropriate professional of
the student's choice.
• Employment records of a student
made and maintained in the normal
course of business. Such employment
records may be obtained in the Stu-
dent Employment Office or Human
Resources under the policies appli-
cable to those offices.
• Financial records of a student's par-
ents, or any information contained
therein.
• Confidential letters and statements
of recommendation placed in the file
before January 1, 1975.
• Records for which the student previ-
ously waived his or her right of access.
• Records that contain only informa-
tion about a person after that person
is no longer a student, such as alumni
records.

The student may request copies of those
records to which he or she has access
under the terms of FERPA. The student
will be charged a nominal fee per page for
these copies.

Release of Personally Identifiable Records
FERPA affords the student the right
to consent to disclosures of personally
identifiable information contained in the
student's educational records, except to
the extent that FERPA authorizes dis-
closure without consent. One exception,
which permits disclosure without con-
sent, is disclosure to school officials with
legitimate educational interests. A school
official is defined as a person employed
by the university in an administrative,
supervisory, academic, or support staff
position (including law enforcement unit
and health staff); a person or company
with whom the university has contracted
(such as an attorney, auditor, or collec-
tion agent); a person serving on the Board
of Trustees; or assisting another school
official in performing his or her tasks. A
school official has a legitimate educational
interest if the official needs to review an
education record in order to fulfill his or
her professional responsibility.

Upon request, the university discloses
education records without consent to
officials of another school in which a
student seeks or intends to enroll. The
university also discloses education records
to organizations conducting studies for
educational agencies or institutions under
certain circumstances.

Directory Information
For the convenience of faculty and fellow
students, FERPA provides for a category
known as directory information which
may be released without requesting the
eligible student's specific prior consent.
Rather, the act requires that students be
 notified annually of the types of infor-
mation included in this category and be
given an appropriate period in which to
express, in writing, any preference that
such information about themselves not
be released. For this purpose, directory
information is defined to include
- Name (including both maiden name and married name, where applicable)
- Address, telephone listing, and electronic mail address
- Date and place of birth
- Major field of study
- Anticipated graduation date
- Enrollment Status (undergraduate or graduate, full-time or part-time)
- Dates of attendance
- Degrees and awards received
- Participation in officially recognized sports and activities
- Weight and height (members of athletic teams)

Any student who would prefer that the university not release such information about himself or herself should so notify the Office of the University Registrar, in writing, prior to the first week of classes in the fall semester. Students entering the university at midyear may submit such notice during the first week of classes of the spring semester.

Transcripts

A transcript of grades will be released only upon written request of the student, either in person or by mail. A fee is charged for each transcript copy. Transcripts will not be issued to, or on behalf of, students who have not discharged all delinquent obligations to the university.

POLICY ON SEXUAL HARASSMENT

It is the policy of Case Western Reserve University to provide a positive, discrimination-free educational and working environment. Sexual harassment is unacceptable conduct which will not be tolerated. All members of the university community share responsibility for avoiding, discouraging, and reporting any form of sexual harassment.

Members of the university community found in violation of this policy may be disciplined, up to and including being discharged for cause or being expelled from the university. Retaliation against persons raising concerns about sexual harassment is prohibited and will constitute separate grounds for disciplinary action, up to and including discharge or expulsion from the university.

This policy and the accompanying procedures shall serve as the only internal university forum of resolution and appeal of sexual harassment complaints.

The university has passed and disseminated to all parties on this campus—students, faculty, and staff—a detailed statement titled Policies and Procedures Regarding Sexual Harassment and Sexual Assault. Copies are available on-line at http://www.case.edu/stuaff/shpp/harasspolicy.html, in the Office of Equal Opportunity and Diversity, the Provost’s Office, all the deans’ offices, and at many of the university offices throughout the campus. Consultation and advice are available in the offices of the Provost, Equal Opportunity, Human Resources, and Student Affairs. See the section, “Student Affairs,” for policies and procedures regarding sexual assault.

STUDENT RIGHT TO KNOW

The Student Right to Know and Campus Security Act requires that universities throughout the country produce statistics and/or information on the following subjects: 1) retention and graduation rates; 2) financial assistance available to students and requirements and restrictions imposed on Title IV aid; 3) crime statistics on campus; 4) athletic program participation rates and financial support; and 5) other institutional information including: the cost of attendance, accreditation and academic program data, facilities and services available to disabled students, and withdrawal and refund policies.

Data on retention and graduation rates is available in the Office of the Provost in Adelbert Hall (216-368-4389) and is posted on the Registrar’s website at: http://www.case.edu/provost/registrar/gradrate.html. Information on financial assistance, including descriptions of application procedures and forms, may be obtained from the Office of University Financial Aid, Yost Hall, (216-368-4530).

Information concerning athletic program participation and financial support may be obtained from the Physical Education and Athletics Department, Veale Center, (216-368-2867). Other institutional information, such as that listed in number 5, above, may be obtained from the Office of the Provost and in the various undergraduate, graduate and professional schools’ registrars’ offices.

Case Western Reserve University’s annual security report includes statistics for the previous three years concerning reported crimes that occurred on campus; in certain off-campus buildings owned or controlled by the university; and on public property within or immediately adjacent to and accessible from the campus. The report also includes institutional policies concerning alcohol and drug use, crime prevention, the reporting of crimes, sexual assault and other matters. You can obtain a copy of this report by contacting the Protective Services Office at 216-368-2908 or by accessing the following website: http://www.cwru.edu/finadmin/security/secmain.htm.

EXCEPTIONS TO POLICIES

Requests for exceptions to any academic or administrative policy must be submitted within three months of the end of the semester for which the exception is sought.
UNIVERSITY ADMINISTRATION
(July 1, 2004)
Edward M. Hundert, M.D.
President
John Anderson
Provost and University Vice President
Christine Ash
Vice President for University Planning and Budget
Kenneth A. Basch
Vice President for Campus Planning and Operations
Derek C. Bellin
Vice President for University Relations and Chief Development Officer
Mark E. Coticchia
Vice President for Research and Technology Management
Donald L. Feke
Vice Provost for Planning and Assessment and Interim Dean for Graduate Studies
Lev S. Gonick
Vice President for Information Technology Services and Chief Information Officer
Anthony Kinslow
Vice President for Human Resources
Glenn Nicholls
Vice President for Student Affairs
Jeanine Arden Ornt
Vice President and General Counsel
William M. Rose
Treasurer and Chief Investment Officer
Hossein Sadid
Chief Financial and Administrative Officer
Susan B. Shurin
Vice President and Secretary of the Corporation
Lynn T. Singer
Deputy Provost and Vice President for Academic Programs

ACADEMIC DEANS
Grover C. Gilmore
Dean of the Mandel School of Applied Social Sciences
Jerold S. Goldberg
Dean of the School of Dental Medicine
Ralph I. Horwitz
Dean of the School of Medicine and Vice President for Medical Affairs
Gerald Korngold
Dean of the School of Law
Myron J. Roomkin
Dean Designate of the Weatherhead School of Management
(appointment effective 11/1/04)
Margaret S. Robinson
Dean of Undergraduate Studies
Robert F. Savinell
Dean of the Case School of Engineering
Mark Turner
Dean of the College of Arts and Sciences
May L. Wykle
Dean of the Frances Payne Bolton School of Nursing

BOARD OF TRUSTEES
(July 1, 2004)
Officers
Frank N. Linsalata, Chair
Joie A. Gregor, Vice Chair
David P. Hunt, Vice Chair
Timothy J. Callahan, Vice Chair
Trustees
George N. Aronoff
Sarah S. Austin
S. Andrew Banks
James L. Bildner, J.D.
William E. Bruner, II, M.D.
Timothy J. Callahan
Antony E. Champ
Archie G. Co
David A. Daberko
Thalia Dorwick, Ph.D.
Gregory L. Eastwood, M.D.
Edward M. Esber, Jr.
Fred D. Gray
Joie A. Gregor
Sally Gries
Peter S. Hellman
Robert J. Herbold, Ph.D.
Michael J. Horwitz
Edward M. Hundert, M.D., ex officio
David P. Hunt
Jennie S. Hwang, Ph.D.
Samir N. Jadallah
Joseph P. Keithley
Charles J. Koch
Edith Lauer
John F. Lewis
Frank N. Linsalata
Joshua W. Martin III
Harold D. McRae
A. Malachi Mixon III
Mario M. Morino
John C. Morley
Ferid Murad, M.D., Ph.D.
Alfred M. Rankin, Jr.
James A. Ratner
Carol G. Renner
Joseph B. Richey
Theodore Schroeder
Patrick C. Walsh, M.D.
Russell J. Warren
Richard T. Watson
Honorary Trustees
Claude M. Blair
Charles P. Bolton
Theodore J. Castele, M.D.
Anne M. Clapp
Helen T. Clements
John R. Donnell
Allen H. Ford
Elaine G. Hadden
Dorothy Humel Hovorka
George M. Humphrey II
Louise Ireland Humphrey
Morton L. Mandel
Samuel H. Miller
Lindsay Morgenthaler
Lucia S. Nash
Patrick S. Parker
Richard W. Pogue
Karl H. Rudolph
Ward Smith
Elizabeth Spahr, M.D.
Bertram D. Thomas
Joseph H. Thomas
Robert M. Ward
Albert J. Weatherhead III
Ambassador Milton A. Wolf, Ph.D.
All financial obligations to the university must be discharged before a student can graduate and obtain a degree. A student will not be considered to have registered in the university until all tuition and fees have been paid in full or deferred in accordance with the deferred payment plan outlined at the end of this section. Checks and money orders should be made payable to Case Western Reserve University and should show the name and social security number of the student for whom payment is made.

TUITION CHARGES

Students registered in the undergraduate colleges and the School of Nursing will be charged tuition according to the following schedule for 2004-2005:

1 to 11 credit hours (credit or audit) $1,104.00 per semester hour

12 or more credit hours (credit or audit) $13,250 per semester.

Students registered in the School of Graduate Studies will be charged according to the following schedule for 2004-2005:

1-11 credit hours (credit or audit) $1,058 per semester hour

12-17 credit hours (credit or audit) $12,700 per semester

Above 17 hours in Graduate Studies, a surcharge of $1,058 per semester hour will be assessed.

Students enrolled in undergraduate courses for the summer semester will be charged at a rate, which is one-half of the previous semester’s per credit hour charge.

Registration in the fall or spring semester for more than 9 credit hours of dissertation research or more than a total 16 graduate credit hours requires special permission of the Dean of Graduate Studies. Such permission is also necessary for summer session registration in excess of 6 graduate credit hours.

Dental Medicine

The School of Dental Medicine has implemented a fixed, four-year rate for each entering class effective with the 2003-2004 academic year.

Students entering the School of Dental Medicine in Fall 2004 will be charged $37,650 for each of the four years of the academic program. Students who entered the Dental program in Fall 2003 will pay $34,860 per academic year. Students entering prior to Fall 2003 will pay $34,205 for the 2004-5 academic year. Dental Medicine students pay additional tuition for each summer clinic. For summer 2004, this amount is $1,865.

Medicine

The School of Medicine has implemented a fixed, four-year rate for each entering class effective with the 1997-98 academic year. The tuition rate for students entering in Fall 2004 is $37,200. Students who entered in Fall 2003 will be charged $36,500 in tuition. Students who entered in Fall 2002 will be charged $35,000 in tuition. Students who entered in Fall 2001 will be charged $33,750 in tuition.

Management

Full-time students registered in the various masters programs of the Weatherhead School of Management will be charged $29,040 for the 2004-2005 academic year with a part-time rate of $1,210 per credit hour and $14,220 for selected summer 2004 programs. Full time students enrolled for credit hours in excess of 20 during a semester will be assessed an additional $1,210 per credit hour. Part time MBA students enrolling for more than 12 credit hours will pay $14,520 plus $1,210 for each credit hour over 12. First-year students in the Executive Master of Business Administration program are charged $35,700 for the academic year 2004-2005. Second year students will pay $33,500 for the academic year and $8,000 for summer 2004. Students in the Executive Doctor of Management program will be charged $29,200 for the 2004-2005 academic year.

Law

In the School of Law, all students pursuing a J.D. degree taking 10 credit hours or more will be charged $28,200 for the 2004-2005 academic year with a part time rate of $1,175 per credit hour.

Mandel School

In the Mandel School of Applied Social Sciences, a student in the master's program will be charged $12,700 per semester for the 2004-2005 academic year for enrollment between 12 and 16 credits in a semester. The part-time rate of $847 applies to students taking 1-11 credits In a semester. Full time students enrolled for credit hours in excess of 16 will be assessed an additional $847 per credit hour. Doctoral candidates will be charged $1,058.00 per credit hour to a maximum of $12,700 per semester for registrations of 12-17 credit hours. Students enrolled in the Mandel Center for Nonprofit Organizations will be charged $1,058.00 per credit hour to a maximum of $12,700 per semester for 12-20 credit hours. Students taking more than 20 credits during a semester will be assessed a $1,058 surcharge per credit.

SPECIAL FEES—NOT REFUNDABLE

Application Fees

Required with all applications for admission. This fee is payable at the time of filing the application. It is not refundable and no portion will be applied to tuition.

Applied Social Sciences: $25

Dentistry: $45

Graduate Studies: $25 (not required for non-degree students)

Law: $40
Management: $50
Medicine: $60
Nursing: $75 (N.D. & M.S.N.)
Health Service and Medical Insurance Fee: $437/semester

The university’s Medical Plan fee is automatically billed at the beginning of the fall semester and spring semester (spring semester coverage extends through the summer) to all students registered for one or more credit hours. The Medical Plan provides coverage for medical care not available at the University Health Service. Students registered for one or more credit hours are eligible to use the University Health Service regardless of their participation with the Medical Plan. Students who have alternate medical insurance may waive the university’s Medical Plan fee each semester by completing an online waiver form. The deadline date for completing the waiver process is stated on the website. Remember, this fee is billed twice a year; therefore, a waiver must be completed twice a year.

Late Registration Fee
Required of students who register after classes have begun: $25

Transcript Fee
There is a $5 fee assessed for each transcript request.

Student Activities Fee
Undergraduate: $106 per semester
Dentistry: $90 per semester
Graduate: $5 per semester
Law: $36 per semester
Nursing: $15 per semester (N.D. & M.S.N); $7.50 per semester (Ph.D. & B.S.N.)
Medicine: $15 per semester

Co-op Fee
First-time participants: $150
Subsequent placements: $75

Clinical Practice Fee
All nursing undergraduates are charged a clinical practice fee in the fall semester of each year. For the 2004-2005 academic year, the clinical practice fee is $200.

Laboratory Fee
Dentistry: $100 per semester

Graduation Fee
Doctor of Philosophy: $120
This fee for the doctorate includes the cost of microfilming the doctoral dissertation by University Microfilms, Ann Arbor, Michigan, which is a requirement for the degree.

In Absentia Fee
Paid by undergraduate degree candidates who are registered in an approved program at another institution: $500.

Junior Year Abroad
Undergraduates: $500.

Tuition Deposit
Mandel School of Applied Social Sciences: $100 (non-refundable)
Dentistry: $1,000 (non-refundable)
Nursing (ND, NG): $200 (non-refundable)
Law: $150 spring deposit and $250 summer deposit (both non-refundable)
Management: $500 (non-refundable)
Undergraduate: $300 enrollment deposit (non-refundable)

Special Nursing Fees
Professional and personal liability insurance ($1,000,000 limit): $79-$158
FPB/NSNA insurance, N.D. students: $35 per year
Malpractice Insurance - B.S.N. - $50 per year

OTHER EXPENSES (ESTIMATED)

Books, Supplies, and Equipment
Nursing—Level I: $1,730 Level II: $1,180; Levels III and IV: $1,120
Medicine—$1,000 year (students must also supply their own microscopes; contact School of Medicine for requirements)
Dentistry—first year: $9,855; second year: $5,825; third year: $1,580; fourth year: $1,580
Law: $1,200 per year
Management: $1,330 for first year students; $1,200 for second year students

Housing and Meals (On Campus)
See “Office of Housing and Residence Life” in the Student Affairs section of this Bulletin.

PERSONAL PROPERTY INSURANCE

Students are responsible for their personal property while on campus. The university assumes no responsibility for loss of or damage to a student’s personal property, and the university insurance program does not cover such losses. Many “homeowner policies” purchased by a student’s family provide coverage for such perils as fire, water, and theft. If this coverage does not exist, the student may wish to consider the purchase of a separate policy.

POLICY FOR TUITION PAYMENT

Students enrolled in fall, spring, and summer terms for courses of full-term length may arrange to pay bills for tuition and fees in two installments. At least one-half of the total bill must be paid at registration; the remainder must be paid by October 15 for the fall semester, March 15 for the spring semester, and July 15 for the summer session. Any remainder after the dates specified will be considered delinquent and will be assessed a late payment charge of 1.5% per month. Students registering as transient from another institution must pay the tuition and fees in full at the time of registration. Case
Western Reserve University provides a Tuition Made E-Z Payment Plan. This ACH process will automatically debit a designated checking account on a monthly basis and apply the credits electronically to the student’s account. This process will eliminate the need for writing checks and the cost of postage. Information on this plan is available through the Office of Student Accounts Receivable at 216-368-2226 or the Controller’s Office Website at www.case.edu/finadmin/controller/con-thome.htm.

Case uses a full service eCommerce product that allows students and authorized third parties to view tuition bills and make payments to their accounts online. Bills are sent electronically via an e-mail message that contains an embedded link to the QuikPay site. All students are automatically enrolled in QuikPay and will receive their billing statements online.

REFUNDS

It is the policy of Case Western Reserve University that a refund from a scholarship, a grant, a loan or other assistance will be issued only after all charges payable to the university for an entire semester have been satisfied. If the gift assistance and loans for a semester exceed the student’s charges for that semester, a refund will be issued during that semester. Since a refund cannot be processed until after the end of the late registration/drop/add period, there is a delay of approximately two weeks after the costs and aid are confirmed. Any student, who is anticipating a refund, should make provision to cover costs to be incurred prior to the issuance of the refund check. (Please note that any form of aid designated as Pending is not considered to be received until the pending designation is removed and the credit has been applied to the student’s account.)

COMPLETE WITHDRAWAL

A student who completely withdraws from a fall or spring semester must pay a percentage of the tuition charge. The percentage charged is based on the number of weeks classes have been in session at the time of withdrawal.

<table>
<thead>
<tr>
<th>Week</th>
<th>Amount of Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>2-3</td>
<td>12%</td>
</tr>
<tr>
<td>4-5</td>
<td>25%</td>
</tr>
<tr>
<td>6-7</td>
<td>37%</td>
</tr>
<tr>
<td>8-10</td>
<td>50%</td>
</tr>
<tr>
<td>After 10th week</td>
<td>100%</td>
</tr>
</tbody>
</table>

There is no tuition refund after the tenth week of classes.

A student who completely withdraws from a summer session must likewise pay a percentage of the tuition charge. The amount is based on the number of weeks classes have been in session at the time of withdrawal.

<table>
<thead>
<tr>
<th>Week</th>
<th>Amount of Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>14%</td>
</tr>
<tr>
<td>3</td>
<td>26%</td>
</tr>
<tr>
<td>4</td>
<td>39%</td>
</tr>
<tr>
<td>5-6</td>
<td>50%</td>
</tr>
<tr>
<td>After 6th week</td>
<td>100%</td>
</tr>
</tbody>
</table>

There is no tuition refund after the sixth week of classes.

The university will refund any tuition paid for a semester by any student in good standing who is inducted into the armed forces before the end of that semester and who does not receive credit for the work completed during that semester.

RETURN OF FEDERAL AND INSTITUTIONAL STUDENT AID FUNDS

This policy applies to students who withdraw or are dismissed and refunds for these students are determined according to the following policy:

1) The term “Federal Student Aid Funds” refers to the Federal financial aid programs authorized under the Higher Education Act of 1965 (as amended) and includes the following programs unsubsidized FFEL Loans, subsidized FFEL Loans, unsubsidized Federal Direct Loans, subsidized Federal Direct Loans, Federal Perkins Loans, FFEL PLUS Loans, Federal Direct PLUS Loans, Federal Pell Grants, and Federal Supplemental Educational Opportunity Grant.

2) A student’s withdrawal date is the date the student began the institution’s withdrawal process by submitting a completed withdrawal form to the University Registrar. The form must be signed by representatives of all specified departments, including a representative of the Dean’s Office of the school of enrollment. Students who leave the university without official notification will be considered to have withdrawn as of the midpoint of the semester or the last date of attendance at an academically related activity as documented by the university.

3) Refunds on tuition and room and board, if contracted with the university, will be prorated on a weekly basis based upon the university calendar up to the 60% point of the semester. There are no refunds after that time.

4) Federal aid and institutional aid is earned in a prorated manner on a per diem basis based upon the university calendar up to the 60% point of the semester. Federal and all other aid is viewed as 100% earned after that date.

5) In accordance with Federal regulations, when financial aid is involved, refunds are allocated in the following order:


6) Any funds received in excess of the amount earned must be returned to the funding source. If the return of unearned Federal assistance causes any portion of the student’s tuition and other charges to be unpaid, the student will be billed by the university.

7) Refunds and adjusted bills will be sent to the student’s home address following withdrawal.
PARTIAL WITHDRAWAL

A student who withdraws from a course or courses after the normal drop/add period without completely withdrawing from the university is not entitled to a tuition refund for the course or courses dropped. At the discretion of the dean of a school, a partial tuition refund may be authorized in cases in which unforeseen and unavoidable circumstances necessitate that a student withdraws from a course or courses, and the student does not wish to withdraw completely. Federal, state or institutional aid may be adjusted to reflect the adjusted tuition cost in accordance with federal, state and institutional rules, regulations and policies. These may require a minimum level of enrollment to receive any assistance from a specific program.

FINANCIAL ASSISTANCE

An important consideration for nearly every student is how much higher education will cost and how much the student will be expected to provide toward that cost. Students should not assume that they will be unable to attend Case Western Reserve University for financial reasons. Each year more than half of the entering class receives financial assistance. Sources of support are many and varied. Students and parents are encouraged to investigate the financial aid opportunities at Case Western Reserve University. For undergraduate students, in addition to a comprehensive program of financial assistance based on a student’s demonstrated need, the university offers academic awards based solely on academic merit. Individual students may be eligible for the Financial Aid Program or the Academic Awards Program, or both. Scholarship and university-controlled grant support are restricted to tuition only, unless otherwise noted. An individual student may not receive gift assistance from university programs or scholarship funds in excess of full tuition.

Case Western Reserve University has established academic prizes to recognize the outstanding academic achievement of its students in the pursuit of their educational programs and objectives. These prizes are announced at honors assemblies at the conclusion of each academic year. In recognition of its commitment to scholarship and research excellence, Case Western Reserve University permits the first $500 of any academic prize received at the honors assemblies to be awarded to a student without affecting other university scholarship or grant assistance. In instances in which federal or state regulations would mandate a reduction in need-based assistance, financial aid and scholarship policy will result in a reduction of up to $500 in self-help assistance (loan and job), if possible, before any grant or scholarship assistance will be adjusted.

For graduate and professional students, in addition to extensive loan assistance and in some cases opportunities for employment, a number of schools and departments offer assistantships and/or grant and scholarship aid. Financial aid information may be found on-line at http://finaid.case.edu/. Information regarding application procedures, eligibility criteria, financial aid definitions, university scholarships and grants, and student employment is currently available. The university’s Financial Aid home page has direct links to other financial aid Web pages that provide current financial aid publications. Prospective and current students may search for external scholarships by connecting to the fastWEB free scholarship search home page. Students may direct specific questions to the University Office of Financial Aid using the “Ask the Financial Aid Counselor” link. One of the counselors will respond via the Internet.

A secure link on the Financial Aid website, briefCase, provides students and applicants twenty-four hour access to the status of the application and actual financial aid award. Students will use briefCase to obtain current information on the financial aid process and assistance awarded.

FINANCIAL AID POLICY

A student at Case Western Reserve University may receive assistance for academic excellence, financial need, or both. Academic excellence is recognized by the Academic Awards Program and other scholarship programs of the undergraduate colleges and by various assistantships, fellowships, scholarships, and other awards of individual departments in the School of Graduate Studies and several of the professional schools. A student who wishes to apply for financial assistance based on merit should contact the admissions office of the appropriate college or school.

The term “financial aid” refers to assistance awarded to meet demonstrated financial need. The university’s policy regarding the determination of financial need and the awarding of financial aid is presented below. This policy is administered by the University Office of Financial Aid (except for the School of Medicine).

NEED-BASED AID POLICY

Case Western Reserve University assumes that a student’s family will make available from its income and assets a reasonable contribution toward the cost of attending the university. The university will assist a family to make up the difference between the family’s contribution and the cost of attendance. In its effort to employ an equitable method of evaluating requests for financial assistance, the university requires that all new undergraduate students complete the Free Application for Federal Student Aid (FAFSA) and the supplemental Financial Aid Profile Form of the College Scholarship Service, which together provide the university with an objective means of determining a reasonable educational contribution. All continuing undergraduate students are requested to submit the FAFSA to the processing center and send other documents directly to the Office of University Financial Aid for use in determining eligibility and the amount of financial aid to be awarded. Graduate and professional students are required to complete the FAFSA and sub-
mit the other documents directly to the Office of University Financial Aid.

The analysis of the application documents considers the family's annual income and accumulated assets, with allowances for family size, the number of dependent family members attending postsecondary educational institutions, retirement needs, and other factors. A determination is also made of the amount a student may be expected reasonably to contribute toward college expenses from savings and employment. Financial need is computed by subtracting the student and parental contributions from the cost of attendance, also called student’s budget. This budget includes the actual cost of tuition and fees, an allowance for housing and meals, books and supplies, miscellaneous personal and incidental expenses, and transportation. An undergraduate student’s financial aid award consists generally of three basic types of financial assistance: non-repayable gift or grant assistance, repayable loans, and student employment during the school year. A graduate or professional student’s financial aid award is primarily in the form of loan assistance, although other types of aid may be awarded. Most gift assistance is in the form of assistantships, fellowships, or scholarships. Case Western Reserve University adheres to the principle that a student’s need-based financial assistance may not exceed demonstrated financial need.

Because financial aid is initially awarded without regard to any other aid a student may receive from other sources (university or non-university), a student’s financial aid may be adjusted if additional assistance is received. It is the obligation of each financial aid recipient to report the amount, terms, and sources of other assistance not included in the university’s financial aid award. This includes any work, loan, or gift assistance not incorporated in the financial aid package. Any significant change in the family’s financial circumstances (an increase or decrease of $300 or more in income or assets) should be reported to the Office of Financial Aid. The amount of an individual’s financial aid will vary from year to year as the individual’s financial need varies. The determination of eligibility for financial aid is usually based on the prior calendar year’s income. Normally, financial aid is awarded with the expectation that it will be renewed each year upon reapplication on the basis of funds available, continued demonstrated financial need, and satisfactory academic performance and conduct. Each applicant will be considered for all programs of financial assistance for which he or she is eligible.

In most cases, students who are classified as independent are not required to provide information on their parents’ finances. For purposes of receiving financial aid, a student is considered independent who is:

1. 24 years of age or older by December 31 of the year for which aid is requested; or
2. An orphan or ward of the court at age 18; or
3. A veteran; or
4. Married; or
5. A graduate or professional student; or
6. Not married but with legal dependents.

Even though a student is classified as independent, the Office of Financial Aid may make an objective determination of the total resources available to the student from all sources, including parents.

APPLICATION PROCEDURES

Undergraduate Students

The Free Application For Federal Student Aid (all students) and the Profile Form of the College Scholarship Service (new undergraduate students only), available at the applicant’s secondary school or from the Office of University Financial Aid, should be submitted to the Federal Processor and College Scholarship Service respectively. Return address envelopes are included in each application packet. Applications may be completed on-line at www.fafsa.ed.gov for the Free Application For Federal Student Aid and www.collegeboard.com for the Profile. Submission of these forms by February 1 is strongly recommended because it takes approximately four weeks to analyze and forward the information to the university. Case Western Reserve University’s school code for the Profile is 1105. The Federal code for the FAFSA is 003137 for all undergraduates. Case Western Reserve University also requires as part of the application for financial aid a signed photocopy of the parents’ Internal Revenue Service Form 1040, including all schedules and W-2 forms, for the latest calendar year. The student’s name, Social Security number, and the college in which the student will be enrolled should be printed clearly at the top of the form. The IRS form should be sent directly to: University Office of Financial Aid Case Western Reserve University Yost Hall, Room 417A 10900 Euclid Avenue Cleveland, Ohio 44106-7049 Fax (216) 368-5054

If the student filed a federal tax return for the previous year, a signed copy, along with all W-2 forms from employers, must be submitted to the University Office of Financial Aid. If the student did not file a tax return, a Student Affidavit of Income must be completed and submitted to the University Office of Financial Aid. This form is available from the University Office of Financial Aid. In addition, all sophomore, junior, and senior applicants must obtain and complete a Case Western Reserve University Financial Aid Application. This form should be returned directly to the Office of University Financial Aid. All application forms are available for downloading and printing from the Financial Aid website at http://finaid.case.edu under “Forms and Publications.”

Transfer students are evaluated for all sources of financial aid. Transfer students must submit the Free Application For Federal Student Aid, the Profile Form, and IRS forms as noted above. In addition, transfer students must complete a Case Western Reserve University Application for Financial Aid. Undergraduate students admitted to either the Integrated Graduate Studies or the Bachelor of
Science/Master of Science program must include a memorandum of departmental financial support with their annual application. To maintain continued eligibility for undergraduate aid, the student must register for a 12-credit-hour, full-time undergraduate course load and meet all other requirements of undergraduate aid awards. Undergraduate financial aid eligibility including state and institutional gift assistance normally terminates after ten semesters of enrollment, regardless of degree completion.

Students selected for Verification by the Federal Processor or the Office of Financial Aid will be sent a Verification Form by the university. Applicants should respond promptly to the request for completion of the Verification Form because Federal regulations prevent the disbursement of any Federal funds until the verification process has been completed.

For more information about application procedures, request the booklet “Undergraduate Financial Aid and Scholarships” from:

University Office of Financial Aid
Case Western Reserve University
Yost Hall, Room 417A
10900 Euclid Avenue
Cleveland, Ohio 44106-7049

Graduate and Professional Students

Following is a summary of procedures for applying for need-based assistance by school. For more detailed and specific information, request the booklet “Financing Graduate and Professional Education at Case Western Reserve University” from:

University Office of Financial Aid
Case Western Reserve University
Yost Hall, Room 417A
10900 Euclid Avenue
Cleveland, Ohio 44106-7049

Students in the School of Medicine should contact the Financial Aid Office in the School of Medicine.

In most instances it is the policy of the University Office of Financial Aid to meet the first $8,500 of financial need with a Stafford Loan. All financial aid application forms are available from the admission offices of the various schools or the University Office of Financial Aid. Some schools may have specific application forms for institutional funds. Check with the Admissions Office of the graduate/professional school for information on the application procedures and forms. (Students of the School of Medicine should obtain all application forms from the School of Medicine’s Financial Aid Office.)

Each student in or applying to a dual-degree program must request and provide the University Office of Financial Aid with a memorandum detailing financial support that the student will receive from each school involved in the dual-degree program.

Mandel School of Applied Social Sciences

First-year students or first-time financial aid applicants must submit:

1. A Free Application for Federal Student Aid (FAFSA) Federal Code E00084
2. To the University Office of Financial Aid:
   b. A signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the Mandel School of Applied Social Sciences specifying the amount and types of aid, if any, the student will be receiving from the School.

Continuing students must submit:

1. A Free Application for Federal Student Aid (FAFSA) Federal Code E00084
2. To the University Office of Financial Aid:
   b. A signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.

School of Dental Medicine

All financial aid applicants must submit:

2. To the University Office of Financial Aid:
   b. A signed copy of the parents’ prior year federal income tax return and W-2 forms.
   c. A signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   d. A financial aid transcript from any previous U.S. dental school attended (transfer students and applicants to the graduate master’s programs only).

School of Graduate Studies

New and continuing students must submit a Free Application for Federal Student Aid (FAFSA) Federal Codes E00680-Engineering Students; E00681-Arts & Science Students.

All applicants for financial aid, other than that awarded by the department, must submit to the Office of Financial Aid:

1. A Case Western Reserve Application for Financial Aid.
2. A signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and
W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.

c. A memorandum from the student’s department or program specifying the amount and type of aid, if any, the student will be receiving from the department/program for each period of enrollment during the academic year, and the number of credit hours to be taken during each term.

School of Law

All applicants for financial aid must submit:


2. To the University Office of Financial Aid:
   a. A signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   b. A Case Western Reserve Application for Financial Aid.
   c. A memorandum from the School of Law to the University Office of Financial Aid.

Weatherhead School of Management

All financial aid applicants must submit the following documents:

1. New and continuing students: A Free Application for Federal Student Aid (FAFSA) Federal Code E00080

2. To the University Office of Financial Aid:
   a. A Case Western Reserve Financial Aid Application form.
   b. A signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and W-2 forms. If a tax return was not filed, a Student/Spouse Affidavit of Income is necessary.
   c. A memorandum from the Weatherhead School of Management specifying the amount and types of aid, if any, the student will receive from the school.

School of Medicine

All financial aid applicants must submit a Free Application for Federal Student Aid (FAFSA) Federal Code E00079 and complete the electronic Need Access application provided by the Access Group.

Other required documentation should be sent directly to the School of Medicine.

Frances Payne Bolton School of Nursing

Graduate Programs

The following procedures must be observed for all Doctor of Nursing (N.D.), M.S.N., and Ph.D. students seeking financial aid based on need:

1. All new and continuing students must submit a Free Application for Federal Student Aid (FAFSA) Federal Code E00083.

2. Some new students may be required to submit a Financial Aid Transcript from the college or university previously attended. The transcripts are to be sent to the University Office of Financial Aid.

3. All new and continuing students must submit to the University Office of Financial Aid:
   a. A Case Western Reserve Financial Aid Application;
   b. A signed or certified copy of the student’s and spouse’s (where applicable) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the School of Nursing specifying the amount and types of aid, if any, the student will receive from the school.

TYPES OF AID

Gift and Scholarship Aid

Aid Available to Undergraduate, Graduate, and Professional Students

Ukrainian Student Assistance Fund Scholarship

Available to students in the Case School of Engineering, the College of Arts and Sciences, the School of Graduate Studies, and each of the professional schools, this scholarship stipulates that the applicant must be a full-time student in good
One $16,500 Elizabeth Walker Scholarship every four years for a freshman accepted in the arts, humanities, natural sciences, social and behavioral sciences, management and accountancy.

A Trustee’s Scholarship for first-year students. (Value in 2004: $22,000.) The university may establish annual limits on the number of Trustee’s Scholarships to be offered.

A President’s Scholarship for for first-year students. (Value for 2004: $17,000.) The university may establish annual limits on the number of President’s Scholarships to be offered.

A Provost’s Scholarship for first-year students. (Value in 2004: $12,000.) The university may establish annual limits on the number of Provost’s Scholarships to be offered.

Up to 16 Provost’s Special Scholarships for first-year students who demonstrate superior academic achievement and who have encountered economic or educational obstacles that affected their college preparation. Applicants from inner city and remote rural schools, including Indian Reservations, and members of underrepresented minority groups are encouraged to apply. Students with special talents and significant extracurricular and community activities are encouraged to apply as well. (Value in 2004: $14,500.) The dollar value of the Trustee’s, President’s, and Provost’s Scholarships each year will be the prevailing dollar value of the scholarship at year of entry at the university.

Renewal of Trustee’s, President’s, and Provost’s Scholarships

Scholarships are renewable for each year of undergraduate study provided that the student meets the renewal criteria established for the student’s class. A student may receive scholarship assistance for no more than eight (8) semesters of continuous undergraduate course work or until the student completes the number of continuous semesters of full-time undergraduate course work to receive a degree, whichever is less.

Student records are reviewed at the end of each academic year for renewal of scholarship assistance regardless of the number of semesters for which the student was enrolled during the academic year. The student must meet both a qualitative and quantitative standard for scholarship renewal.

The minimum standards for continuation are:

a) Cumulative hours earned after matriculation at Case Western Reserve (not including AP/IB/transfer or Pre-College Scholar credit earned prior to matriculation at the university)

At end of first year: 24 semester hours
At end of the second year: 54 semester hours
At end of the third year: 84 semester hours

*For students participating in an approved off-campus program (Cooperative Education, Practicum, Junior Year Abroad, or Washington Semester) an adjustment is made in the number of hours expected.

b) A cumulative scholarship grade point average of 2.50 at the end of the first year, and a cumulative scholarship grade point average of 3.00 thereafter.**

**Scholarship Grade Point Average: No courses are eliminated from a student’s record for the purpose of calculating the “Scholarship G.P.A.” The “Scholarship G.P.A.” is the student’s cumulative G.P.A.; unless the student has used the Repeat Option or has earned any F grades in the freshman year that do not appear on the official transcript. If a scholarship recipient has used the Repeat Option for any course or has earned any F grades that do not appear on the official transcript, the original grades will be included in the computation of the cumulative grade average for the purpose of determining eligibility for scholarship continuation.

If a scholarship recipient’s achievement falls below the standard, or the student does not enroll at Case Western Reserve University in a semester for which the
s scholarship recipient would receive the scholarship, the scholarship is terminated.

Students should consult the Handbook for Undergraduate Students for complete details regarding the renewal of the scholarships.

Ohio Leadership Awards Program
Minimum of twelve awards of up to $5,000 to freshmen admitted to the undergraduate colleges. Academic and leadership qualities required. Selection is on basis of nomination by high school teacher and interview.

Cleveland Plain Dealer Scholarship Program
The Cleveland Plain Dealer Scholarship Program provides two $1,000 scholarships to incoming freshmen who intend to concentrate in business management or print journalism, and are residents of Northeast Ohio. They must have demonstrated high academic achievement in their high school record and be determined by the Office of Financial Aid to have financial need. Scholarship availability is contingent upon annual funding levels. Interested students should contact the Office of University Financial Aid.

Creative Achievement Awards Program
Three scholarships for entering freshmen who demonstrate outstanding creative ability and achievement in the arts. Each applicant is required to submit a portfolio of original work. An on-campus interview is required. The scholarship is valued at $12,000 for students entering in 2004.

Music and Theater Arts Scholarship
Case offers scholarships to prospective first-year students who plan to major in Music or Theater Arts. A total of fifteen (15) scholarships through the Music Department and six (6) through the Theater Arts Department are available each year. Individual scholarships range from $2,000 to $16,000 per year. Scholarships are renewable for each of the four years of undergraduate study, or until the attainment of the Baccalaureate degree, whichever comes first. To be considered for the scholarship, students will audition with the specific Department.

Minority Scholars Program
A special program of academic preparation, career counseling, internships, and mentoring is offered for selected minority students. Program participants may qualify for special financial assistance designated for low income or disadvantaged students. To apply, a student must identify himself or herself as an underrepresented minority to the Office of Undergraduate Admission. Minorities who are underrepresented in higher education include Native Americans, African Americans, Mexican Americans, Puerto Ricans, Native Alaskans, and Native Pacific Islanders.

National Merit Scholarships
Case Western Reserve University sponsors at least 25 four-year scholarships for National Merit Scholarship Corporation finalists who have listed Case Western Reserve University as their first-choice institution. Scholarships range from $500 to $2,000 per year.

Case School of Engineering Alumni Association Scholarships
The Case School of Engineering Alumni Association provides scholarship assistance to selected juniors and seniors who have demonstrated outstanding academic achievement and participation in extracurricular activities.

Alden Undergraduate Fellowship in Systems Engineering
Several scholarships of varying amounts are offered for the junior and senior years to students in Case School of Engineering who have declared a major in systems engineering. Contact the department for further details.

James Dysart Magee Scholarships
Two or more scholarships are awarded annually to seniors in the Integrated Graduate Studies programs in economics and the social and behavioral sciences.

Trustee’s, President’s, and Provost’s Scholarships for Underclassmen
The President has authorized the awarding of a limited number of scholarships to upper-class students beginning in the fall of 2002. Recipients will be chosen from students not previously receiving these or similar scholarships. All first, second, and third year students will be eligible for consideration provided that the student has achieved a minimum 3.75 cumulative grade point average at the university and has earned at least 30, 60, or 90 credit hours respectively at Case Western Reserve after the freshman, sophomore, or junior year of study. AP credit and Transfer Credit will not be considered. Recipients will be selected from eligible applicants who have attained a record of achievement, participation, and leadership at Case Western Reserve University that distinguishes them from their peers. Recipients will be selected by the Committee on Academic Standing.

The following scholarships will be available beginning in the 2002-2003 academic year:

One Trustee’s Scholarship
Two President’s Scholarships
Four Provost’s Scholarships
Students may obtain an application after February 15th in the Office of Undergraduate Studies or the Office of University Financial Aid. Applicants must submit the completed application and a letter of recommendation from a faculty member by April 15th to the Office of Undergraduate Studies.

The scholarships are renewable through the fourth year of undergraduate study or completion of the undergraduate degree, whichever comes first. A student must achieve a cumulative 3.0 grade point average, full time undergraduate status, and earn at least thirty additional credit hours during each subsequent year to retain the scholarship.

Undergraduate Aid Based on Financial Need and Contingent upon Satisfactory
Academic Progress, Awarded by Case Western Reserve University
(Follow the application procedures outlined above, unless otherwise indicated.)

GRANTS-IN-AID FROM THE SCHOOLS
Grants-in-aid comprise non-repayable gift assistance which vary according to the amount of unmet financial need but which may not exceed tuition.

Federal Supplemental Educational Opportunity Grants (FSEOG)
Students with financial need may receive a Federal Supplemental Educational Opportunity Grant. The FSEOG is awarded to students with great financial need who would be unable to attend the university without this grant. Grants may range from $200 to $4,000 per year.

UNDERGRADUATE AID AWARDED OUTSIDE CASE WESTERN RESERVE UNIVERSITY
Federal Pell Grant
The Federal Pell Grant program is a Federal grant program through which a student can receive a maximum of $4,050 (for 2004-2005). The student must apply for the Federal Pell Grant by completing the Free Application for Federal Student Aid (FAFSA). Within four to six weeks of filing, the student will receive a Student Aid Report, and the Office of University Financial Aid will receive a roster of eligible students.

Ohio Student Choice Grant
All full-time undergraduate students who are residents of Ohio and were not full-time students at a college or university on or prior to July 1, 1984, are eligible to receive this grant. For 2004-2005 the amount is $1002.

Ohio Academic Scholarship Program
The State of Ohio has established the Ohio Academic Scholarship Program, through which 1,000 scholarships of $2,205 each are offered each year. Each high school in the State of Ohio is guaranteed at least one Ohio Scholarship each year. The scholarships are renewable for each of four consecutive years of undergraduate or graduate study, beginning with the freshman year, provided that satisfactory academic progress toward a degree is maintained. Individual applications to the State of Ohio are submitted through the student's high school. The high school record and composite score on the American College Test (ACT) will be used to select the winners of the scholarships. Students should see their high school guidance counselors for additional information.

War Orphans Scholarship Program
The State of Ohio provides scholarship assistance to children of veterans who were killed in action during times of war, who received a service-connected disability of at least 60 percent, or who are totally disabled. The veteran must have entered the service as a resident of Ohio. The scholarship provides a sum of money equal to the average of tuition and fees of state-assisted institutions to students who attend eligible private institutions in the state of Ohio. Students should contact the Student Assistance Office of the Ohio Board of Regents for further details.

Other State Scholarship and Grant Programs
The states of Delaware, Maryland, Michigan, Pennsylvania, Rhode Island, and Vermont have state scholarship or grant programs for residents. The recipients of these state scholarship or grant programs may use this assistance at any eligible college or university. Students should contact their high school guidance directors or the appropriate state agency for further information.

ROTC
U.S. Army and Air Force Scholarships are available on a competitive basis. The scholarships pay a portion or all of the recipient's tuition, laboratory, textbook, and incidental fees. Recipients also receive a tax-free stipend ranging from $250 to $400 on a monthly basis during the academic year. Students compete for three or four year scholarships. Case Western Reserve University provides matching grants to assist with tuition for up to ten new students each year.

OTHER GRANTS AND SCHOLARSHIPS
Many students receive grants or scholarships from companies, community organizations, ethnic or religious groups, or fraternal organizations. Students are encouraged to seek such outside assistance. It is a condition of receiving financial assistance from the university that the student notify the University Office of Financial Aid of all assistance received from outside the university, whether paid directly to the university or to the student.

Mandel School of Applied Social Sciences
Direct Mandel SASS Grants
Grants are awarded to students in varying amounts, as determined by financial need and academic merit. These grants are renewable provided the recipient meets...
eligibility requirements and availability of funds.

Scholarships

Alumni Scholarships in varying amounts are awarded to one or more second-year students based on outstanding performance and financial need. Two Full Time Tuition Scholarships are awarded annually. Two Intensive Semester Half Tuition Scholarships are awarded annually. Three International Student Scholarships are awarded annually.

School of Dental Medicine

Alumni Scholarships

The School of Dental Medicine, with the support of the Alumni Association, awards a number of four-year partial tuition scholarships to entering students of outstanding achievement and potential.

American Dental Association (ADA) Endowment and Assistance Fund

The ADA provides competitive scholarships to second year Dental Medicine students. Selection criteria include U.S. citizenship; demonstrated need of at least $2,500; cumulative grade point average of 3.0 on a 4.0 scale. Applications are available through the School of Dental Medicine. The application deadline is June 15.

American Dental Association (ADA) Endowment Fund Minority Dental Student Scholarship Program

The ADA offers scholarships for second year minority Dental Medicine students. Selection criteria include demonstration of financial need and cumulative grade point average of 2.5 on a 4.0 scale. Applications and information are available through the School of Dental Medicine.

Armed Services Scholarship Program

The Army, Navy, and Air Force permit selected students to be commissioned as officers in their programs. Terms and conditions of each branch scholarship program are available from the Health Professions recruiter for the specific branch of service.

Other Financial Assistance

The university has contracted with Sallie Mae to provide private loan funds to supplement Federal and university loans. Among the programs currently available for Dentistry are the Sallie Mae Custom Signature Loan. Further information and application forms are available from the Office of University Financial Aid or the Financial Aid Advisor in the School of Dental Medicine.

It is suggested that applicants check with local fraternal and community organizations and with their local dental societies.

School of Graduate Studies

Fellowships, Traineeships, Assistantships, and Awards

The university has approximately 1,000 competitive awards for the support of full-time study in the School of Graduate Studies. These include a variety of fellowships, traineeships, and assistantships, and are assigned through most of the departments offering graduate degree programs. Most awards are granted for study beginning in the fall semester. New students are eligible for award consideration at the time they apply for admission. The general deadline for completed applications for admission with financial aid consideration is March 1 for the following semester.

Other Resources

The Office of Research Administration has access to a terminal-based data system (SPIN) that can provide information on a variety of additional public and private sources for financial assistance.

School of Law

Law School Scholarships

Each year a number of scholarships are awarded to entering students on the basis of merit. The scholarship is renewable provided the recipient maintains the requisite grade point average. Funds for these scholarships are provided from the generous support of alumni and friends of the law school. Scholarships are awarded in varying amounts up to full-tuition, depending upon academic performance and availability of funds.

Weatherhead School of Management

In addition to participating in Federal financial aid programs, the Weatherhead School of Management sponsors its own programs of financial assistance for qualified M.B.A. and M.Acct. students. The Weatherhead School programs include scholarships, grants, and loans. All requests for financial aid should be submitted no later than April 1. Because the availability of financial aid is limited, students are encouraged to apply as early as possible for such aid. Decisions concerning admission and financial aid are made independently of one another. Applying for financial aid will neither help nor hinder an applicant’s chances for admission.

To apply for any of the Weatherhead Scholarships, check the appropriate space on the application for admission. Scholarship decisions are made on a rolling basis until funds are exhausted.

Scholarships

The Weatherhead School awards a limited number of scholarships each year to entering full-time M.B.A. and M.Acct. students. Primary consideration is given to students who have demonstrated a high level of academic achievement in undergraduate studies in conjunction with outstanding scores on the GMAT. Relevant work experience is also evaluated in the award decision. Special fellowships and scholarships are awarded to full-time M.B.A. candidates who add to the diversity of the student body. The Weatherhead Alumni Association awards an annual full-tuition scholarship to an outstanding full-time M.B.A. candidate, with a minimum of two years’ work experience. The student must demonstrate outstanding academic achievement and GMAT test results. Internships, extracurricular activities, community service, and the application essay will also be consid-
ered in determining management and leadership potential.

School of Medicine

Scholarship Funds
It is the policy of the School of Medicine to use its limited scholarship funds to assist those students whose financial needs are so great that, if they were all met by loans, the burden of indebtedness would be extreme. No scholarships are granted merely because of academic excellence to students whose personal and family resources are adequate to meet the costs of a medical education. Minority group students selected for admission to the medical school are eligible to apply for aid from:

National Medical Fellowships, Inc.
110 West 32nd St.
New York, NY 10001-3205

It is desirable for eligible students (African-Americans, Mexican-Americans, mainland Puerto Ricans, and Native Americans) to initiate such applications promptly after they are accepted.

Fellowships
Many students seek opportunities to devote vacation months to intensive study of some subject in which they have become interested. Summer research fellowships are made available to students to enable them to engage in such investigations under the supervision of a faculty sponsor. The present policy is to provide, insofar as possible, a stipend of $1,200, with the requirement that the student devote a minimum of two months of full-time effort to the project. Support for the vacation research fellowship program comes from many sources.

Federal Scholarship Programs
Branches of the military service and the National Health Service Corps offer scholarship benefits to recipients including tuition, fees, and a stipend. Participants are obligated for a full year of service for each year of benefits with a minimum obligation of two years. Further information about these programs may be obtained from the local recruiting office of the armed forces or through the financial aid officer of the medical school.

Frances Payne Bolton School of Nursing

Doctorate of Nursing (N.D.)
Grants-in-Aid are awarded to full-time students in the N.D. program who demonstrate financial need and maintain satisfactory academic progress. Some of these are from endowments but the majority are contributions from alumni of the School.

The Ohio League for Nursing (OLN) provides a scholarship and loan program for full-time students who are pursuing the first Nursing degree (B.S.N. or N.D.) who are residents of Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, or Summit Counties in Ohio. For information write to:

Ohio League for Nursing, Greater Cleveland Area
2800 Euclid Avenue, Suite 235
Cleveland, Ohio 44115

M.S.N. and Ph.D. Students
The following grants and scholarships are available through the School of Nursing:

Professional Nurse Traineeships are Federal traineeships designed for full-time graduate students preparing for teaching, administration, or specialization in a particular field of nursing practice. Students must be enrolled full-time both fall and spring semesters to qualify. Students entering in the spring will qualify if they commit to full-time enrollment thereafter. Professional Nurse Traineeships may be used for master's study for up to 18 months. The current level of funding pays a remission of tuition for 9 hours each semester plus a monthly stipend competitive with those at other major private universities in exchange for 17-1/2 hours of work a week by the student. To apply for a fellowship/assistantship, check the appropriate space on the School of Nursing's application form.

LOAN ASSISTANCE

Loans Awarded by Case Western Reserve University Office of Financial Aid
These loans are awarded on the basis of financial need. A loan will probably be a part of a package awarded in response to an application for financial assistance.

Federal Perkins Loan
Perkins Loans enable students to borrow up to $4,000 through graduate school (up to $20,000 as an undergraduate). Repayment begins six months after graduation or after the student ceases enrollment on at least a half-time basis. To be eligible a student must be a citizen of the United States or have a permanent resident visa, be at least a half-time student making satisfactory progress toward a degree, and establish financial need for the loan. The Federal Perkins Loan may be awarded to undergraduate students and graduate and professional students in all programs except the School of Medicine.

Health Profession Student Loans (HPSL)
Awarded to students in the School of Dental Medicine and School of Medicine who demonstrate financial need, HPSL is a federal loan that enables eligible students to borrow at 5 percent simple interest, with repayment made over a 10-year period. Parental information must be
provided by all students wishing consideration for these funds.

**Federal Nursing Loan Program**

Only N.D. and M.S.N. students in the School of Nursing are being awarded the limited federal loans provided under the Nursing Student Loan Program. They may receive up to $4,000 per year, depending upon financial need and availability of funds. Interest is 5%, and repayment begins when the student completes the program or ceases to be enrolled at least half time.

**University Loans**

A university loan is a low-interest long-term loan provided to a student to assist with educational expenses. Repayment is made over a ten-year period after graduation or over a ten-year period after the student ceases enrollment on at least a half-time basis. Interest is 8%.

a) Undergraduate

Forty-eight loan funds have been established for undergraduate students. Loans are awarded by the Office of Financial Aid on the basis of need.

b) Graduate and Professional

The Mandel School of Applied Social Sciences has a small amount of loan money available to meet financial need after Federal loan availability has been exhausted. These loans are awarded by the University Office of Financial Aid.

A number of loan funds have been established for students in the School of Dental Medicine. Loans from these funds are awarded only to meet cases of exceptional need that cannot be met by other funding, and some of these funds are restricted to certain classes and categories of students.

The School of Law provides low-interest, long-term loans to students with unmet need who have exhausted all other available assistance.

The Weatherhead School of Management has loan funds for M.B.A. students who demonstrate financial need.

Loans are available to students in the School of Medicine from funds given to the School of Medicine for that purpose. The Medical Alumni Association Rotating Loan Fund, augmented each year by contributions from graduates of the school, is a major source of aid for currently enrolled students.

The Frances Payne Bolton School of Nursing has several loans funds available to assist students with exceptional financial need as determined by the Office of Financial Aid.

**Loans Awarded by Agencies Outside the University**

The following loans are available to all undergraduate, graduate, and professional students who are enrolled on at least a half time basis, hold U.S. citizenship or permanent resident status, and are admitted to or enrolled in a degree-seeking program.

**Subsidized Loans**

Case Western Reserve University participates in the Federal Stafford Loan program. The Federal Stafford Loan program lends money through private lenders, including Case Western Reserve University, to students in certain graduate and professional schools.

Students must be enrolled half time (6 credit hours per semester) and demonstrate financial need. The variable interest rate is adjusted annually and is capped at 8.25%. The interest is subsidized (paid) by the Federal Government as long as the student remains enrolled at least half time (6 credit hours per semester). A student making satisfactory academic progress may borrow up to $2,625 for the first year of undergraduate study, up to $3,500 for the second year, $5,500 for each year of subsequent undergraduate study, and $8,500 for each year of graduate study, with an aggregate maximum of $23,000 undergraduate and $65,000 undergraduate and graduate. Repayment begins six months after the student ceases to be enrolled on at least a half-time basis. No principal or interest must be paid while the student is enrolled half time or more. All students must demonstrate financial need as determined by the University Office of Financial Aid in accordance with criteria established by the Federal Government. All undergraduate students must apply for the Federal Pell Grant. Case, in partnership with Student Loan Marketing Association, provides a list of preferred lenders to students who may apply for the loan electronically through the Sallie Mae website. Students who prefer to work with another lender are responsible for submitting completed loan applications to the Office of Financial Aid. All applicants for Stafford Loans must submit the following:

1. A Free Application for Federal Student Aid (FAFSA). New undergraduate students must complete the Profile Form of College Scholarship Service as well.

2. To the Office of University Financial Aid:


b. A signed copy of the parents’ prior year federal income tax return, including all schedules and W-2 forms (in the case of dependent students).

c. A signed copy of the student’s prior year federal income tax return, including all schedules and W-2 forms (and where appropriate, the student’s spouse’s), or, if a tax return was not filed, a completed Student/Spouse Statement of Income.

d. In the case of students enrolled or admitted to the Mandel School of Applied Social Sciences, School of Graduate Studies, School of Law, Weatherhead School of Management, Mandel Center for Nonprofit Organizations, or the N.D., M.S.N. or Ph.D. program of the Frances Payne Bolton School of Nursing, the Office of University Financial Aid also requires a memorandum from the school specifying the admission status, number of credit hours enrolled for each term, current academic standing, and the amount of other financial assistance, if any, being awarded. The student should allow at
least 8 to 10 weeks between submission of the forms to the Office of University Financial Aid and receipt of the loan proceeds.

e. All first time Stafford Loan borrowers must complete a loan entrance interview to acquaint themselves with the rights and responsibilities of Federal loan borrowers. This information session may be handled online at the SallieMae website and must be completed before the promissory note may be signed or funds disbursed.

Unsubsidized Loans

Unsubsidized Federal Stafford Loans require the same enrollment criteria and feature the same interest rates as their subsidized counterparts. Borrowers are responsible for paying the interest during the in-school and deferment periods. Borrowers may choose to make periodic interest payments to the lender/servicer, or opt to have the accrued interest capitalized (added on to) the principal loan amount. Borrowers who do not qualify for the maximum amount under a subsidized loan may borrow an unsubsidized loan up to the maximum allowable loan amount. The maximum allowable loan amounts for dependent students are $4,000 per year for freshmen, $5,500 per year for sophomores, $6,500 per year for juniors and seniors, and $8,500 per year for graduate students. Independent undergraduate students are eligible for an additional unsubsidized loan in the amounts of $4,000 per year for freshmen and sophomores, $5,000 per year for juniors and seniors, and $10,000 per year for graduate students. Students enrolled in the Schools of Medicine and Dental Medicine are eligible to borrow an additional $20,000 annually. The application process is identical to that for the subsidized loans. Undergraduate students must apply for and have eligibility determined for the Federal Pell Grant and all students must have eligibility for the subsidized loan determined before borrowing an unsubsidized loan. Promissory notes are completed online at the SallieMae website.

Federal Parent Loans for Undergraduate Students (FPLUS)

Many lending institutions participate in the FPLUS program, through which a parent may borrow on behalf of a dependent undergraduate student up to the difference between the cost of education and any other financial assistance awarded. Students must be enrolled at least half time (6 credit hours per semester), be admitted to or enrolled in a degree seeking program, and be making satisfactory academic progress. Interest and repayment begin 60 days after disbursement of the loan. The interest rate is variable but cannot exceed 9 percent. There is no aggregate borrowing limit. Eligibility is not based on need, but a Case Western Reserve Application for Financial Aid must be submitted to the Office of University Financial Aid. The loan applications may be obtained from lending institutions such as banks, credit unions, and savings and loan associations or a parent may apply on-line at the SallieMae website and select from several lenders. The student should allow at least 8 to 10 weeks between submission of the forms to the Office of Financial Aid and receipt of the loan.

Federal Consolidation Loans

Borrowers with outstanding indebtedness through the William D. Ford Federal Direct Loan Program, Federal Stafford Loan, Unsubsidized Stafford Loan, Federal Supplemental Loan for Students, National Direct Student Loan, Federal Perkins Loan, or Health Professions Student Loan programs may consolidate their loans, provided the loans are not in default or if in default, the borrower must have made satisfactory repayment arrangements with the lender. Consolidation may occur during the repayment period or the grace period preceding repayment.

Limited deferments of principal are available. The interest rate is established at the time of consolidation as a fixed rate calculated as the weighted average of the interest rates of the loans being consolidated. Repayment terms may include graduated or income-sensitive repayment schedules. The repayment period is tied to the amount consolidated and may extend up to 30 years.

Interested borrowers should contact their lenders for additional information and referrals to participating agencies. Borrowers under the William D. Ford Federal Direct Loan program may contact the Servicing Center’s Consolidation Department or the University Office of Financial Aid.

Outside Loan Programs

Case Western Reserve University, in partnership with the Student Loan Marketing Association (Sallie Mae), offers low interest educational loans to students and/or parents. These loans are in addition to or alternatives to the Federal Stafford and PLUS Programs. Interest rates are variable, based on the Prime Rate. Interest payments may be paid during the in-school period or capitalized upon repayment. Students in the schools of Medicine and Law may use other loan programs and should consult their school of enrollment for additional information and application materials.

Frances Payne Bolton School of Nursing

Ohio Nurse Education Assistance Loan Program (NEALP)

This program was created to assist the State of Ohio in meeting nursing shortages by providing assistance to students enrolled in approved nurse education programs and to encourage these students to remain in Ohio as they enter the nursing profession. These loans are available to students pursuing the B.S.N. and N.D. degrees.

Eligibility requirements include
1. Ohio residency
2. U.S. citizenship or permanent residency
3. Acceptance or enrollment in an approved R.N. nurse education program.
4. Demonstration of intent to practice nursing within the State of Ohio after graduation.
5. Owe no refund nor be in default on any state or Federal educational loan or grant.

6. Satisfactory academic record that places student in good academic standing.

Financial Aid, has been established to prevent discrimination, and increase the employment opportunities, provide standardized centralize information about employment. Applications are available from the campus and in the community.

The Federal College Work Study Program is funded by the university through departments on campus and offers part-time employment to students. Students not demonstrating financial need but interested in securing on-campus employment may apply to the Office of Student Employment. Students not on financial aid who obtain jobs on campus on their own initiative are permitted to work provided there is no student with a financial need qualified and willing to take the job offered. All students working on campus must clear their employment with the Student Employment Office.

Satisfactory Academic Progress for Financial Aid

Case Western Reserve University has established guidelines for determining whether students are making satisfactory academic progress for financial aid purposes. Federal regulations require that in order to receive Title IV assistance, all students must maintain a standard of satisfactory academic progress, as determined by the university. Title IV assistance comprises the following:

Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Perkins Loans, Federal College Work Study awards, Federal Stafford Loans (subsidized and unsubsidized), loans under the FPLUS program, and any state grants funded by the State Student Incentive Grant program.

A Case Western Reserve University undergraduate student must satisfy the minimum number of semester hours and earn the minimum cumulative grade point average listed in the table below. A half-time student must have successfully completed one half of the minimum number of semester hours with at least the minimum cumulative grade-point average in the table below:

<table>
<thead>
<tr>
<th>Year at the University</th>
<th>Semester Hours Completed</th>
<th>Cumulative Grade-point Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>21</td>
<td>1.75</td>
</tr>
<tr>
<td>2</td>
<td>43</td>
<td>2.00</td>
</tr>
<tr>
<td>3</td>
<td>67</td>
<td>2.00</td>
</tr>
<tr>
<td>4</td>
<td>91</td>
<td>2.00</td>
</tr>
<tr>
<td>5</td>
<td>115</td>
<td>2.00</td>
</tr>
<tr>
<td>6</td>
<td>139</td>
<td>2.00</td>
</tr>
</tbody>
</table>

(If a student has an uneven number of semesters, then the mid-point between the necessary semester hours completed for the year before and the year after will be the appropriate expectation. For example, if a student has completed five semesters and a determination is required of hours completed, then 55 would be considered satisfactory, i.e., the midpoint between 43 and 67.)

Procedure: If, after two semesters at Case Western Reserve, the student fails to meet the criteria for satisfactory academic progress, the student is placed on financial aid probation. While on Financial Aid Warning, a student may continue to receive Title IV aid for one semester. At the end of that semester, if the student is still not meeting the criteria, he or she is placed on financial aid probation. While on Financial Aid Probation, a student may not receive any Title IV aid but may be eligible for other assistance, including university grants-in-aid. If, after a semester on financial aid probation, the student still does not meet the criteria for satisfactory academic progress, the student is removed from all institutional financial aid. A student will be restored to good standing if found to be making satisfactory academic progress at the end of a semester on warning, probation, or separation. However, aid may be restored only once follow-
ing financial aid separation. Students in financial aid good standing will have their satisfactory academic progress reviewed at the end of the spring semester. Students below good standing will have their status reviewed each semester.

Appeals may be made on grounds of mitigating circumstances; such appeals should be addressed to the associate director of financial aid.

For further details of financial aid policy and procedure regarding Satisfactory Academic Progress, consult the University's Office of Financial Aid.

Graduate and Professional Students

Since each graduate/professional school of the university differs in length of program and in method of evaluation, there is a different method of measuring Satisfactory Academic Progress for Title IV aid for each school, although the same general principles and procedures apply as indicated above. For specific information about how satisfactory academic progress is determined for an individual school or program, please consult the University Office of Financial Aid.
The University Office of Student Affairs provides leadership in the development of services and programs that supplement the classroom experiences of university students and enrich student life. The staff of the Office of Student Affairs attempts to promote an environment which provides positive, developmental experiences for all students. Additionally, the office serves as an ombudsman, focusing attention on the rights and responsibilities of students within the university community. The Office of Student Affairs is a central source of information about university policies and procedures that affect student life and co-curricular programs and services. Students should feel free to contact the Office of Student Affairs for resolution of specific problems and for referral to other university offices and campus agencies. Services the Vice President’s office itself offers include orientation, minority affairs, free access to cultural institutions, Cleveland Orchestra and Cleveland Play House ticket drawings, crisis intervention, the judicial/disciplinary process, and student research.

STUDENT AFFAIRS ADMINISTRATION

Glenn Nicholls, M.A.R. (Asbury Theological Seminary)
Vice President for Student Affairs
Clay Barnard, M.S. (Miami University)
Assistant Vice President for Student Affairs
Donald J. Kamalsky, M.S. (State University of New York, Albany)
Assistant Vice President for Student Affairs and Director of Housing and Residence Life
Sue Nickel-Schindewolf, M.A. (University of Akron)
Assistant Vice President for Student Affairs and Director of Residence Life
G. Dean Patterson, M.S. (Case Western Reserve University)
Assistant Vice President for Student Affairs

Colleen Barker-Williamson, M.A. (Bowling Green State University)
Director of Thwing Center for Programs and Leadership
Edith Berger
Director of International Student Services
Mayo Bulloch, M.A. (Case Western Reserve University)
Director of Educational Enhancement Programs
Eleanor Davidson, M.D. (University of Michigan Medical School)
Director of University Health Services
Kristin Hughes,
Interim Chair of the Department of Physical Education and Athletics and Professor
Thomas Matthews
Director of Career Center
Caseal Jordan Medley, B.A. (Cleveland State University)
Director of Administration and Operations for Thwing Center
Glenn Odenbrett, M.A. (Case Western Reserve University)
Director of Student Community Service
Judith Olson-Fallon, M.S. (Purdue University)
Director of Educational Support Services
Dennis Rupert, M.A. (Edinboro University of Pennsylvania)
Director of Finance and Administration
Jes Sellers, Ph.D. (University of Florida)
Director of University Counseling Services and Center for Behavioral Health
Deboral Richardson-Bouie
Director of Multicultural Affairs

ATHLETICS

Veale Center
Phone: 216-368-2420

The department sponsors a variety of intercollegiate and intramural activities. Intercollegiate varsity sports for men are football, soccer, cross country, basketball, wrestling, swimming, fencing, golf, baseball, tennis, and indoor and outdoor track. Intercollegiate varsity sports for women are volleyball, basketball, swimming, indoor and outdoor track, fencing, tennis, cross country, soccer, and softball. The university is a charter member of the University Athletic Association. Competition in all sports in the Association is available to men and women. The University Athletic Association includes Brandeis University, Carnegie Mellon University, Emory University, New York University, University of Chicago, University of Rochester, and Washington University. Aikido, archery, crew, cycling, volleyball, tae kwon do, badminton, ultimate frisbee, and ice hockey sport clubs are available to all students, faculty, and staff. Intramural competition is available in more than 40 activities, and more than one-half of the undergraduates participate for relaxation, physical fitness, or a chance to improve skills.

HOUSING, RESIDENCE LIFE & GREEK LIFE

4 Yost Hall
10900 Euclid Avenue
Cleveland, Ohio 44106-7061
Phone 216-368-3780; Fax 216-368-6658
E-mail: housing@case.edu
http://housing.case.edu

Undergraduate Housing

Living on campus provides students with many benefits. Because of this, all undergraduate students who do not live with their parents live in a residence hall or university-recognized fraternity or sorority house. In addition to the opportunities to meet new people and to develop a sense of campus community, students appreciate the convenience of being close to classrooms, libraries, laboratories, and other campus facilities.

To enrich the college experience, the Housing and Residence Life Program is designed to meet the needs of residential students throughout their time on campus. The program is designed to meet the specific needs of first year, second year and upper-class students by exploring the academic and social expectations students experience as they progress through their university education.
Each residence hall is staffed with trained undergraduate students (residence assistants and learning assistants), graduate students (resident directors), and professional staff (coordinators of residence education). In addition to administering the daily operation of the buildings, the staff works to meet the academic, interpersonal, social, and community needs of their populations. Staff members also work with students in developing quality programs, projects, and social activities in the residence halls. Through a variety of programs, students explore personal and social issues, make new friends, and discover opportunities for personal growth. The staff members know the university community resources and are committed to helping each student benefit to the fullest extent from their college experience.

The First Year Experience at CASE

The first year at the university is the beginning of an exciting time of learning about the many opportunities and resources available on campus, in University Circle, and beyond. To facilitate and maximize this learning, all first year students who reside in University Housing live together in one of three Residential Colleges - Juniper Residential College, Magnolia Residential College and Mistletoe Residential College. Programs are designed specifically to assist students in their transition to the university, involving various departments across campus.

Each Residential College is comprised of 2-3 residence halls housing approximately 100 students in each hall. Residential Colleges are staffed by full-time live-in Coordinator of First Year Residence Education (FYC). With offices located in the Residential Colleges, the FYCs strive to build a community where students can live, learn and reach their maximum potential.

The Second Year and Upperclass Experiences

The second year at Case Western Reserve is often a time of continued social and academic adjustment, and a time when students are expected to commit to a particular academic major. Therefore, the focus of the Second Year Experience is the emphasis on the exploration of academic, career and personal decisions, engaging in leadership opportunities, traditions, and mentoring relationships and creating a personal vision for the upperclass years.

Upperclass students are faced with many questions and decisions regarding their future. The Upper-class Experience is designed to ease the transition to life after graduation. In collaboration with numerous other Student Affairs and academic offices, the Residence Life Staff works to provide information and services designed to assist upper-class students in their decision making process.

North Residential Village

The North Residential Village (NRV) is situated just a few blocks from Cleveland’s renowned museums, cultural centers, and the humanities and social sciences classroom buildings. The NRV is the home to eleven residence halls with beautifully landscaped outdoor areas, recreational fields and a dining commons. It offers students a variety of living arrangements convenient to classes and community resources. Eight of the eleven residence halls are found within the Residential Colleges. Juniper Residential College is comprised of Norton House, Raymond House and Sherman House. Magnolia Residential College contains Smith House, Taft House and Tyler House. And, Mistletoe Residential College is comprised of Fribley House and Hitchcock House. These Residential Colleges feature double rooms with community bathrooms and floor lounge.

The remaining three residence halls in the North Residential Village are designed to meet the needs of second year and upperclass students. Cutler House and Storrs House feature double and single rooms within a quad setting. Clarke Tower provides suite-style living with single and double room options.

In the center of the North Residential Village community, students can find Leutner Commons, which houses Leutner Dining Commons, where meals are served for all North Residential Village residents. Wade Commons houses a Resource Center which consists of satellite offices for the Office of Undergraduate Studies, the Center for Women, the Peer Helper Network and the North Residential Village Coordinator; a fireplace lounge; a tutoring center that is open for walk-in tutoring; Club W, a fitness room; a convenience store and the Wade Area Office. The Wade Area Office is the central location for package pickup, filing maintenance requests and room key distribution for the North Residential Village residence halls.

South Residential Village

A mix of second year and upperclass students live in the seven suite-style residence halls, located on Murray Hill Road and Carlton Road that make up the South Residential Village. Glaser House, Kusch House and Michelson House are three high-rise undergraduate halls located on Carlton Road. Alumni House, Howe House, Staley House, and Tippit House are located on Murray Hill Road. Each suite has six private bedrooms that share a furnished living room area and bathroom.

Also found within the South Residential Village is Fribley Commons, which houses Fribley Dining Commons, a fireside lounge, a convenience store and the Fribley Area Office. The Fribley Area Office is the central location for package pick-up, filing maintenance requests and distribution of room keys for South Residential Village residents.

Students with Disabilities

Students who have a disability which requires special accommodations should contact the Coordinator of Disability Services at 216-368-5230.

Room Rates

For the most up-to-date rate information, please visit our website at http://housing.case.edu/docs

The following accommodations are currently available for Case students: Doubles (North Residential Village), Singles (North and South Residential Villages). Two to nine person apartments will...
be available to upperclass students in the
Fall of 2005.

Meal Plan
For the most up-to-date meal plan rate
information, please visit our website at
http://housing.case.edu

The following meal plans are available to
all Case students. First and second year
students must choose from the 19 Flex or
17 Flex plans.
• 19 Flex + 75 (19 meals/week) and $75
dining dollars/semester
• 17 Flex + 150 (17 meals/week) and
$150 dining dollars/semester
• 14 Flex + 200 (14 meals/week) and
$200 dining points/semester
• 10 Flex + 250 (10 meals/week) and
$250 dining dollars/semester

Additional meal plan information
can be found at http://www.case.edu/
diningservices/

Graduate Housing
There is currently no graduate housing
available. However, to assist graduate
students in identifying off-campus hous-
ing, the Office of Housing, Residence Life
and Greek Life publishes an Off-Campus
Housing Bulletin. The bulletin contains
apartment and housing listings, room-
mate wanted advertisements, etc. that are
located within a short distance from cam-
pus. The bulletin is updated each Friday
at noon and can be viewed online at
http://housing.case.edu/offcampus.

Facilities
Thwing Center
1111 Euclid Avenue
Phone 216-368-2660

From its prominent position in the very
center of Cleveland’s University Circle,
Thwing Center overlooks the campus
of Case Western Reserve University and
Euclid Avenue. The facility is named for
Charles Franklin Thwing, who was presi-
dent of Western Reserve University from
1890 until 1921. Thwing Center provides
space for a variety of programs, services,
and facilities. The center houses meeting
rooms; Charlie’s Place, a cafeteria-style
snack bar; the University Bookstore; a
postal substation; an elegant ballroom
with a vaulted ceiling; lounges for study
and programs; the commuter lounge;
a share-a-ride board; and the Student
Activities Office.

STUDENT ORGANIZATIONS AND
ACTIVITIES
Student activities and leadership opportu-
unities are available in a multitude of ways.
Students may become involved within the
Undergraduate Student Government or
in planning all campus programs with the
University Program Board. Approximately
one hundred student clubs and Class
Officers exist offering a large number of
opportunities to implement or simply
participate in a variety of social, cultural
and recreational events. The Student Ac-
tivities Office is home to several university
traditions, including Family Weekend,
Halloween at the Farm, Homecoming
and the Hudson Relays.

The Arts
Students interested in the arts have
numerous opportunities for involvement.
Eldred Theater offers dance and drama
activities. Students interested in the visual
arts may work with the Mather Gallery
Committee. Students with musical inter-
ests may participate in several performing
organizations, including the Case West-
ern Reserve University Marching Band,
two jazz bands, the Wind Ensemble, the
University Circle Chorale, the Collegium
Musicum, the Glee Club, and the Uni-
versity Circle Chamber Orchestra. The
Department of Music has information on
auditions.

Athletics
Veale Center
Phone: 216-368-2863

The department sponsors a variety of
intercollegiate and intramural activities.
Intercollegiate varsity sports for men are
football, soccer, cross country, basketball,
wrestling, swimming, baseball, tennis,
and indoor and outdoor track. Inter-
collegiate varsity sports for women are
volleyball, basketball, swimming, indoor
and outdoor track, fencing, tennis, cross
country, soccer, and softball. Aikido, ar-
chery, crew, cycling, volleyball, tae kwon
do, badminton, ultimate frisbee, fencing
and ice hockey sport clubs are available
to all students, faculty, and staff. Intramu-
ral competition is available in more than 40
activities, and more than one-half of the
undergraduates participate for relaxation,
physical fitness, or a chance to improve
skills.

Publications
Students may practice journalism and
management on any of seven different
publications. The undergraduate student
newspaper on campus, The Observer, is
published weekly. Other campus publica-
tions include a yearbook, Retrospect; a
literary magazine, Case Reserve Review; a
technical magazine, the Engineering and
Science Review; and a humor magazine,
the Athenian.

Broadcasting
The university’s student-operated radio
station, WRUW-FM 91.1, which oper-
ates at 15,000 watts, offers opportunities
for any student interested in radio broad-
casting and engineering. Ignite TV, the
student television station, allows students
to produce their own television shows and
short films.

Campus Leadership
The Office of Student Activities has made
a commitment to providing a variety
of leadership opportunities to students.
The Undergraduate Student Govern-
ment holds elections each fall for student
class representatives of residence hall,
commuters, class officers, and fraternity
and sorority constituencies. The student
government acts as a liaison between the
students and the faculty, administration,
and other appropriate groups and fulfills
legislative and executive functions. The
Executive Committee plans the agenda
for assembly meetings every other week
and sets long-range goals. The Finance
Committee recommends recognition and
budget allocations for undergraduate stu-
dent organizations. The Finance Commit-
tee also advises the student government.
on the management of special project funds. The Development Committee works to improve the quality of co-curricular life on campus and maintains a grievance process whereby students may express their opinions. An elected undergraduate representative serves as a voting member of the university-wide Faculty Senate. Each class elects Class Officers, serving to coordinate large and small scale programs. The Media Board, supervises and reviews the operations of all undergraduate student publications and broadcast media. The Media Board, made up of students and faculty advisors, is coordinated by the Thwing Center Administrative Office. From the student newspaper to campus radio to literary reviews and the film society, the Media Board provides a valuable outlet for creative students. The University Program Board (UPB) presents all-campus social, educational, cultural, and recreational activities. Committees made up of undergraduate volunteers program activities in accord with their interests. The Entertainment Committee selects and sponsors singers, bands, and comedians at the Spot, Rough Rider Room, and Thwing Center. The Fine Arts Committee presents jazz, dance, visual arts, and other performing arts programs. The Lecture Committee plans and sponsors lectures by national speakers on topics of significance. The Diversity Programs Committee presents social and educational programs to increase cross-cultural understanding as well as cultural and educational programs concerning racial, sexual, and disabled minority interests. Traditional annual events such as Homecoming are planned by the Special Events Committee. All-campus parties and major concerts are planned by the Concert Committee. The Recreation and Development Committee co-sponsors educational programs as well as tickets to major sporting attractions and our annual Hudson Relays weekend. The Interfraternity Congress/Panhellenic Council oversees the activities of the Greek social organizations on campus. In the spring, they plan Greek Week activities and an all-campus party. The Thwing Center Advisory Board serves as an advisor to the director of Thwing Center in making policy and developing facilities. Students, staff, faculty, and alumni serve as members of the Advisory Board. Each undergraduate class elects officers to plan class activities, and each of the more than 100 student organizations.

Commuter Life

Commuter services for undergraduate commuting students are provided through the office of Educational Support Services (ESS). A Commuter Assistant (CA) team spearheads commuter services by hosting commuter events, advocating for commuter concerns, sending a weekly electronic newsletter, and maintaining the Rock Bottom Lounge, located in the basement of Thwing Center West.

The CA team also publishes the annual Commuter Guide, plans special commuter orientation activities, and organizes the Annual Commuter Appreciation Day.

The Rock Bottom Lounge is open daily from 7 am to 1 am. Commuters may have card access to the lounge’s exterior door by stopping at the ESS office during business hours. The exterior entrance is located on the bookstore side of the Thwing Center. All commuters and residents are welcome to use the lounge, which contains lockers, a pool table, a television and VCR, and a kitchenette with refrigerator and microwave oven.

Films

An unusually large number of films is shown at the university. The Film Society shows outstanding motion pictures four times weekly, from popular films to foreign art films. The Film Society publishes a calendar of offerings each semester. The Film Society uses Strosacker Auditorium. It is one of the few university film societies to show films in 70 mm and Dolby stereo. Other student organizations also show films centered on their interests or for special events.

Fraternities and Sororities

Greek life is the largest campus activity at the university, involving 30 percent of the undergraduate population in the 24 fraternity and sorority chapters. All of the chapters belong to one of the two umbrella organizations which govern the Greek community and link the chapters to the campus. The Panhellenic Council coordinates the activities of the six sororities while the Interfraternity Congress governs the 18 fraternities. The Greek community also supports the Order of Omega, a society which recognizes outstanding Greek leaders, and Gamma Sigma Alpha, a scholastic honor society for Greeks with a grade point average above 3.60. The Greek Life Staff including the director of Greek life and coordinator of Greek Life are full-time staff members who offer administrative, supervisory, counseling and related services to all facets of Greek life. The Black Greek Council (BGC) is the governing organization of the eight historically Black Greek fraternities and sororities represented at Case. The five national sororities are Alpha Chi Omega, Alpha Phi, Delta Gamma, Phi Mu, and Phi Sigma Rho; and there is one local sorority, Sigma Psi. The 18 national fraternities are Alpha Epsilon Pi, Beta Theta Pi, Delta Kappa Epsilon, Delta Tau Delta, Delta Upsilon, Phi Delta Theta, Phi Gamma Delta, Phi Kappa Psi. The 18 national fraternities are Alpha Epsilon Pi, Beta Theta Pi, Delta Kappa Epsilon, Delta Tau Delta, Delta Upsilon, Phi Delta Theta, Phi Gamma Delta, Phi Kappa Psi, Phi Kappa Tau, Phi Kappa Theta, Sigma Alpha Epsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Theta Chi, Zeta Beta Tau, and Zeta Psi. Eighteen chapters reside in houses on either the north or south campus. The other 6 chapters reside in residence halls.

Honorary Societies

Case Western Reserve has four major undergraduate honoraries. Several more are based on specific fields of interest. Tau Beta Pi and Eta Kappa Nu are engineering honoraries. Mortar Board, a national honorary society for full-time senior students, recognizes scholarship leadership, and service. Phi Beta Kappa, a national honorary society, recognizes outstanding scholarship in the liberal arts and sciences. Outstanding students may qualify for election to membership in the second semester of the senior year. A few specially gifted students may be elected to membership as juniors.
Religious Activities

The three staffed campus ministries recognized by the university are the Newman Catholic Campus Ministry, the Hillel Foundation, and the United Protestant Campus Ministries. These centers sponsor worship services and religious education activities, as well as general programs oriented to the interest of all students. In addition, the campus has several other religious organizations open to all students.

STUDENT COMMUNITY SERVICE

The Office of Student Community Service (OSCS) coordinates both curricular and co-curricular activities that promote learning by Case students from service to communities locally, nationally, and internationally. Service learning venues supported by OSCS include academic course work, Work-Study, residence-hall and religious life programs, AmeriCorps national service, and independent student organizations. OSCS-sponsored projects address community needs in the areas of education, the environment, public health, technology, and the arts through partnerships with a great variety of community-based organizations.

UNIVERSITY COUNSELING SERVICES AND CENTER FOR COLLEGIATE BEHAVIORAL HEALTH

Center for Collegiate Behavioral Health
University Health Service
216-368-2510 or email: mindbody@case.edu

University Counseling Services
Sears Library Building, 2nd floor
216-368-5872 or email: wecounsel@case.edu

University Counseling Services (UCS) and Collegiate Behavioral Health (CBH) provides individual, group and couples counseling, psychiatric consultation, psychological and learning disabilities testing, and referrals for community services for all undergraduate, graduate, and professional school students and their spouses or partners. In general, these services are offered on a short-term basis (usually 12 or fewer sessions) to help students make adjustments in their personal, social, and educational areas of life. The staff of the UCS & CBH understands the need to maintain confidentiality; therefore, the UCS/CBH will not disclose information to any other party, e.g., faculty, parents, future employers without written permission from the student. Release of information without written consent would occur only in cases of imminent harm to one’s self or to another adult or child, or when compelled by law or court ruling to do so.

There are two locations on the Case campus: The Counseling Service in the Sears Library Bldg., 2nd floor and the Center for Collegiate Behavioral Health at the University Health Service building. Both services are staffed with professional social workers, counselors, psychologists, psychiatrists, and substance abuse intervention and prevention specialists who are experienced in helping college students.

The monthly ‘MindBody Connection Newsletter’ and our website at www.case.edu/stuaff/mindbody illustrate our commitment to the promotion of healthy lifestyle choices for our students and the entire university community. Free workshops, groups and seminars are also offered each semester on topics including test anxiety management, meditation and stress reduction, overcoming shyness, students in recovery, global nomads, eating and nutrition groups and sleep hygiene. Also, the Sex, Drugs, and Rock n’ Roll Conference is an annual student conference for the appreciation of popular culture and for the prevention of alcohol and substance abuse among college students.

CAREER CENTER

206 Sears Library Building
Phone 216-368-4446; Fax 216-368-4759
www.careercenter.case.edu

The Career Center offers individualized assistance, programs, and technologically advanced resources to educate students in the development of lifelong career management skills, the attainment of work experience, and the integration of academic and career plans.

The Career Center offers programs and resources to address career development issues such as:

- Identifying career interests and related options
- Learning more about specific career fields
- Choosing a major and setting career goals
- Applying for admission to graduate and professional schools
- Obtaining relevant work experience through Internships, Practica, and summer employment
- Targeting and researching prospective employers
- Preparing effective cover letters, resumes, and other written communications
- Identifying current job openings
- Preparing for interviews

Specific services and resources include:

- Individual career counseling and job search guidance
- Career exploration programming and special services for 1st-year and undecided students
- Accenture Career Resource Library
- Occupational information, career references, computer workstations, and more
- www.cwru.edu/stuaff/careers
- Comprehensive website of career/employment resources
- CareerSearch.net online database of nearly 1.5 million prospective employers nationwide
- Career Network – mentoring, shadowing and networking program for students to connect with alumni
- Videotaped mock interviews
- On-campus interviewing opportunities, resume referrals, and annual job fairs
- Practicum and Internship Programs
- Credential files service for graduate/professional school or employment
Students with disabilities should disclose their disability and provide supporting documentation to the Coordinator of Disability Services in Educational Support Services (ESS). The coordinator will review the documentation in order to make a determination of a student’s eligibility for and the type of services needed.

Once students have been accepted and have decided to attend Case, they receive a disability disclosure form within a larger packet of information. Once completed and submitted, this form permits the coordinator to begin evaluating the student’s individual needs. Students (and their parents) are encouraged to make an appointment with the Coordinator at any time before, during or after the admissions process.

Students may contact the coordinator and submit documentation at any time during their tenure at Case. However, accommodations and services cannot be provided retroactively. Students with disabilities must be proactive in their request for services, equipment and/or accommodations. Students that suspect that they may have an undiagnosed disability should meet with the coordinator; it may be possible to arrange for an evaluation through either the University Health Services or the University Counseling Services.

Students with disabilities that require assistance with parking, transportation, housing, academics or any other area involving their participation at Case should be made eligible through Disability Services. The Coordinator will facilitate the necessary accommodations, services and/or equipment with the appropriate departments on campus. The coordinator is available to do information programs for any student group. All students are welcome to meet with the coordinator to discuss any disability issues at any time.

Disability Services, as a part of ESS is located in Kelvin Smith Library, room 105.

Disability services are available through Educational Support Services, which serves as the resource center and ombudsman for university students with disabilities.

Graduate testing at Case Western Reserve is overseen by ESS, which oversees computer-based testing for Educational Testing Service as well as various paper and pencil exams. ESS provides information and application materials for the GRE, GMAT, MCAT, LSAT, Miller Analogies Test, and the TOEFL.

ACES, the Academic and Computing Excellence Seminar, is a noncredit program developed by the Office of Educational Support Services. The course is offered in the summer and at the beginning of each semester and helps students develop effective study strategies and confidence using the university’s high-speed network. The course includes assessment, class-
room instruction, and use of the PDEL. Summer ACES is a residential program
designed for in-coming freshmen.

University Studies (UNIV) 400 is the
non-credit course required for all gradu-
ate students who assume (or will assume)
instructional responsibilities for any
undergraduate course at the university.
Educational Support Services coordinates
UNIV 400.

UNIV 400A. Professional Development for
Graduate Teaching Assistants (0)
An orientation and a series of seminars for new
TAs designed to develop skills in communication
and teaching. Successful completion requires
attending the campuswide TA orientation and
a minimum of three of the seminars offered
throughout the year. Required of students with
graduate appointments that include instructional
responsibilities.

UNIV 400B. Professional Development for
Int’l Graduate Teaching Assistants (0)
In addition to satisfying the requirements of
UNIV 400A, ITAs are required to attend a spe-
cial half-day ITA orientation and to participate
in an evaluation of spoken English, the SPEAK
evaluation.

UNIV 400C. ITA Communication Skill De-
velopment (0)
Small group, interactive course that concentrates
on American culture, pronunciation, idiomatic
usage, and English grammar. Required of all new
ITAs who do not meet the minimum require-
ments on the SPEAK evaluation.

UNIVERSITY HEALTH SERVICES
Eleanor W Davidson MD, Director
Lois Wells, RN-C, Director of Nursing
Mary Beth Katitus, MPA, Business
Manager
2145 Adelbert Rd
Phone 216-368-2450

Hours:
M,T,W,F ........................ 8:30 am - 4:30 pm
Thurs ............................. 9:30 am - 4:30 pm
Closed weekends and holidays
Appointments 216-368-4539
On Call/Emergency Phone 216-368-
2450

University Health Service (UHS) is served
by health care professionals whose special
interest is in college health. These include
board certified nurse practitioners and
physician-specialists (internal medicine,
pediatrics, family practice), psychologists,
psychiatrists, registered nurses, social
workers and a licensed dietician.

All students registered for one or more
credit hours may use any of the services
offered within UHS during Fall and
Spring semester AT NO CHARGE.
Students who choose to waive the Student
Medical Plan (insurance) are still eligible
to use our services without charge. If
laboratory tests or x-rays are ordered, then
the student will receive a bill from the
provider of these services (usually Uni-
versity Hospitals of Cleveland), and they in
turn submit these bills to their own insurance
for consideration of reimbursement.

Primary Care
Care for most acute illness (infections, in-
juries, etc) is delivered by the staff of the
Primary Care Clinic. Students are seen by
appointment (there are urgent, same day
appointments available every day - the
earlier a student calls, the more likely they
can be seen the same day.) Whenever pos-
sible, we try to have the student receive
care from the same provider at each visit,
in order to improve continuity of care.

There are several specialty clinics available
within UHS during the regular school
year. These include Women’s Clinic (for
annual gynecologic exams; evaluation of
such things as irregular menstrual periods,
breast lumps, etc; diagnosis and treat-
ment of genital infections; prescription
of birth control), Skin Clinic (for treat-
ment of acne, warts, mole removal, etc),
and Allergy Clinic. If more subspecialized
care is required, students are referred to
appropriate physicians in the Cleveland
metropolitan area.

Labs/X-ray/Emergency Room
For any of these services that are provided
outside UHS (usually by University Hos-
pitals of Cleveland), a student will receive
a bill. They need to submit a copy of the
itemized bill to the University Medical
Plan or their own insurance for consid-
eration of payment.

Medications
In some cases, the counter medications
or frequently prescribed drugs are
provided without charge to students but
only when part of the prescribed treat-
ment plan (UHS does not have a pharma-
cy). In other cases, students may receive
a written prescription for medications
that may fill at a nearby pharmacy
of their choice. If they have the Student
Medical Plan, they pay for these drugs
at the time of receipt and file a claim
for possible reimbursement via the Plan
benefits.

Hospitalization
In those unusual situations when stu-
dents require inpatient care, they will be
referred to one of the multiple excellent
facilities available nearby. Where this oc-
curs will depend on the student’s medical
needs as well as their medical insurance
requirements. On occasion following
hospitalization, a student may be asked
to meet with a member of the Univer-
sity Counseling Service or UHS staff to
determine their ability to return to full
campus life.

Notification of Illness/Privacy
In general, UHS does not notify any third
parties regarding a student’s illness. It is
the student’s decision whom to notify and
when this might be appropriate. UHS
believes strongly in the student’s right to
privacy.

UHS staff will notify a student’s imme-
diate family in case of illness or injury
after consent has been obtained from the
student. Specific medical information
about a student’s illness is confidential
and privileged. In cases of life threatening
emergencies, notification will be made
without prior consent. In other cases, the
UHS staff will work with the student to
have the student do the notification of
family members, whenever possible. At
the student’s request, UHS will also notify
the appropriate Dean’s Office about their
illness.
On Call/After Hours

A nurse, physician, and counselor are available by beeper, 24 hours a day, 7 days a week during the regular fall and spring semesters. They can be reached by calling the main UHS phone at 216-368-2450. This will reach the Answering Service who can page them. The on-call staff assists students in making decisions about what situations are truly medical emergencies and where best they can access the services that they need. In case of obvious severe illness or injury, students should proceed directly to the nearest Emergency Room and then notify the Health Service later. Students will be billed directly for the services they receive. It is their responsibility to initiate insurance claims for these expenses. Assistance in filing claims for those enrolled in the Student Medical Plan is available within UHS.

Medical Records/HIPAA

Information from a student’s medical record is only available to staff within UHS and not to anyone outside of UHS, without the express written consent of the student. A parent may not access information in this record without the same express written consent of the student.

University Counseling Services records are maintained separately and are only released in accordance with their own policies and procedures. The student’s written authorization is required, except in the case of life-threatening emergencies.

Excuses

If a student must miss a class, a laboratory, or an exam because of illness, it is the student’s responsibility to notify the relevant faculty member directly. UHS does not issue excuses. In circumstances of prolonged illness or hospitalization, UHS (with the student’s permission) may notify the appropriate academic dean.

What We Need from Each New Student

Each new student should receive in the mail a copy of the Immunization form and brief Medical History (whom to notify in case of emergency). They should complete these and return them to the Health Service. (It might be helpful to keep a copy of the Immunization History before mailing it in, for future records, travel abroad, etc.) The Immunization History may be completed by a family physician, or students may send a copy of their school immunization record.

A tuberculin skin test (Mantoux) is required of all students in the healthcare professions (medicine, dentistry, nursing, applied social sciences, podiatry) as well as all international students. These will be provided without charge after arrival on campus, unless appropriate testing within the past 6 months is documented by a physician.

Students who have not been immunized because of illness or religious beliefs should document that for our records. In some instances, they might be excluded from classes and residence halls in the event of an outbreak of a vaccine-preventable disease.

Student Medical Plan

The Student Medical Plan provides coverage, within the stated guidelines, for medical services rendered outside the University Health Service (typically lab tests, x rays, prescriptions, hospitalization, etc.). A fee for this Plan is automatically billed each fall and spring semester to all students enrolled for one or more credit hours. Students with alternative coverage for such expenses may waive the Student Medical Plan by indicating this as they register for courses online or accessing the waiver option on the Student Medical Plan website at www.cwru.edu/stuaff/UHS/mdplanpg.html. A waiver must be completed each semester by the deadline stated (check the website for the appropriate dates).

When a student is enrolled for the Medical Plan in the spring semester, coverage automatically applies through the summer until August 1st.

Students taking a leave of absence because of a personal medical condition may be eligible to extend that coverage one additional semester, if already covered by the Plan (inquire at UHS for further information 216-368-3050).

For additional information about the Student Medical Plan, go to the UHS website at www.cwru.edu/stuaff/UHS/uhsh.html or telephone us at 216-368-3050. All students should receive a brochure about the current Student Medical Plan yearly. Additional copies may be obtained by calling 216-368-3050.

Dependent Coverage

Information regarding optional medical coverage for dependent spouse, domestic partner, or children is available at UHS.

INTERNATIONAL STUDENT SERVICES

The Office of International Student Services (ISS) assists all foreign students with non-academic concerns. The office acts as a liaison with off-campus agencies, such as the Bureau of Citizenship and Immigration Services, the U.S. Department of State, embassies, educational consular offices, the International Institute of Education, and Fulbright-Hays grant offices. ISS staff members serve as advocates for international students, with the goal of ensuring that each student has the best possible educational, cultural, and personal experience at Case Western Reserve University.

The ISS supports the university’s goal to internationalize. The Office partners with other offices, departments and divisions at Case to nurture the growth of an international community and to help develop a campus environment that is responsive to their needs. More than 80 different countries are represented on campus. Every fall, a special orientation is held for newly arrived international students, and a year-long program is designed to enhance the lives of all international students. The ISS Office sponsors an International Club, an annual international dinner, cross-cultural workshops, a student lounge and study room, field trips, and several social gatherings. A newsletter is published each semester, and an electronic news list keeps students informed.
students up to date on immigration policies, special events on campus and in the community, and other matters of particular interest to international students. Many nationality-based student organizations provide additional opportunities for international students to meet others with similar interests and experiences.

Case has been authorized under federal law to enroll non-immigrant alien students on both F-1 and J-1 visas.

(See Students from other Countries for additional information)

THE OFFICE OF MULTICULTURAL AFFAIRS (OMA)

450 Sears Building
Phone 216-368-2904

The Office of Multicultural Affairs encourages, supports, and facilitates the success of all Case Western Reserve University students by providing opportunities for diverse interaction and cultural education that occurs outside of the classroom environment. The OMA supports the university’s mission to recruit, retain, and graduate underrepresented students. The OMA guides students to available resources throughout the university and strives to ensure that multicultural student’s needs are recognized and addressed. The OMA collaborates with departments campus-wide to support efforts such as individual tutoring, master tutor study groups, college success workshops, academic advising, counseling, developing a sense of community, social and cultural enrichment programs, and career development opportunities. The office involves students, faculty, administrators, and staff to create a campus environment that promotes intellectual development, independent thinking, self-confidence, and appreciation of ethnic and cultural diversity. The OMA welcomes all students to become involved in their office’s efforts to educate, appreciate, collaborate, and build bridges for an inclusive welcoming society.

ACCESS/TRIO PROGRAMS
(Upward Bound/SPPSHS and Talent Search)
131 Yost Hall
216-368-3750
216-368-6640

Upward Bound/SPPSHS
The Upward Bound/Special Program for Preprofessional Students in the Health Sciences (SPPSHS) is the oldest of the existing minority programs at Case Western Reserve University. Established in 1966, the program is designed to prepare low-income and potential first-generation-college high school students for successful postsecondary studies directed toward professional health careers. High school students, grades nine through twelve, attending Cleveland and East Cleveland Public Schools are eligible for participation in the program. The program is year-round and includes a six-week summer residential component and a well-developed academic year component.

Talent Search
The Talent Search Program is an educational program at Case Western Reserve University designed to (1) identify qualified youths with potential for education at the postsecondary level and encourage them to complete secondary school and undertake a program of postsecondary education and (2) to publicize the availability of student financial assistance for persons who seek to pursue postsecondary education. Talent Search is the newest of the pre-college programs at the university, having been first funded September, 1998.

STANDARDS OF CONDUCT
A student enrolling in the university assumes an obligation to behave in a manner compatible with the university’s function as an educational institution. It is clear that in a community of learning, willful disruption of the educational process destruction of property, dishonesty, and interference with the rights of other members of the university cannot be tolerated. The university retains the right to maintain order within the university and to exclude those who are disruptive to the educational process.

Student organizations are held accountable for their actions through their leadership. Representative officers of organizations are held responsible for group action to the extent they are judged to have control of such action.

The following principles are the basis for the Standards of Conduct at Case Western Reserve University:
Respect
Integrity
Tolerance
Safety
Cooperation
Pride
Civility
Responsibility
Honesty

Conduct which is subject to university disciplinary action includes:
1. Interference with freedom of speech or movement, or intentional disruption or obstruction of teaching, research, administration, or other functions on university property.
2. Actual or threatened physical harm or mental abuse of any person on university premises or at functions sponsored or supervised by the university.
3. Refusal to comply with the directions of university officials, instructional or administrative, acting in performance of their duties.
4. Theft or vandalism of university property or that of a member of the university community or campus visitor.
5. All forms of dishonesty, including cheating, plagiarism, knowingly furnishing false information to the university, forgery and the alteration or misuse of university documents, records, or instruments of identification.
6. Unauthorized carrying or possession on university premises of firearms or of any weapon with which injury, death, or destruction may be inflicted.

The following principles are the basis for the Standards of Conduct at Case Western Reserve University:

Respect
Integrity
Tolerance
Safety
Cooperation
Pride
Civility
Responsibility
Honesty

Conduct which is subject to university disciplinary action includes:

1. Interference with freedom of speech or movement, or intentional disruption or obstruction of teaching, research, administration, or other functions on university property.
2. Actual or threatened physical harm or mental abuse of any person on university premises or at functions sponsored or supervised by the university.
3. Refusal to comply with the directions of university officials, instructional or administrative, acting in performance of their duties.
4. Theft or vandalism of university property or that of a member of the university community or campus visitor.
5. All forms of dishonesty, including cheating, plagiarism, knowingly furnishing false information to the university, forgery and the alteration or misuse of university documents, records, or instruments of identification.
6. Unauthorized carrying or possession on university premises of firearms or of any weapon with which injury, death, or destruction may be inflicted.
7. Violations of civil law on university premises or in connection with university functions.

8. Violation of published university rules and regulations.

Academic Integrity Policy

Students, faculty, and administrators share responsibility for the determination and preservation of standards of academic integrity. They must not only adhere to their own personal codes of integrity but also be prepared to educate others about the importance of academic integrity, to take reasonable precaution to discourage violations of academic integrity, and to adjudicate violations.

For students, education about the importance of academic integrity begins during the admissions process. The centrality of integrity to the academic enterprise is reinforced during new student orientation when students engage in discussion about academic integrity. Specific mention of academic integrity and course-specific guidelines should be presented in all classes. Programs and instruction about academic integrity guidelines also should be offered throughout the students’ undergraduate career.

Faculty and students are expected to uphold standards of academic integrity by taking reasonable precaution in the academic arena. Reasonable precaution involves implementing measures that reduce the opportunities for academic misconduct but do not inhibit inquiry, create disruption or distraction in the testing environment, or create an atmosphere of mistrust.

The vitality of academic integrity is dependent upon the willingness of community members to confront instances of suspected wrongdoing. Faculty have specific responsibility to address suspected or reported violations as indicated below. All other members of the academic community are expected to report directly and confidentially their suspicion of violation to a faculty member or a dean or to approach suspected violators and to remind them of their obligation to uphold standards of academic integrity.

Definition of Violations

All forms of academic dishonesty including cheating, plagiarism, misrepresentation, and obstruction are violations of academic integrity standards. Cheating includes copying from another’s work, falsifying problem solutions or laboratory reports, or using unauthorized sources, notes or computer programs. Plagiarism includes the presentation, without proper attribution, of another’s words or ideas from printed or electronic sources. It is also plagiarism to submit, without the instructor’s consent, an assignment in one class previously submitted in another. Misrepresentation includes forgery of official academic documents, the presentation of altered or falsified documents or testimony to a university office or official, taking an exam for another student, or lying about personal circumstances to postpone tests or assignments. Obstruction occurs when a student engages in unreasonable conduct that interferes with another’s ability to conduct scholarly activity. Destroying a student’s computer file, stealing a student’s notebook, or stealing a book on reserve in the library are examples of obstruction.

Discussing, Reporting, and Adjudicating Violations

If a faculty member suspects that an undergraduate student has violated academic integrity standards, the faculty member shall advise the student and the departmental chair and consult with the Dean of Undergraduate Studies about the appropriate course of action. Before speaking with the student, the faculty member also may choose to consult with the Chair or Dean about academic integrity standards. If the faculty member, in consultation with the Dean, determines that the evidence is not adequate to charge the student with a violation, the matter will be dropped. Otherwise, the following procedures will be followed:

First Violations

If the faculty member and the student agree that a violation has occurred and the violation is determined to be a first violation (the university has no record of previous violations by the student of the university’s Standards of Conduct), the faculty member shall choose either to sanction the student or to refer the case to the academic integrity board. If the faculty member chooses to sanction the student, the minimum sanction is failure in the work in question and the maximum sanction is failure in the course. The faculty member will be provided with a standard reporting form to be signed by both the student and faculty member.

However, the case will be referred to the Assistant Vice President for Student Affairs for integrity board action if

1. the student claims not to have violated academic integrity standards or the student disagrees with the sanction imposed by the professor;
2. the faculty member feels that the seriousness of the first offense warrants presentation to the academic integrity board; or
3. the faculty member, after consultation with the dean, prefers to have the academic integrity board investigate or adjudicate the alleged violation, or prefers that the board sanction the student.

The signed report form from a faculty member or the finding of responsibility by the academic integrity board will become part of the student’s university judicial file. Students found responsible for a first violation will be required, in addition to any other sanctions imposed, to attend an ethics education program or to complete an ethics exercise as assigned by the dean of undergraduate studies or the Assistant Vice President for Student Affairs.

Subsequent Violations

If the university judicial file indicates that the student suspected of a violation has been responsible for one or more previous violations of the university’s Standards of Conduct, the university’s Standards of Conduct, the faculty member shall choose either to sanction the student or to refer the case to the academic integrity board. If the faculty member chooses to sanction the student, the minimum sanction is failure in the work in question and the maximum sanction is failure in the course. The faculty member will be provided with a standard reporting form to be signed by both the student and faculty member.

However, the case will be referred to the Assistant Vice President for Student Affairs for integrity board action if

1. the student claims not to have violated academic integrity standards or the student disagrees with the sanction imposed by the professor;
2. the faculty member feels that the seriousness of the first offense warrants presentation to the academic integrity board; or
3. the faculty member, after consultation with the dean, prefers to have the academic integrity board investigate or adjudicate the alleged violation, or prefers that the board sanction the student.

The signed report form from a faculty member or the finding of responsibility by the academic integrity board will become part of the student’s university judicial file. Students found responsible for a first violation will be required, in addition to any other sanctions imposed, to attend an ethics education program or to complete an ethics exercise as assigned by the dean of undergraduate studies or the Assistant Vice President for Student Affairs.
Conduct, the case will be referred to the Assistant Vice President for Student Affairs for Academic Integrity Board Action.

Misrepresentation and Obstruction
Reports of suspected academic misrepresentation or obstruction occurring in settings other than the classroom will be referred to the Assistant Vice President for Student Affairs for Academic Integrity Board Action.

Academic Integrity Board
If a suspected or known violation of academic integrity standards warrants consideration by the Academic Integrity Board, the Assistant Vice President for Student Affairs (or his or her designee) will convene the board. The board will be composed of three students (voting members) appointed by the Undergraduate Student Government, two faculty (voting members) appointed by the Executive Committee of the Faculty Senate and two administrators (non-voting members). One administrator will be a dean from the Office of Undergraduate Studies. The other administrator, the Assistant Vice President for Student Affairs or his or her designee, will chair the board. All members of the board may question witnesses. Academic Integrity Board Procedure, the vote required for the determination of responsibility, and the evidence standard will be the same as those for the University Judicial Board.

Should the board find the student not responsible for a suspected violation, the faculty member and the student will be so informed. The faculty member will be asked to evaluate the student’s performance in the assignment in question and to issue a grade based on his or her normal grading practices.

If the board finds a student responsible for a violation of academic integrity standards, the board will notify the student and the faculty member. The board can sanction violations by issuing failure in the work in question, failure in the course, university disciplinary warning, university disciplinary probation, university disciplinary suspension, or expulsion.

In cases in which the academic integrity board finds a student responsible for a second or subsequent violation, the minimum sanction will be failure in the course; the maximum penalty will be expulsion.

If the Academic Integrity Board finds a student responsible for misrepresentation or obstruction, the minimum sanction will be university disciplinary probation; the maximum penalty will be expulsion.

Violations Reported after Voluntary Withdrawal or Academic Separation
Suspected violations of academic integrity standards reported after a student voluntarily withdraws or is academically separated will be investigated and adjudicated. A student who withdraws or is academically separated during the investigation and adjudication of a suspected violation may be asked to appear at a hearing or, if the student fails to appear, have his or her case heard in absentia. If the student is found responsible for a violation, sanctions can be imposed.

Violations Reported after Graduation
In the event that a suspected violation of academic integrity standards is reported after graduation, the Assistant Vice President for Student Affairs will make a determination as to the feasibility of investigation and adjudication. Graduation will not preempt investigation or adjudication of a suspected violation when those processes are feasible. If a student is found responsible for a violation and the sanction imposed makes the student ineligible to earn his or her degree, the degree may be revoked.

Maintenance of Records
Violations of academic integrity standards are considered violations of the university’s Standards of Conduct and will be recorded in the student’s judicial record. University judicial files are maintained by the Assistant Vice President for Student Affairs in the office of student affairs.

GUIDELINES ON ALCOHOL
The university will conform to all state and local laws controlling the sale and use of alcoholic beverages. It is illegal to sell, provide, or serve beer, wine, or liquor to anyone who is under the legal age (21). Servers of alcohol and sponsors of social events must be aware of and comply with all state statutes and with university policies and procedures. The following regulations apply to all events at which students are present.

1. The sponsors of events where alcohol is served must file an Alcohol Use Permit in the Office of Student Affairs at least three business days prior to the event. A copy of this form will be needed for student groups to reserve any university facility for events where alcohol is served.

2. Open containers of alcoholic beverages are generally prohibited in public places according to state law and are specifically restricted in some university areas including Squire Valleeve Farm, Harkness and Amasa Stone Chapels, and at university athletic events.

3. At all events where alcohol is served, an effective procedure must be established and adhered to for certifying those legally of age to drink. To obtain alcoholic beverages a valid driver’s license or other valid legal document showing proof of age must be presented. A Case Western Reserve I.D. card may be required for admission.

4. The quantity of alcohol will be determined by using the following formula (no. of servings= no. of legal drinkers in attendance x hours of event). This also applies to BYOB events.

5. When alcohol is sold, temporary F or F-2 permits will be required in accordance with state laws. The sale of alcohol is defined to include such methods for defraying the cost of the beverage or event as sale by the glass or container, advance ticket sales, and cover charges at the door.

6. At all events where alcohol is served, non-alcoholic beverages must be
11. When beer is provided, it must be provided should reflect the proportion of those attending the event who are legally eligible to drink; the amount of non-alcoholic beverages provided should be sufficient to serve the number of people attending the event who are too young to drink or choose not to drink alcohol.

7. No one should be coerced, even subtly, to drink or overindulge, and the rights of those who choose to abstain must be respected.

8. When alcohol is served, food must be provided by the sponsor of the event in adequate amounts to last through the event.

9. The kind and amount of security required for an event will be determined according to the following factors: the nature of the event, the number of people attending the event, whether an alcoholic beverage is served, and whether cash will be on hand.

10. Social events which encourage drinking or drunkenness as themes and the advertisement of such events are considered inappropriate and will not be permitted. Neither the cost nor brand of alcoholic beverage may be advertised in Ohio.

11. When beer is provided, it must be served to individuals in single servings in containers of 16 ounces or less. When wine or liquor is provided, it must also be served in appropriately sized glasses.

12. The serving of alcohol must cease at least one-half hour before the scheduled end of an event.

13. When entertainment is included in the event, the type of entertainment and the duration must be listed on the Alcohol Use Permit.

14. The gift of alcohol as a reward for any student activity or contest is prohibited.

15. Individuals or groups violating state law or university student alcohol policy will be subject to disciplinary action. Additional information on the Student Alcohol Policy and the university’s commitment and expectation are included in the Student Services Guide.

GRIEVANCE PROCEDURE

Case Western Reserve University has established a mechanism whereby students of the university may express a grievance against the actions of other students or members of the faculty. Details of the grievance procedure are included in the Student Services Guide, an annual publication of the University Office of Student Affairs. Students who wish to have a specific problem reviewed should contact Student Affairs.

University Appeals Board

The University Appeals Board has jurisdiction over student appeals of disciplinary actions. Appeals to the board must be presented in writing to the Vice President of Student Affairs. The board normally reviews the case on the record alone.

DRUG POLICY

Case Western Reserve University has the responsibility to provide its students, employees, and the public with the safest environment possible. The university also has an interest in promoting the highest standard of health and welfare among its students, staff, and faculty. It is therefore the policy of Case Western Reserve University to discourage the use of controlled substances. The unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in and on property owned or operated by Case Western Reserve University. Further information regarding the university’s drug policy is available in the Student Services Guide.

UNIVERSITY POLICY ON E-MAIL COMMUNICATIONS WITH STUDENTS

Official communications from the university may be sent electronically using the student’s university-assigned e-mail address. The university expects that students will read such official university communications in a timely fashion. Students who choose to forward e-mail from their university account to another e-mail address remain responsible for receiving and reading official university communications.

SEXUAL ASSAULT POLICY

Case Western Reserve University is a community dependent upon trust and respect for its constituent members—students, faculty and staff. Sexual assault is a violation of that trust and respect; it will not be tolerated. The university strongly encourages persons who have been sexually assaulted to report the assault, to seek assistance and to pursue judicial action or sanctions for their own protection and that of the entire campus community. Complete details on the university’s policy and reporting procedure are included in the Student Services Guide, published annually by the University Office of Student Affairs.

SMOKING POLICY

As a matter of public policy, the university is dedicated to providing a safe and healthful environment. In addition, the university has substantial commitments to health-related research and teaching. Thus, the Case Western Reserve University community has a particular obligation to be sensitive to health-protection issues. Case Western Reserve University permits no smoking in its facilities with the exception of residence hall rooms. Smoking is permitted in residence hall rooms only if it is acceptable to all of the assigned occupants. It is permissible to smoke on campus grounds; smokers are asked to use urns provided for ash and butt disposal and to respect the rights of non-smokers at public gatherings on the grounds.

STUDENTS FROM OTHER COUNTRIES

Case Western Reserve University will consider for admission highly qualified students who are not citizens of the United States. An international student who is
admitted to study at the university generally aces problems of living in a different cultural environment under an unfamiliar academic system. It is anticipated that the student can solve these problems if he or she has an excellent academic record, understands rapidly spoken English and can speak, read, and write English with facility. In addition to completing the regular application materials, a student from another country must take several additional steps.

Financial Resources

In addition to regular application materials, international students must submit a letter from their sponsor and a bank statement verifying the sponsor's willingness and ability to fund a Case education. For the 2004-2005 school year, sponsors must demonstrate an ability to contribute at least $36,000. Case provides no financial assistance or need-based scholarships to international undergraduate students. At the present time, the only financial aid available to graduate students from other countries is a limited number of tuition grants and assistantships provided by certain departments of the university. These grants are made available only to unusually well-qualified students. A decision on these awards is made only after a decision on acceptance to the university. Case Western Reserve does not grant any financial assistance to undergraduate international students. An international student may want to arrange for a sponsor who will provide full financial assistance. Such a sponsor must document fully his or her ability to support the student, including the cost of tuition and fees, room and meals, books, incidentals, and travel expenses. The university cannot predict what individual expenses will be. Refer to the "Financial Information" section of this Bulletin. Costs for tuition and room and board are subject to change and do not reflect travel costs.

Transfer of Funds

Before the student leaves his or her home country, it is very important to inquire about the regulations regarding the transfer of funds. In addition to expenditures for travel, the student should have at least $1,200 (U.S.) on arrival in Cleveland to meet initial expenses. Foreign bank drafts made out to Case Western Reserve University may take as long as one month to redeem (cash) at this university. It is advisable to draw a draft on a bank located in the United States. Traveler's cheques are recommended in place of currency.

Employment

International students on F-1 or J-1 visas may work on campus provided they (1) maintain status and (2) do not work more than a total of 20 hours per week while school is in session. They may be employed on campus full time during holidays and vacation periods provided they are eligible and intend to register for the next school term.

English Requirement

Applicants from other countries must be able to speak, read, write, and comprehend English. A score of at least 550 on the paper-based Test of English as a Foreign Language (TOEFL), a score of 213 on the computer-based TOEFL, or completion of ELS Language Center, Level 109, at Case Western Reserve University is a mandatory requirement for admission and must be on file before registration will be permitted. Students may be retested on arrival at the university. The TOEFL test was introduced as a computer-based test in July 1998 in many parts of the world. Sylvan Learning Systems, Inc. administers the computer-based test year-round at permanent testing centers throughout the world. In addition, testing is offered at supplemental centers on specific dates or during specific time periods. For testing at supplemental centers, students must obtain the "Information Bulletin for Supplemental TOEFL Administrations" from TOEFL Services. TOEFL Services P. O. Box 6151 Princeton, New Jersey 08541-6151 U.S.A. http://www.toefl.org

Information bulletins are also available overseas at the Institute of International Education overseas branch offices; at the American-Korean Foundation in Seoul, Korea; at many U.S. embassies, binational centers and USIS centers; and at many universities. Applicants are exempt from the TOEFL requirements if they (1) speak English as their native language; (2) have completed a bachelor's degree or higher at a foreign university where the instruction was in English; (3) qualify for admission on the basis of U.S. high school graduation (rank in class and SAT scores); (4) have completed six semester hours of sophomore level English literature in a U.S. college or university; or (5) have earned a bachelor's degree or higher in a U.S. college or a university with instruction in the English language. Applicants who are required to submit TOEFL scores may be tested again for English placement before they are permitted to register.

Medical Insurance

All students must carry medical insurance. No exceptions are allowed. Refer to "University Health Service" for details.

Passports and Visas

When accepted by the university, the student will be sent a letter of admission and the appropriate form by which he or she may obtain a student visa for entry into the United States. The form for the U.S. visa will be issued by the Office of International Student Services only on receipt of a statement indicating sufficient financial support (for example, a letter of award of scholarship, a bank statement of deposited funds, or an affidavit of support) for one full year of tuition and living expenses. Students who are admitted as transfers from other U.S. colleges will be contacted by the Office of International Student Services as to the procedures to be followed. To meet U.S. government regulations, a graduate student on an F-1 or J-1 visa must take at least nine semester hours of university work for credit. An undergraduate must register for at least 12 credit hours.

Application

An application should be submitted by Jan. 15 for Fall admittance and by Oct. 15 for Spring admittance. Certified trans-
lations of academic credentials into English should be submitted with the official copies of all credentials. Initial undergraduate inquiries should be submitted to Office of Undergraduate Admissions
Case Western Reserve University
10900 Euclid Ave.
Cleveland, Ohio 44106-7055
U.S.A
Specific Schools and Colleges
Management

Only those applicants from other countries who have an undergraduate educational equivalent to that required for a bachelor's degree from an accredited institution in the United States will be considered for admission to the Weatherhead School of Management. Candidates with a three-year bachelor's degree will not be considered for admission unless they have also completed further education for which they have received a degree or diploma, or have completed significant professional work experience (minimum five years). The school does not accept applications from candidates who have already completed a Master of Business Administration (MBA) from another college/university.

The school requires the results of performance on the Graduate Management Admission Test (GMAT) and the Test of English as a Foreign Language (TOEFL). The TOEFL requirement is waived if a student has completed his/her undergraduate education at a college/university where the language of instruction was English. The GMAT and the TOEFL are administered daily at testing centers throughout the world. Application forms and information bulletins can be obtained by writing to:
Graduate Management Admission Test or
Test of English as a Foreign Language
Educational Testing Service
Box 966
Princeton, New Jersey 08540
or visiting their website at:
http://www.gmat.org

All applicants from other countries are required to pay the $50 application fee. Requests for application materials and all correspondence, transcripts, and documents supportive of an application should be forwarded to:
Admission Office
310 Enterprise Hall
Weatherhead School of Management
Case Western Reserve University
10900 Euclid Ave.
Cleveland, Ohio 44106-7235
(216) 368-2030

Applicants to the J.D./M.B.A. program must meet all of the admission requirements of both the School of Law and the School of Management. These applicants should write the admission offices of both schools for bulletins and application forms and should indicate on both applications that they are applying for the joint J.D./M.B.A. program. Separate application fees of $50 (by the School of Management) and $40 (by the School of Law) are charged. Candidates must take the Law School Admission Test (LSAT) as well as the GMAT. The results of the LSAT are sent to the School of Law and the results of the GMAT are sent to the School of Management. Information about the LSAT may be obtained from:
Law School Admission Council
Box 2000
Newtown, Pennsylvania 18940
or check their website at http://www.lsac.org or from the School of Law.
### Degree Programs Offered

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>Bachelor of Science in Accounting</td>
<td>Master of Accountancy</td>
<td>Bachelor of Science in Accountancy/Master of Accountancy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Master of Accountancy/Master of Business Administration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Accountancy/Master of Science in Management</td>
</tr>
<tr>
<td>Aerospace Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>American Studies</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td>Anatomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthesiology</td>
<td></td>
<td>Master of Science</td>
<td></td>
</tr>
<tr>
<td>Anthropology</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
<td>Bachelor of Arts/Master of Arts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Master of Arts/Master of Public Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Philosophy/Master of Public Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Science in Nursing/Master of Arts</td>
</tr>
<tr>
<td>Applied Anatomy</td>
<td></td>
<td>Master of Science</td>
<td>Master of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Applied Mathematics</td>
<td>Bachelor of Science in Applied Math.</td>
<td>Master of Science</td>
<td>Bachelor of Science in Applied Mathematics/Doctor of Medicine</td>
</tr>
<tr>
<td>Art Education</td>
<td>Bachelor of Science in Art Education</td>
<td>Master of Arts</td>
<td></td>
</tr>
<tr>
<td>Art History</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
<td>Bachelor of Arts/Master of Arts</td>
</tr>
<tr>
<td>Art History and Museum</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
<td></td>
</tr>
<tr>
<td>Asian Studies</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td></td>
</tr>
<tr>
<td>Astronomy</td>
<td>Bachelor of Arts in Astronomy</td>
<td>Master of Science</td>
<td>Bachelor of Science in Astronomy/Master of Science</td>
</tr>
<tr>
<td>Banking and Finance</td>
<td>Bachelor of Science in Astronomy</td>
<td>Master of Business Administration</td>
<td></td>
</tr>
<tr>
<td>Biochemical Research</td>
<td></td>
<td>Master of Science</td>
<td></td>
</tr>
</tbody>
</table>

- Joint program with Cleveland Institute of Art.
- Available only as a second major.
- Joint program with Cleveland Institute of Music.
- Includes dietetics.
- See clinical (child) psychology, clinical (adult) psychology, developmental psychology, experimental psychology, and mental retardation research psychology.
- The Medical Scientist Training Program.
- Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
- Degrees conferred jointly by the Mandel School of Applied Social Sciences and the Weatherhead School of Management.
- Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.
- Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
- Joint 5-year Doctor of Medicine/Master of Science
- Doctor of Dental Surgery degree available to currently enrolled students until May 2007.
<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Science in Biochemistry/Master of Science</td>
</tr>
<tr>
<td></td>
<td>Bachelor of Science in Biochemistry</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Arts/Master of Science in Nursing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Arts/Doctor of Medicine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Arts/Doctor of Philosophy (Genetics)</td>
</tr>
<tr>
<td>Bioethics</td>
<td></td>
<td>Master of Arts</td>
<td>Master of Arts/Juris Doctor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Master of Arts/Master of Science in Nursing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Arts/Doctor of Medicine</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Arts/Doctor of Philosophy (Genetics)</td>
</tr>
<tr>
<td>Biology</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Science in Biology/Master of Science</td>
</tr>
<tr>
<td></td>
<td>Bachelor of Science in Biology</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td>Biophysics and Bioengineering</td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>Bioscience Entrepreneurship</td>
<td></td>
<td>Master of Business</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Administration</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>Biotechnology and Physiology</td>
<td></td>
<td>Master of Science</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>Cell Biology</td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Philosophy/Doctor of Medicine</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Science</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Science in Chemistry/Master of Science</td>
</tr>
<tr>
<td></td>
<td>Bachelor of Science in Chemistry</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Science/Doctor of Medicine/Doctor of Philosophy (Genetics)</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Science</td>
</tr>
<tr>
<td>Classics</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Master of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Clinical Research</td>
<td></td>
<td></td>
<td>Doctor of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Communication Sciences</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Arts/Master of Arts</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Science</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Arts/Master of Science</td>
</tr>
<tr>
<td></td>
<td>Bachelor of Science in Computer Science</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Science in Computer Science/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Doctor of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Computing and Information Sciences</td>
<td></td>
<td>Master of Science</td>
<td>Bachelor of Science in Computer Science/Master of Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Contemporary Dance</td>
<td></td>
<td>Master of Fine Arts</td>
<td>Doctor of Dental Medicine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Master of Arts</td>
<td>Master of Science in Dentistry</td>
</tr>
<tr>
<td>Dentistry</td>
<td></td>
<td>Doctor of Dental Medicine</td>
<td>Doctor of Science in Dentistry</td>
</tr>
<tr>
<td>Economics</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>Field of Study</td>
<td>Undergraduate</td>
<td>Professional/Graduate</td>
<td>Combined</td>
</tr>
<tr>
<td>------------------------------</td>
<td>----------------------------------------</td>
<td>--------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Engineering (Practice-Oriented)</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Engineering</td>
<td></td>
</tr>
<tr>
<td>Engineering (Undesignated)</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>Engineering and Management (Integrated)</td>
<td>Master of Engineering and Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Mechanics</td>
<td>Master of Science</td>
<td></td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>Engineering Physics</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science in Engineering/Master of Science</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>Bachelor of Arts</td>
<td>Master of Arts, Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Arts</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>Master of Business Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Geology</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Health Sciences</td>
<td>Master of Science, Doctor of Philosophy</td>
<td>Master of Science/Doctor of Medicine/Doctor of Philosophy</td>
<td></td>
</tr>
<tr>
<td>Environmental Studies</td>
<td>Bachelor of Arts</td>
<td>Master of Science, Doctor of Philosophy</td>
<td>Master of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Epidemiology &amp; Biostatistics</td>
<td>Master of Science</td>
<td></td>
<td>Master of Science/Doctor of Medicine, Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td>Evolutionary Biology</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise Physiology</td>
<td>Master of Science</td>
<td></td>
<td>Master of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Fluid and Thermal Engineering Science</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science, Doctor of Philosophy</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>French</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
<td>Bachelor of Arts/Master of Arts</td>
</tr>
<tr>
<td>French and Francophone Studies</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genetic Counseling</td>
<td>Master of Science</td>
<td></td>
<td>Master of Arts (Bioethics)/Doctor of Philosophy</td>
</tr>
<tr>
<td>Genetics</td>
<td>Doctor of Philosophy</td>
<td></td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td>Geological Sciences</td>
<td>Bachelor of Arts, Bachelor of Science in Geological Sciences</td>
<td>Master of Science, Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Science, Bachelor of Science in Geological Sciences/Master of Science</td>
</tr>
<tr>
<td>German</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>German Studies</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gerontological Studies</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>Bachelor of Arts</td>
<td>Master of Arts, Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Arts, Bachelor of Arts/Master of Arts, Juris Doctor</td>
</tr>
</tbody>
</table>

a. Joint program with Cleveland Institute of Art.
b. Available only as a second major.
c. Joint program with Cleveland Institute of Music.
d. Includes dietetics.
e. See clinical (child) psychology, clinical (adult) psychology, developmental psychology, experimental psychology, and mental retardation research psychology.
g. The Medical Scientist Training Program.
h. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
i. Degrees conferred jointly by the Mandel School of Applied Social Sciences and the Weatherhead School of Management.
j. Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.
k. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
l. Joint 5-year Doctor of Medicine/Master of Science
m. Doctor of Dental Surgery degree available to currently enrolled students until May 2007.
<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>History and Philosophy of Science</td>
<td>Bachelor of Arts</td>
<td>Master of Science in Management</td>
<td>Juris Doctor/Master of Business Administration/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Information Systems</td>
<td></td>
<td>Master of Business Administration</td>
<td>Juris Doctor/Master of Science in Social Administration/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Juris Doctor/Master of Arts/Bachelor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>International Studies</td>
<td>Bachelor of Arts</td>
<td></td>
<td>Juris Doctor/Master of Arts/Bachelor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Japanese Studies</td>
<td>Bachelor of Arts</td>
<td></td>
<td>Juris Doctor/Master of Arts/Bachelor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Labor and Human Resource Policy</td>
<td></td>
<td>Master of Business Administration</td>
<td>Juris Doctor/Master of Arts/Bachelor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Law</td>
<td></td>
<td>Juris Doctor/Master of Business Administration/Master of Science in Social Administration/Bachelor of Science/Master of Business Administration</td>
<td></td>
</tr>
<tr>
<td>Macromolecular Science</td>
<td></td>
<td>Master of Science Doctor of Philosophy</td>
<td>Bachelor of Science in Engineering/Master of Science/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Management</td>
<td>Bachelor of Science in Management</td>
<td>Master of Science in Management/Doctor of Philosophy</td>
<td>Juris Doctor/Master of Business Administration/Doctor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Management Policy</td>
<td></td>
<td>Master of Business Administration</td>
<td>Juris Doctor/Master of Business Administration/Doctor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Management Technology</td>
<td></td>
<td>Master of Business Administration</td>
<td>Juris Doctor/Master of Business Administration/Doctor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Marketing</td>
<td></td>
<td>Master of Business Administration</td>
<td>Juris Doctor/Master of Business Administration/Doctor of Science/Master of Management/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Materials Science and Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science Doctor of Philosophy</td>
<td>Bachelor of Science in Engineering/Master of Science/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Bachelor of Arts/Master of Science in Mathematics</td>
<td>Master of Science Doctor of Philosophy</td>
<td>Bachelor of Science in Mathematics/Master of Science/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Mathematics and Physics</td>
<td>Bachelor of Science in Mathematics and Physics</td>
<td>Master of Science Doctor of Philosophy</td>
<td>Bachelor of Science in Mathematics/Master of Science/Bachelor of Science/Master of Business Administration</td>
</tr>
<tr>
<td>Field of Study</td>
<td>Undergraduate</td>
<td>Professional/Graduate</td>
<td>Combined</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science Doctor of Philosophy</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>Medicine</td>
<td>Doctor of Medicine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molecular Biology and Microbiology</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
<td></td>
</tr>
<tr>
<td>Molecular Nutrition</td>
<td>Master of Science Doctor of Philosophy</td>
<td>Doctor of Philosophy/Doctor of Medicine</td>
<td></td>
</tr>
<tr>
<td>Molecular Virology</td>
<td>Doctor of Philosophy</td>
<td>Doctor of Philosophy/Doctor of Medicine</td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td>Bachelor of Arts Bachelor of Music</td>
<td>Master of Music</td>
<td></td>
</tr>
<tr>
<td>Early Music</td>
<td>Master of Arts Doctor of Musical Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music Education</td>
<td>Bachelor of Science in Music Education</td>
<td>Master of Arts Doctor of Philosophy</td>
<td></td>
</tr>
<tr>
<td>Musicology</td>
<td>Doctor of Philosophy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music History</td>
<td>Master of Arts</td>
<td>Master of Arts/ Master of Nonprofit Organizations</td>
<td></td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neuroscience and Bioengineering</td>
<td>Doctor of Philosophy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Joint program with Cleveland Institute of Art.

b. Available only as a second major.

c. Joint program with Cleveland Institute of Music.

d. Includes dietetics.

e. See clinical (child) psychology, clinical (adult) psychology, developmental psychology, experimental psychology, and mental retardation research psychology.

f. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.

i. Degrees conferred jointly by the Mandel School of Applied Social Sciences and the Weatherhead School of Management.

j. Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.

k. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.

l. Joint 5-year Doctor of Medicine/Master of Science

m. Doctor of Dental Surgery degree available to currently enrolled students until May 2007.
<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonprofit Organizations</td>
<td></td>
<td>Master of Nonprofit Organizations&lt;sup&gt;i&lt;/sup&gt;</td>
<td>Master of Nonprofit Organizations&lt;sup&gt;i&lt;/sup&gt;/Juris Doctor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Master of Nonprofit Organizations&lt;sup&gt;i&lt;/sup&gt;/Master of Science in Social Administration</td>
</tr>
<tr>
<td>Nursing</td>
<td>Bachelor of Science in Nursing</td>
<td>Doctor of Philosophy&lt;br&gt;Doctor of Nursing&lt;br&gt;Master of Science in Nursing&lt;br&gt;(Clinical Nurse Specialist–Medical-Surgical Nursing Options: oncology, critical care Community Health Nursing&lt;br&gt;Option: infection control Gerontology Nursing Psychiatric/Mental Health Nursing; Nurse-Anesthesia Nurse-Midwifery Nurse Practitioner Acute Care Options: Flight Nursing and Cardio-Vascular Nurse Specialist Adult Family Neonatal Pediatric Psychiatric/Mental Health Gerontology Nursing Informatics)</td>
<td>Master of Science in Nursing/Master of Business Administration&lt;br&gt;Master of Science in Nursing/Master of Arts (Anthropology) Master of Science in Nursing/Master of Arts (Bioethics) Master of Science in Nursing/Master of Public Health</td>
</tr>
<tr>
<td>Nutrition</td>
<td>Bachelor of Arts&lt;sup&gt;d&lt;/sup&gt;&lt;br&gt;Bachelor of Science in Nutrition&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Master of Science&lt;sup&gt;d&lt;/sup&gt;&lt;br&gt;Doctor of Philosophy</td>
<td>Bachelor of Science in Nutrition/Master of Science&lt;br&gt;Doctor of Philosophy/Doctor of Medicine&lt;sup&gt;g&lt;/sup&gt; Master of Science/Doctor of Medicine&lt;sup&gt;l&lt;/sup&gt;</td>
</tr>
<tr>
<td>Nutritional Biochemistry and Metabolism</td>
<td>Bachelor of Arts&lt;br&gt;Bachelor of Science in Nutritional Biochemistry and Metabolism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operations Management</td>
<td></td>
<td>Master of Business Administration</td>
<td></td>
</tr>
<tr>
<td>Operations Research</td>
<td></td>
<td>Master of Business Administration&lt;br&gt;Master of Science in Management&lt;br&gt;Doctor of Philosophy</td>
<td></td>
</tr>
<tr>
<td>Organizational Behavior</td>
<td></td>
<td>Master of Business Administration&lt;br&gt;Doctor of Philosophy</td>
<td></td>
</tr>
<tr>
<td>Organization Development and Analysis</td>
<td></td>
<td>Master of Science</td>
<td></td>
</tr>
<tr>
<td>Pathology</td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Medicine/Doctor of Philosophy&lt;sup&gt;g&lt;/sup&gt;&lt;br&gt;Master of Science/Doctor of Medicine</td>
</tr>
<tr>
<td>Field of Study</td>
<td>Undergraduate</td>
<td>Professional/Graduate</td>
<td>Combined</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------</td>
<td>-----------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Pharmacology</td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Medicine/Doctor of Philosophy</td>
</tr>
<tr>
<td>Philosophy</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics</td>
<td>Bachelor of Arts, Bachelor of Science in Physics</td>
<td>Master of Science, Doctor of Philosophy</td>
<td>Bachelor of Science in Physics/Master of Science</td>
</tr>
<tr>
<td>Physiology</td>
<td></td>
<td>Master of Science</td>
<td></td>
</tr>
<tr>
<td>Physiology and Biophysics</td>
<td></td>
<td>Doctor of Philosophy</td>
<td></td>
</tr>
<tr>
<td>Political Science</td>
<td>Bachelor of Arts</td>
<td>Master of Arts, Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Arts, Master of Arts/Juris Doctor</td>
</tr>
<tr>
<td>Polymer Science and Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science in Engineering/Master of Science</td>
<td></td>
</tr>
<tr>
<td>Pre-Architecture</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>Bachelor of Arts</td>
<td>Master of Arts (Integrated Graduate Studies only), Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Arts, Master of Arts/Doctor of Philosophy (Anthropology)</td>
</tr>
<tr>
<td>Public Health</td>
<td></td>
<td>Master of Public Health</td>
<td>Master of Public Health/Master of Business Administration, Master of Public Health/Juris Doctor, Master of Public Health/Doctor of Medicine, Master of Public Health/Master of Science in Nursing (Infection Control), Master of Public Health/Master of Science (Anthropology), Master of Public Health/Doctor of Philosophy (Anthropology)</td>
</tr>
<tr>
<td>Public Health Nutrition</td>
<td></td>
<td>Master of Science</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Welfare</td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Master of Science in Social Administration/Doctor of Philosophy</td>
</tr>
<tr>
<td>Social Work</td>
<td></td>
<td>Master of Science in Social Administration</td>
<td>Master of Science in Social Administration/Juris Doctor, Master of Nonprofit Organizations/Master of Science in Social Administration, Master of Science in Social Administration/Master of Business Administration, Master of Science in Social Administration/Doctor of Philosophy</td>
</tr>
<tr>
<td>Sociology</td>
<td>Bachelor of Arts</td>
<td>Master of Arts (Integrated Graduate Studies only), Doctor of Philosophy</td>
<td>Bachelor of Arts/Master of Arts</td>
</tr>
</tbody>
</table>

a. Joint program with Cleveland Institute of Art.
b. Available only as a second major.
c. Joint program with Cleveland Institute of Music.
d. Includes dietetics.
e. See clinical (child) psychology, clinical (adult) psychology, developmental psychology, experimental psychology, and mental retardation research psychology.
g. The Medical Scientist Training Program.
h. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
i. Degrees conferred jointly by the Mandel School of Applied Social Sciences and the Weatherhead School of Management.
j. Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.
k. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
l. Joint 5-year Doctor of Medicine/Master of Science.
m. Doctor of Dental Surgery degree available to currently enrolled students until May 2007.
<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Arts/Master of Science</td>
</tr>
<tr>
<td>Statistics</td>
<td>Bachelor of Arts</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Arts in Statistics/Master of Science</td>
</tr>
<tr>
<td>Supply Chain Management</td>
<td></td>
<td>Master of Science in Management</td>
<td></td>
</tr>
<tr>
<td>Systems and Control Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
</tr>
<tr>
<td>Systems Integrated Physiology</td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Philosophy/Doctor of Medicine</td>
</tr>
<tr>
<td>Teacher Education(^a)</td>
<td>Bachelor of Arts</td>
<td>Master of Fine Arts</td>
<td></td>
</tr>
<tr>
<td>Theater Arts</td>
<td>Bachelor of Arts</td>
<td>Master of Fine Arts</td>
<td></td>
</tr>
<tr>
<td>Women's Studies(^b)</td>
<td>Bachelor of Arts</td>
<td>Master of Fine Arts</td>
<td></td>
</tr>
<tr>
<td>World Literature (English and French)</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
<td></td>
</tr>
</tbody>
</table>

- a. Joint program with Cleveland Institute of Art.
- b. Available only as a second major.
- c. Joint program with Cleveland Institute of Music.
- d. Includes dietetics.
- e. See clinical (child) psychology, clinical (adult) psychology, developmental psychology, experimental psychology, and mental retardation research psychology.
- g. The Medical Scientist Training Program.
- h. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
- i. Degrees conferred jointly by the Mandel School of Applied Social Sciences and the Weatherhead School of Management.
- j. Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.
- k. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
- l. Joint 5-year Doctor of Medicine/Master of Science
- m. Doctor of Dental Surgery degree available to currently enrolled students until May 2007.
Undergraduate Studies

PROGRAMS, REQUIREMENTS, AND REGULATIONS

Office of Undergraduate Studies
357 Sears Building
Phone 216-368-2928; Fax 216-368-4718
E-mail: UGStudies@case.edu
Web page: http://www.case.edu/provost/ugstudies/undstud.htm

ADMINISTRATION

Margaret B. Robinson, M.A. (State University of New York at Stony Brook)
Dean of Undergraduate Studies
Timothy M. Dodd, M.A. (Fordham University)
Associate Dean of Undergraduate Studies
Julie L. Amon, M.Ed. (Kent State University)
Assistant Dean for First Year Students
Joseph W. Pieri, M.S. (Northeastern University)
Assistant Dean of Undergraduate Studies
Claudia C. Anderson, B.A. (Youngstown State University)
Director of Advising and Evaluation for Off-Campus Study
Julie M. Petek, Ph.D. (Kent State University)
Director of Degree Audit and Data Services
Jane Buder-Shapiro, Ph.D. (Case Western Reserve University)
Health Professions Advisor
JoAnne Urban Jackson, J.D. (Northwestern University)
Pre-Law Advisor

Case Western Reserve University offers several baccalaureate programs jointly with the Cleveland Institute of Art, and the Cleveland Institute of Music. The faculties and administration are dedicated to offering educational programs that enable undergraduates to achieve disciplinary literacy in one or more major fields, to acquire educational breadth through study across the natural sciences, humanities and arts, and social sciences, and to learn to think critically and to communicate effectively. Furthering the university mission, the educational programs aim to foster the development of qualities of integrity, creativity, leadership, and societal engagement.

The bachelor's degree programs engage students in in-depth study in one field (the major), as well as general education or core requirements. Overlap among the general education and core curricula for the various bachelors' degree programs allows students flexibility and choice in the choice of majors and degree program. Foundational courses and seminars introduce students to modes of inquiry, thought, and communication in the natural sciences, humanities and arts, and social sciences.

Advisors for first year students, departmental advisors, other faculty, and deans assist students in selecting from approximately 60 alternative curricula and major concentrations a field of study suited to the students’ interests and qualifications. Highly motivated and responsible students whose educational and career goals are better served through an individualized course of study may pursue academic programs of their own design through a Dean's Approved Major.

Students with broad educational interests and goals may pursue concurrently two or more majors for the Bachelor of Arts degree, or may earn two bachelor's degrees, completing both a Bachelor of Arts degree and a Bachelor of Science degree, or fulfilling the requirements for two Bachelor of Science degrees. The Bachelor of Music degree may be combined with either a Bachelor of Arts or a Bachelor of Science degree. Qualified students who wish to accelerate their undergraduate and graduate or professional studies may earn the opportunity to begin in the senior year advanced study toward a graduate or professional degree.

The university provides undergraduates with a rich variety of experiential learning opportunities off campus as well as on campus and in University Circle. Programs that engage students in curriculum-related employment include the Cooperative Education Program, the Practicum Program, and internships. Junior Year Abroad, the Fisk University Semester and the Washington Semester immerse students in educational environments that build global and national knowledge and perspective. Research opportunities for undergraduates abound at the university, in University Circle institutions, and in Cleveland. Individual departments offer independent study opportunities to motivated and qualified students; some departments offer courses which incorporate practical field experience or community service. The location of the university in University Circle, with its outstanding array of cultural, educational, and health care institutions, and the proximity and accessibility of the University's various professional schools and their facilities enable undergraduates to draw upon diverse and distinctive resources to enrich their education.

DEGREE PROGRAMS

Case Western Reserve University offers a broad range of programs in the liberal arts and sciences, engineering, management, accountancy, and nursing leading to the Bachelor of Arts (B.A.), and the Bachelor of Science (B.S.) degrees. These programs provide depth through concen-
Bachelor of Science in:

- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Physics
- Fluid and Thermal Engineering Sciences
- Materials Science and Engineering
- Mechanical Engineering
- Polymer Science and Engineering
- Systems and Control Engineering
- Engineering (undesignated)

Bachelor of Arts

- Bachelor of Science in Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Physics
- Fluid and Thermal Engineering Sciences
- Materials Science and Engineering
- Mechanical Engineering
- Polymer Science and Engineering
- Systems and Control Engineering
- Engineering (undesignated)

The Bachelor of Music (B.M.) degree is offered through the Joint Program in Music of Case Western Reserve University and the Cleveland Institute of Music. Students who are candidates for the B.M. major fields:

- Aerospace Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Physics
- Fluid and Thermal Engineering Sciences
- Materials Science and Engineering
- Mechanical Engineering
- Polymer Science and Engineering
- Systems and Control Engineering
- Engineering (undesignated)

The B.A. is available in more than 40 degrees offered by the university.

Enroll in the Cleveland Institute of Music.

Students who are candidates for the B.M. and the Cleveland Institute of Music.

Music of Case Western Reserve University is offered through the Joint Program in Music of Case Western Reserve University and the Cleveland Institute of Music. Students who are candidates for the B.M. and the Cleveland Institute of Music.

The B.S. in Engineering is available in 13 major fields.

The Bachelor of Music (B.M.) degree is offered through the Joint Program in Music of Case Western Reserve University and the Cleveland Institute of Music. Students who are candidates for the B.M. and the Cleveland Institute of Music.

The B.A. is available in more than 40 degrees offered by the university.

Listed below are all the undergraduate degrees offered by the university.

Bachelor of Arts

Bachelor of Science in:

- Accounting
- Applied Mathematics
- Art Education
- Astronomy
- Biology
- Chemistry
- Computer Science
- Geological Sciences
- Management
- Mathematics
- Mathematics and Physics
- Music Education
- Nursing
- Nutrition
- Nutritional Biochemistry and Metabolism
- Physics
- Statistics
- Bachelor of Science in Engineering

Major fields:

- Aerospace Engineering

Every candidate for a baccalaureate degree from the university must:

1. Complete the English Composition Requirement, as described below. This is normally done in the first year.
2. As specified for the degree sought, complete a core curriculum or general education requirements which include courses to develop quantitative, analytical, and communication skills, and a heightened awareness of human values, cultures, and institutions.
3. Complete a course of studies with a cumulative grade point average of no less than 2.00 for work taken at Case Western Reserve University.
4. Earn in residence at Case Western Reserve University a minimum of 60 semester hours, including at least 30 hours after achieving senior status.
5. Complete two semesters of physical education. This is normally done in the first year through a combination of half and/or full semester offerings in Lifetime Sports Activities.

The English Composition Requirement, incorporated into the general education and core curricula for all baccalaureate degree programs, is normally completed in the first year of enrollment and must be met in one of the following ways:

1. Completion of ENGL 150, Expository Writing, with a grade of C or higher.
2. Achievement of a score of 4 or 5 on the College Board Advanced Placement Examination in English Language/Composition.
3. For transfer students, acceptance of transfer credit for ENGL 150 and then, either passing the English placement examination, or completing ENGL 180, Writing Tutorial, with a grade of C or higher.
4. For students participating in the Seminar Approach to General Education and Scholarship (SAGES) pilot program, compilation of a portfolio of graded writing from the First Seminar and the University Seminars that meets the “C” competence level described below.

Students who fail ENGL 150 will be required to repeat the course. Students who pass ENGL 150 with a grade of D or SAGES students whose writing portfolios are below the “C” competence level will be required to complete ENGL 180, Writing Tutorial (1 credit) with a grade of C or higher. ENGL 180 may be taken up to three times to achieve a C performance in English composition. On the basis of admission records or on the basis of the English placement examination for transfer students, students may be placed in ENGL 148, Introduction to Composition. Students placed in ENGL 148 must complete ENGL 148 with a grade of C or better in order to enroll in ENGL 150. A maximum of three hours of credit for ENGL 148 will count toward the requirements for a bachelor’s degree.

**Definition of “C” Competence in English Composition.**

“C” competence means that the student has demonstrated in the course of writing
7,000 words (an equivalent of 28 typed, double-spaced pages) that he or she can consistently produce an original paper which has, prior to revisions suggested by the instructor, the following characteristics: (1) Mechanics-The “C” paper is neat and free of repeated errors in spelling, verb, and pronoun form, agreement, sentence completion, punctuation, and capitalization. (2) Organization-The “C” paper clearly states a reasonably limited thesis on a subject appropriate to the assignment and continues to focus on the idea with some supporting detail (footnoted where necessary) and with transitions between sections that are clear, though not necessarily smooth. (3) Style-The “C” paper is generally clear and moderately concise, even though the word choice may be narrow and the emphasis awkward.

Physical Education Requirement

Two semesters of non-credit courses in physical education are required as part of all undergraduate curricula. Normally this requirement will be satisfied in the first year of enrollment and must be met by all undergraduate students unless waived by the chair of the Department of Physical Education or the Dean of Undergraduate Studies.

SAGES

A pilot program, the Seminar Approach to General Education and Scholarship (SAGES), inaugurated in fall 2002, enables some students to fulfill General Education or Core Curriculum Requirements with a sequence of specially developed seminars and a selection of courses. Students begin the program in the fall of the first undergraduate year with the First Seminar: The Life of the Mind, that focuses on critical thinking and communication (see below). In each subsequent semester of the first two years at the university, students participating in the pilot program enroll in three University Seminars in which specific topics selected by faculty become the focus for thinking about the natural world, or the symbolic world, or the social world. The First Seminar and each of the University Seminars incorporate the consideration of diversity, ethics, and information literacy. To fulfill the University’s English Composition Requirement, students in the SAGES pilot program submit portfolios of writing from the First Seminar and subsequent University Seminars. SAGES seminars and courses provide an alternate way to fulfill traditional general education and core requirements, as noted within the descriptions of the requirements for specific degrees.

USFS 100, First Seminar (4)

This four credit-hour course provides an introduction to various dimensions of academic life. It will be characterized by intense yet open-ended intellectual inquiry, guided by reading from primary as well as secondary sources, and will include practice in written and oral communication in small groups. Each seminar is led both by a faculty member and a writing co-instructor. The goals are to enhance basic intellectual skills of academic inquiry, such as critical reading, thoughtful analysis, and written and oral communication; to introduce basic information literacy skills; to provide a foundation for ethical decision-making; to encourage a global and multidisciplinary perspective on the learning process; to facilitate faculty-student interactions; and, in the most general sense, to provide a supportive common intellectual experience for first-year students at Case.

NOTE: In 2005, SAGES, incorporating modifications to the pilot program, will be implemented for all students entering Case in 2005 and thereafter. SAGES will provide a common foundation for all bachelor's degree programs. SAGES includes a series of three small, interdisciplinary seminars taken in the first and second years; a discipline-based seminar, usually in a student’s major field, taken in the third year; and a senior capstone experience. The first-year seminars give special emphasis to writing skills, information literacy, quantitative reasoning, and ethical decision-making. The discipline-based seminar incorporates writing that is specific to the discipline. The senior capstone experience culminates in a paper and presentation that incorporate acquired knowledge and demonstrate critical thinking and communication skills.

Requirements for Specific Degrees

Bachelor of Arts Degree

(College of Arts and Sciences)

Candidates for the Bachelor of Arts degree, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 120 semester hours earned.
   a) No more than 42 hours beyond the 100 level in any one department may be applied to the 120 hour total.
   b) The 120 semester hours must include at least 90 semester hours in arts and sciences. These credits may be drawn from those offered by the College of Arts and Sciences as well as those in economics, biochemistry, nutrition or computer science. (Students completing both a B.A. and B.S. degree are exempted from 6 hours of the 90 hour arts and sciences requirement for the B.A.)

2. The General Education Requirements of the College of Arts and Sciences or the SAGES pilot program.

3. A minimum of 30 semester hours of courses at the 300-400 level.

4. The requirements for a major as specified in this bulletin for each department or program. A major concentration requires a minimum of 30 semester hours, at least 24 of which are taken in the major department or program. For all courses taken in the major department and for which grades are averaged, and for all courses taken to satisfy major requirements and for which grades are averaged, a B.A. candidate must earn a minimum cumulative average of 2.00. Major requirements include all required and elective work completed in the major department combined with required courses completed in related fields. Transfer students must complete at
design may submit, before the end of the sophomore year, a program proposal to the Office of Undergraduate Studies for approval by the Deans’ Committee.

**BACHELOR OF SCIENCE DEGREE**

(College of Arts and Sciences)

Candidates for the Bachelor of Science degrees, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 120-134 hours as specified by the requirements for each B.S. program.
2. A minimum of 30 semester hours of courses at the 300-400 level.
3. The Arts and Sciences General Education Requirements or the SAGES pilot program. For some B.S. programs, the Arts and Sciences General Education Requirements have been modified and incorporated into the degree requirements as presented in this bulletin in the section devoted to each department or program.
4. The requirements for a major field as presented in this bulletin in the section devoted to each department or program. For all courses taken in the major department and for which grades are averaged, a candidate for a B.S. from the College of Arts and Sciences must earn a minimum cumulative average of 2.00. Major requirements include all required and elective work completed in the major department combined with required courses completed in related fields. Transfer students must complete at Case Western Reserve University at least half the hours required for the major.

Bachelor of Science degrees conferred by the College of Arts and Sciences are offered in the following fields:

- Applied Mathematics
- Art Education
- Astronomy
- Biochemistry
- Biology
- Chemistry
- Geological Sciences
- Mathematics
- Mathematics and Physics
- Music Education
- Nutrition
- Nutritional Biochemistry and Metabolism
- Physics
- Statistics

**ARTS AND SCIENCES GENERAL EDUCATION REQUIREMENTS**

General Education Requirements of the College of Arts and Sciences provide a broad educational foundation for programs in humanities and arts, social and behavioral sciences, and mathematics and natural sciences, leading to the Bachelor of Arts or the Bachelor of Science degree. The areas in which courses are required are indicated below. In some areas students must complete an approved two-course sequence. Courses that are approved to serve as the first course in a sequence or to meet the requirement for a single course in a specific area are shown in boldface. This information is subject to addition. An updated list that includes such courses as well as the approved two-course sequences is published annually in the Handbook for Undergraduate Students, and is available from the Office of Undergraduate Studies.

1. The English Composition Requirement as described above.
2. Natural and Mathematical Sciences (12 semester hours total) Students must complete at least three semester hours in area a) Mathematical Reasoning and Analysis, three semester hours in area b) Natural Sciences, and an additional course making an approved sequence in area a) or area b). The courses listed below fulfill the minimum three-hour requirement in each area, and also serve as first courses for two-course sequences. An updated list of approved two-course sequences is published annually in the Handbook for Undergraduate Students, and is available from the Office of Undergraduate Studies and on-line at http:
An additional course taken to fulfill the 12 hour requirement may come from area a), b), or c) Science and Society.

a) Mathematical Reasoning and Analysis (3 semester hours minimum): courses in which students engage in step-by-step reasoning and computation using mathematical methods for discovery and for solving problems

MATH 121* or 123* or 125* or 150
STAT 201* or ANTH 319* or PSCL 282*
PHIL 201

* a student completing successfully any one of these three courses is not eligible to enroll in or receive degree credit for either of the other two

b) Natural Sciences (3 semester hours minimum) courses that survey the identification, description, experimental investigation, and theoretical examination of physical or biological phenomena

ANTH 105
ASTR 201 or 202 or 204 or 205 or 221
Biol 114 or 214
CHEM 101 or 105 or 111
GEOL 101 or 110 or 115 or 117
PHYS 100 or 115* or 121* or 123*

* a student completing successfully any one of these three courses is not eligible to enroll in or receive degree credit for either of the other two

c) Science and Society (0-3 semester hours): courses that broadly examine the social/cultural aspects or implications of science and/or technology

ANTH 215, 317, 337, 363; BIOL 103; ECECS 342; ESTD 387; GEOL 105, 202; HSTY 151, 152, 201, 202, 227, 240, 395; PHIL 225, 309, 394; PHIL/RLGN 271; PHYS/PSCL 196; RLGN 206, 240

3. Arts and Humanities (12 semester hours total) Students must complete at least three semester hours in each of the areas below, and an additional three-hour course making an approved sequence in one of the areas. The courses listed below fulfill the minimum three-hour requirement in each area, and also serve as first courses for two-course sequences. An updated list of approved two-course sequences is published annually in the Handbook for Undergraduate Students, and is available from the Office of Undergraduate Studies and on-line at http://www.case.edu/provost/ugstudies/undstud.htm.

a) The Arts (3 semester hours minimum): courses which serve as an introduction to art, music, and theater

ARTH any 100 or 200 level course
MUSC 221 or MUSC 321 (for music/music education majors only)
THTR 123 or 124; THTR 121 or 122

b) History, Philosophy, and Religion (3 semester hours minimum): courses that cover historical change, philosophical or religious ideas and works, and the methods and concepts of these disciplines

AMST 117
CLSC 111 or 112 or 201
HSTY 112 or 113
PHIL 101 or 205
RLGN 102 or 201 or 202 or 203 or 204 or 207 or 208 or 223 or 254

b) History, Philosophy, and Religion (3 semester hours minimum): courses that cover historical change, philosophical or religious ideas and works, and the methods and concepts of these disciplines

AMST 117
CLSC 111 or 112 or 201
HSTY 112 or 113
PHIL 101 or 205
RLGN 102 or 201 or 202 or 203 or 204 or 207 or 208 or 223 or 254

4. Social Sciences (9 semester hours) Students must complete three semester hours in each area listed below, and an additional three-hour course making an approved sequence in one of the areas. The courses listed below fulfill the minimum three-hour requirement in each area, and also serve as first courses for two-course sequences. An updated list of approved two-course sequences is published annually in the Handbook for Undergraduate Students, and is available from the Office of Undergraduate Studies and on-line at http://www.case.edu/provost/ugstudies/undstud.htm. Of the 9 hours, no more than 6 may be from a single department.

a) Social Institutions (3 semester hours minimum): courses that introduce students to the methods and concepts in the social sciences relevant to the understanding of organizational or societal functioning

ANTH 102 or 103 or 107
COSI 228
ECON 102 or 103 or 205
MUSC 241 (for Music Education majors only)
PSCL 109 or 260
SOCI 113

b) Human Behavior and Development (3 semester hours minimum): courses that introduce students to the methods and concepts in the social sciences relevant to understanding individual or family functioning

ANTH 102
COSI 100 or COSI 109
PSCL 101
SOCI 112B or 310

5. Global and Cultural Diversity (3 semester hours) From approved courses designed to develop students’ awareness of their cultural assumptions and to expand their understanding of cultural issues, students must complete a three-hour course which focuses on a culture outside the United States and Europe or on ethnic or cultural differences and/or interactions within or outside the United States. ANTH 314, 322, 352, 353, 356, 357; ARTH 203; ASIA 235; COSI 260; ECON 335, 375; ENGL 363H, 365E, 365N, 365Q, 366G; FRCH 375; HSTY 113, 133, 134, 135, 232, 258, 260, 261, 262, 268, 282, 284, 285, 321; MUSC 337, 338; PHIL 356; POSC 362, 364, 366, 370K, 374, 377, 379; RLGN 204, 215, 217, 223, 254, 280, 303, 314; SOCI 302, 326; SPAN 303, 339, 342, 343; WLIT 225, 235, 245, 255, 345, 355, 363H, 365E, 365N, 365Q, 366G; any 200 or 300
3. A writing portfolio of graded papers
2. Three University Seminars, one in
1. First seminar: The Life of the Mind

by completing the following:

Sciences General Education Requirements, and no single
course may fulfill more than one require-
ment.

Students completing more than one
major, or completing a major and one or
more minors, classified under different
general headings (natural sciences and
mathematics, arts and humanities, social
sciences) are exempt from a maximum
of six semester hours of arts and sciences
general education requirements. Specifi-
cally, students who complete two majors
are exempt from six hours of general edu-
cation requirements in the area of one of
the majors or from three hours of general
education requirements in each of the ar-
eas of the two majors. Students complet-
ing a minor are exempted from six hours
of general education requirements in the
area of the minor.

SAGES and Arts and Sciences General
Education Requirements: Students in
the SAGES pilot program fulfill Arts and
Sciences General Education Requirements
by completing the following:

1. First seminar: The Life of the Mind
2. Three University Seminars, one in
each of the following categories:
   Thinking about the Natural World,
   Thinking about the Symbolic World,
   Thinking about the Social World
3. A writing portfolio of graded papers
   from the above seminars that demon-
   strates writing competency at the level
   established for the English Composi-
tion
4. Courses for disciplinary distribu-
tion (educational breadth), with two
courses selected from each of the fol-
lowing general areas: Natural Sciences
   and Mathematics, Humanities and
   Arts, Social Sciences
5. A Senior Capstone project

Note: The SAGES pilot program will be
replaced in 2005 by the SAGES pro-
gram adopted for implementation for all
bachelor’s degrees.

BACHELOR OF SCIENCE IN
ENGINEERING DEGREE

(Case School of Engineering)

Candidates for the Bachelor of Science in
Engineering (B.S.E.) degree, in addition
to meeting the general requirements for
bachelor’s degrees as described above,
must also complete the following require-
ments:

1. A minimum of 128-133 hours as
   specified by the requirements for each
   B.S.E. program.
2. The Engineering Core Curriculum.
3. The requirements for the specific
   engineering major as presented in this
   bulletin in the section devoted to each
   department or program.

Major Fields Available for the B.S.E.

Bachelor of Science in Engineering
degrees conferred by the Case School of
Engineering are offered in the following
fields:

Aerospace Engineering
Biomedical Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Engineering Physics
Fluid and Thermal Engineering
Sciences
Materials Science and Engineering
Mechanical Engineering
Polymer Science and Engineering
Systems and Control Engineering
Engineering (undesignated)

With the exceptions of engineering phys-
ics and the undesignated major in engi-
neering, all of the engineering programs
listed above are accredited by the Engi-
neering Accreditation Commission of the
Accreditation Board for Engineering and
Technology (ABET).

BACHELOR OF SCIENCE IN
COMPUTER SCIENCE DEGREE

(Case School of Engineering)

Candidates for the Bachelor of Science in
Computer Science degree, in addition
to meeting the general requirements for
bachelor’s degrees as described above,
must also complete the following require-
ments:

1. A minimum of 127 hours.
2. The Engineering Core Curriculum, with
   the exception of ENGR 200, ENGR 210 and ENGR 225
3. The requirements for the computer
   science major as presented in this
   bulletin.

ENGINEERING CORE CURRICULUM

The Engineering Core curriculum of
the Case School of Engineering provides
a foundation in mathematics and sci-
ences for programs in engineering and in
computer science leading to the Bachelor
of Science degree. The Engineering Core
Curriculum is also designed to develop
communication skills and to provide a
body of work in the humanities and social
sciences.

1. The English Composition Require-
ment (3 semester hours) as described
above.
2. Mathematics (14 semester hours):
   MATH 121, 122, 223, Calculus for
   Science and Engineering I, II, III, or
   equivalent;
   MATH 224, Elementary Differential
   Equations or equivalent or an
   approved course in Introduction to
   Dynamic Systems.
3. Chemistry (4 semester hours):
   CHEM 111, Principles of Chemistry
   for Engineers
4. Physics (8 semester hours): PHYS
   121, 122 General Physics I, II, or
   equivalent.
5. Engineering (18 semester hours):
   ENGR 131, Elementary Computer
   Programming:
ENGR 145, Chemistry of Materials;
ENGR 200, Statics and Strength of Materials;
ENGR 210, Introduction to Circuits and Instrumentation,
ENGR 225, Thermodynamics, Fluid Mechanics, and Heat and Mass Transfer.

**Note:** The chemistry-materials course sequences CHEM 105-106-ENGR 145, CHEM 105-106-EMSE 201, or CHEM 105-106-EMAC 276 may substitute for the sequence CHEM 111-ENGR 145.

6. Natural Science, Mathematics, or Statistics Requirement (3 semester hours) as designated by the major department.

7. Humanities and Social Sciences: 21 semester hours (usually 7 courses) in the humanities and social sciences, including:
   a) ENGL 398N, Professional Communication for Engineers (3 hours)
   b) An approved sequence of 9 hours (three courses) in a single department or program in the humanities or social sciences
   c) A minimum of 6 hours (two courses) in the social sciences and 6 hours (two courses) in the humanities, not including the Professional Communications course.

For students who choose to complete a minor, up to 12 hours of these 21 hours, excluding ENGL 398N, may be used towards fulfillment of the minor requirements.

Two semesters of beginning work in a foreign language may be counted toward satisfaction of the requirement for a three-course sequence only when the sequence consists of three courses taken in a single foreign language. Credit for the first semester of beginning study (101 level) in a foreign language will not serve toward satisfaction of any degree requirement unless credit is earned for the second semester (level 102) as well.

**Note:** Studio courses in art and music cannot serve toward the satisfaction of the humanities and social science requirement unless they are part of a sequence. A sequence including such work will normally require more than the three courses that ordinarily serve for this purpose and will require the approval of the sequence advisor in advance.

*Sequences have been classified as follows:

**Humanities:** Art History, Art Studio, Asian Studies, Chinese, Classics, Comparative Literature, English, French, German, History, History and Philosophy of Science and Technology, History of Technology and Science, Italian, Japanese, Music, Philosophy, Pre-Architecture, Religion, Russian, Spanish, and Theater Arts

**Social and Behavioral Sciences:** Anthropology, Communication Sciences, Economics, Gerontological Studies, Political Science, Psychology, and Sociology

For those humanities/social science sequences that are interdisciplinary (Artificial Intelligence, Environmental Studies, and Women's Studies), the program advisor shall assign a program to one category or the other on the basis of its content.

**SAGES and the Engineering Core:** The seminars and writing portfolio of the SAGES pilot program provide an alternate way for students pursuing the Bachelor of Science in Computer Science or the Bachelor of Science in Engineering degree to fulfill the English Composition Requirement and to fulfill the breadth portion of the Humanities/Social Science Requirement of the Engineering Core. For further information, consult the *Handbook for Undergraduate Students.*

**Bachelor of Science in Nursing Degree**

(Frances Payne Bolton School of Nursing)

Candidates for the Bachelor of Science in Nursing (B.S.N.) degree, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 124 hours.
2. The School of Nursing General Education Requirements or SAGES alternative.
3. A minimum of 50 semester hours of courses at the 300-400 level.
4. For all courses taken in nursing and science, a minimum grade of C.

**School of Nursing General Education Requirements**

The General Education Requirements of the Frances Payne Bolton School of Nursing are based upon the Arts and Sciences General Education Requirements, and provide a broad educational foundation for the Bachelor of Science in Nursing program.

1. The English Composition Requirement (3 semester hours) as described above.
2. Natural and Mathematical Sciences (17 semester hours total)
   a) Mathematical Reasoning and Analysis: STAT 201*, Basic Statistics I or ANTH 319* or PSCL 282*.
   * A student completing successfully any one of these three courses is not eligible to enroll in or receive degree credit for either of the other two
   b) Natural Sciences: BIOL 114-Principles of Biology, BIOL 115-Animal and Physiology for Health Sciences Students, BIOL 119 and BIOL 121-Concepts for a Molecular View of Biology I and II. (Natural Sciences requirements are under review in 2004-2005.)
3. Arts and Humanities (12 semester hours total) The requirement is the same as the Arts and Humanities requirement of the Arts and Sciences General Education Requirements (above), except that the courses need not form a sequence; the courses should all be selected from courses designated as first courses for a sequence if a sequence cannot be completed.
4. Social Sciences – Human Behavior and Development (6 semester hours total)
   a) PSCL 101-General Psychology or ANTH 102-Being Human; An Introduction to Social and Cultural Anthropology or SOCI 112B-Introduction to Sociology: Human Interaction
   b) SOCI 203 or an approved course in human growth and development
5. Global and Cultural Diversity (3 semester hours) The requirement is the same as the Global and Cultural Diversity requirement of the Arts and Sciences General Education Requirements
SAGES and Nursing General Education Requirements: Students in the SAGES pilot program fulfill Nursing General Education Requirements by completing the following:
   1. First seminar: The Life of the Mind
   2. Three University Seminars, one in each of the following categories: Thinking about the Natural World, Thinking about the Symbolic World, Thinking about the Social World
   3. A writing portfolio of graded papers from the above seminars that demonstrates writing competency at the level established for the English Composition
4. Courses for disciplinary distribution (educational breadth), with at least two courses selected from each of the following general areas: Natural Sciences and Mathematics (16 hours, as specified above), Humanities and Arts (6 hours), Social Sciences (6 hours, as specified above)
5. A Senior Capstone

For further information, consult the Handbook for Undergraduate Students.

BACHELOR OF SCIENCE DEGREE
(Weatherhead School of Management)
Candidates for the Bachelor of Science in Accounting and the Bachelor of Science in Management degrees, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:
1. A minimum of 122 hours.
2. The Weatherhead School of Management General Education Requirements or SAGES alternative.
3. A minimum of 30 semester hours of courses at the 300-400 level.
4. The requirements for a major field as presented in this bulletin in the section devoted to each department or program. For all courses taken in the major department and for which grades are averaged, and for all courses taken to satisfy major requirements and for which grades are averaged, a candidate for a B.S. from the Weatherhead School of Management must earn a minimum cumulative average of 2.00. Major requirements include all required and elective work completed in the major department combined with required courses completed in related fields. Transfer students must complete at Case Western Reserve University at least half the hours required for the major.

Bachelor of Science degrees conferred by the Weatherhead School of Management are offered in the following fields:
Accounting
Management

WEATHERHEAD SCHOOL OF MANAGEMENT GENERAL EDUCATION REQUIREMENTS

The Weatherhead School of Management General Education Requirements are based upon the Arts and Science General Education Requirements, and provide a broad educational foundation for programs in accounting and management, leading to the Bachelor of Science degree.
1. The English Composition Requirement (3 semester hours) as described above.
2. Natural and Mathematical Sciences (17 semester hours) In addition to the specified mathematics and statistics courses, students must complete at least one course in area b) Natural Science and an additional course from area b) to form a sequence or from area c) Science and Society.
   a) Mathematical Reasoning and Analysis: (11 semester hours): MATH 125-MATH 126 or equivalent courses in introductory calculus, and STAT 207- Statistics for Business and Management Science
   b) Natural Sciences: (minimum 3 semester hours) See Arts and Sciences General Education Requirements
   c) Science and Society: (0-3 semester hours) See Arts and Sciences General Education Requirements
3. Arts and Humanities (for accounting, 9 semester hours total; for management, 12 semester hours total) The requirement is the same as the Arts and Humanities requirement of the Arts and Sciences General Education Requirements (above), except that accounting majors are exempt from the 3-hour arts requirement.
4. Social Sciences (for accounting, 12 semester hours total; for management, 9 semester hours total)
   a) Social Institutions: (6 semester hours): ECON 102-Principles of Microeconomics and ECON 103-Principles of Macroeconomics;
   b) Human Behavior and Development: (3-6 semester hours) Management majors must complete one of the following: COSI 100 or 109 or 236 or PSCL 101 or SOCI 112. Accounting majors must complete two courses in this area: 1) COSI 100 or COSI 236, and 2) PSCL 101 or SOCI 112
5. Global and Cultural Diversity (3 semester hours) The requirement is the same as the Global and Cultural Diversity requirement of the Arts and Sciences General Education Requirements
SAGES and Weatherhead General Education Requirements: Students in the SAGES pilot program fulfill Weatherhead General Education Requirements by completing the following:

1. First Seminar: The Life of the Mind
2. Three University Seminars, one in each of the following categories: Thinking about the Natural World, Thinking about the Symbolic World, Thinking about the Social World
3. A writing portfolio of graded papers from the above seminars that demonstrates writing competency at the level established for the English Composition
4. Courses for disciplinary distribution (educational breadth), with at least two courses selected from each of the following general areas: Natural Sciences and Mathematics (17 hours, as specified above), Humanities and Arts (6 hours), Social Sciences (6 hours, excluding ECON 102, 103; accounting majors must include COSI 100 or 236)
5. A Senior Capstone project

For further information, consult the Handbook for Undergraduate Students and/or the Undergraduate Services Office of the Weatherhead School of Management.

DUAL UNDERGRADUATE DEGREE PROGRAMS

Undergraduates who wish to pursue study in two disciplines may combine degree programs. Possible combinations include:

1. Two different Bachelor of Science degrees. Examples of combinations are: computer engineering/electrical engineering, physics/music education, management/accounting
2. A Bachelor of Science degree and a Bachelor of Arts degree. Examples of combinations of majors are: computer science/English, chemical engineering/music, management/psychology
3. Either the B.A. or a B.S. and a Bachelor of Music (B.M.) degree offered in conjunction with the Cleveland Institute of Music.

To qualify for two degrees, students must meet the requirements of each degree, and complete a minimum of 30 semester hours of study beyond the requirement for one of the degrees. Such programs usually require a minimum of five years, but may be completed in four years by an unusually industrious and capable student.

Students completing both a B.A. and a B.S. degree are exempted from 6 hours of the 90 hour arts and sciences requirement for the B.A.

Students interested in pursuing any of the degree combinations listed above should consult the Office of Undergraduate Studies. Students who seek a dual degree program that involves the B.M. must meet admission requirements of the Cleveland Institute of Music.

MINORS

For the degrees described above, minors are not required. However, students have the option of completing a minor in a discipline other than the major, in addition to the major. A minor concentration normally requires 15-18 semester hours, and will be indicated on a student's transcript if the requirements, as outlined below, are fulfilled.

Minors for Students Majoring in Fields other than Engineering

1. A minor program shall consist of no fewer than 15 and no more than 18 semester hours of specified course work in a discipline other than the student's major.
2. The responsibility for designating the requirements for a minor shall lie with the department offering the minor.
3. With the exception of the humanities and social science requirement stated in section 4 below, no more than two courses taken for the minor may be used simultaneously to satisfy the requirements of the student's major field, including department requirements, technical electives, and the Engineering Core.
4. An engineering student who chooses to do so may, by taking work that goes beyond the requirement for a three-course sequence in the humanities or social sciences, complete a minor concentration in either of these areas, and count towards the minor up to 12 hours of humanities/social science courses that are also being counted towards the 21 hour humanities/social sciences requirement of the Engineering Core. For such a minor to be posted on a transcript, the student must earn a cumulative grade point average of 2.00 for all courses taken to satisfy minor requirements and for which grades are averaged.
Minor Concentrations
Accounting
American Studies
Anthropology
Art History
Artificial Intelligence
Art Studio
Asian Studies
Astronomy
Biology
Biomedical Engineering*
Chemical Engineering*
Chemistry
Childhood Studies
Chinese
Civil Engineering*
Classics (Greek/Latin)
Communication Sciences
Computer Engineering*
Computer Science (for B.A.)
Computer Science (for B.S.)*
Dance
Economics
Electrical Engineering*
Electronics (for B.A.)
English
Entrepreneurial Studies
Environmental Geology
Environmental Studies
Ethnic Studies
Finance
French
French Studies
Geological Sciences
German
German Studies
Gerontological Studies
History
History of Technology and Science
International Studies
Italian
Japanese
Judaic Studies
Management Information and Decision Systems
Materials Science and Engineering*
Mathematics
Music
Natural Sciences
Nutrition
Philosophy
Photography
Physical Education/Sports Medicine
Physics
Political Science
Pre-Architecture
Psychology
Public Policy
Religion
Russian
Sociology
Spanish
Statistics
Systems and Control Engineering*
Theater Arts
Women's Studies
World Literature
* minor based on Engineering Core

EXPERIENTIAL LEARNING

Inside and outside the classroom, Case offers undergraduates a variety of experiences that are an integral part of a Case education, and that are built on a process of guided inquiry, preparation, action and reflection. Many research, internship, and employment opportunities are aligned with academic programs. Linguistic and cultural immersion characterize the study abroad experience. Courses that incorporate community service or internships into the curriculum forge links between Case undergraduates and schools, neighborhoods, business, governmental and health care institutions in Cleveland and elsewhere.

Course-based Experiential Learning

In disciplines as diverse as psychology, journalism, engineering, Spanish, Russian, nursing, anthropology, history, and biology, Case students engage in experiential learning beyond the on-campus classrooms and laboratories. Experiences that form the basis for reflection and synthesis under the guidance of faculty include working with hospitalized children, designing engineering solutions for a problem presented by a municipality, interning at a local media outlet, tutoring in Cleveland's Hispanic community, gaining experience in public health clinics, studying history with “the city as classroom,” or collecting aquatic specimens from the ponds at the university's 389-acre farm.

INTERNATIONAL EXPERIENCE

Qualified students may participate in programs of study or practical experience that immerse them in the culture and language of another country. Up to 36 semester hours of credit may be granted for study as an exchange student at an established foreign university with which Case Western Reserve has an exchange program.

Global Engineering Exchange Program (GE3)

The Global Engineering Education Exchange (GE3) program enables qualified engineering and computer science students to receive up to 36 semester hours of academic credit for courses taken at selected engineering institutions and universities in Europe, Asia, Mexico, and Australia, and to have an internship experience in a foreign setting. The program is administered by the Institute for International Education in collaboration with an international consortium of engineering schools that includes Case. University students participating in exchange programs pay tuition to Case Western Reserve and maintain their student status during the period of the exchange. Information about the GE3 program is available from the study abroad advisor in the Office of Undergraduate Studies.

Bilateral Exchange Programs

Case Western Reserve University has bilateral exchange agreements enabling students from overseas institutions to attend Case as visiting students and permitting Case Undergraduates to receive academic credit for study at the following institutions:

- University of Lancaster, UK (all majors)
- University of Manchester, UK (humanities, social sciences)
- University of Sheffield, UK (all majors)
- University of Sydney, Australia (management, accounting, economics, sociology, political science)
- ESC de Montpellier, France (management, accounting)
- University of Frankfurt, Germany (management, accounting)
Case undergraduates participating in exchange programs pay tuition to Case Western Reserve University and maintain their student status during the period of the exchange. Information about bilateral exchange programs with other overseas universities is available from the study abroad advisor in the Office of Undergraduate Studies.

**Junior Year Abroad**

Full-time undergraduate students who have earned a 3.0 grade point average at the university are eligible to apply for the Junior Year Abroad. Up to 36 semester hours of credit may be granted for study at an established foreign university or for approved foreign study programs offered through accredited American universities. The selection of location and institution for study abroad is made in consultation with a study abroad advisor in the Office of Undergraduate Studies and the student's major advisor. A fee is charged for participation in the Junior Year Abroad program (see schedule of fees). Financial aid may be applied to the Junior Year Abroad.

In recent years, Case Western Reserve University undergraduates have studied in Australia, Austria, Chile, Denmark, England, France, Germany, Israel, Italy, Japan, Kenya, New Zealand, Russia, Scotland, South Africa, and Spain.

**Case Courses**

Some Case courses incorporate short-term overseas experience into the curriculum. For example, summer courses take language students to France and Germany; a summer chemical engineering laboratory course is based at University College London; and the nursing senior capstone experience includes overseas options for clinical placement. The summer engineering exchange program of the School of Engineering and Waseda University, Japan, pairs Case and Waseda students in study and work environments.

**RESEARCH EXPERIENCE**

**Independent Study and Honors**

Most departments offer courses in independent study to their qualified majors. These are advanced level courses and require departmental approval. Students pursuing research under the guidance of a faculty member may register for “Undergraduate Research” and receive degree credit. A number of departments offer outstanding upperclassmen the opportunity to follow an honors program by pursuing independent research and special study in seminars. Those who qualify receive the bachelor’s degree “with departmental honors.”

**Research at Case and in University Circle**

Undergraduate research experience enables students to start from a base of established knowledge to formulate research questions, acquire skills in information collection and analysis, develop hypotheses and conclusions from the information gathered, share ideas with research colleagues, and experience both the exhilaration and frustration that accompany intellectual exploration and persistence. The departments and schools of Case and many of its neighboring University Circle institutions provide numerous and diverse opportunities for undergraduates to work on research projects independently or as a member of a research team. To identify research opportunities appropriate to their skills and abilities, undergraduates should consult the Directory of Undergraduate Research and Independent Study Opportunities, advisors and faculty in the schools of the university, in the Office of Undergraduate Studies, and in the Career Center. In University Circle, the Cleveland Museum of Art, the Cleveland Museum of Natural History, the Western Reserve Historical Society are rich in resources for undergraduate research.

**Research beyond Case and University Circle**

Collaborative research efforts of Case faculty with researchers at other institutions such as NASA or the Cleveland Clinic often include Case undergraduates in the research teams. Case students are encouraged to pursue summer research opportunities at national laboratories, on other university campuses, in independent research organizations, and in national and international organizations. Among recent off-campus summer research placements for undergraduates are the World Health Organization (Geneva), National Institutes of Health (Washington), NASA, University of Wisconsin, Los Alamos National Laboratory, the Center for the Study of Non-Proliferation (California), and the Federal Bureau of Investigation Honors Internship Program.

**WORK EXPERIENCE IN THE PUBLIC AND PRIVATE SECTORS**

**Community Service and Service Learning**

Learning through community service, an important component of the university’s educational programs, is facilitated by the Office of Student Community Service (OSCS). OSCS promotes, provides and supports learning opportunities for Case Western Reserve University students in the form of service that is beneficial to the community. Community service is incorporated into selected courses that engage students in tutoring and helping relationships with children, adolescents, and older adults in Cleveland’s diverse ethnic communities, schools, and health-care settings. A first year engineering design class engages students in various projects that benefit community agencies. Volunteer service in social service and health care agencies in Montreal during spring break is the focus of a service learning course in French.

CWRUCorps, an Americorps National Service program, is the university’s most comprehensive service opportunity. This full-time summer program calls for a strong commitment to meeting critical
community needs in one of five tracks: health, literacy, environment, arts, and technology. Americorps members acquire valuable experience in leadership and collaboration as they work in teams with various community partner organizations. While education is the underlying component of all CWRUCorps projects, the program involves an intense and diverse range of activities and learning opportunities.

During the academic year, through Project STEP-UP (Student Tutoring Effort to Promote Utilization of Potential), Case students provide tutoring and mentoring services to at-risk youth who attend Cleveland public schools. Another program in which students can take a leadership role is “Gettin’ on the Six,” which promotes community service along the bus routes emanating from University Circle.

All OSCS-sponsored programs enable eligible students to utilize federal Work-Study for community service.

Cooperative Education

Cooperative Education (Co-op) is a formalized academic program that enables students to alternate classroom studies with career-based experiences in industry. It is a learning experience designed to integrate classroom theory with practical experience and professional development. The Co-op Program is available to both undergraduate and graduate students. The undergraduate Co-op Program is available to full-time students in the engineering, science, and business disciplines. Through the Co-op Program, students acquire positions in various organizations and gain a better understanding of career objectives and academic goals.

Co-op assignments are full-time work experiences that alternate with coursework. Students are encouraged to complete two seven-month co-op periods, consisting of a summer and contiguous spring or fall semester. Employers prefer seven month assignments as the duration allows students to become involved with challenging projects related to their field of study. While the co-op experience is voluntary and non-credit, it may lead to credit for engineering senior projects with approval from the student's major department.

Students are eligible to co-op after the sophomore year, although schedules vary among departments. Binary and transfer students must complete at least one semester of coursework at the university prior to admission to the Co-op Program. The Co-op Program does not involve any additional coursework, but merely rearranges the academic course load. One faculty member in each participating department serves as the co-op advisor and provides details regarding the optimal semesters students are eligible to be on co-op assignment.

More than 450 employers throughout the United States have expressed interest in participating in the Co-op Program and offer challenging assignments that can lead to offers for permanent employment upon graduation. Generally, organizations pay co-op students approximately two-thirds of the starting salary of a new graduate. In addition to the financial compensation that students receive while on co-op assignment, students often benefit from the higher starting salaries and greater lifetime earnings that can result from the experience acquired from co-op assignments.

Prior to obtaining a co-op position, students are assisted with identifying organizations of interest, designing a professional resume, and refining interviewing skills. The Co-op Program staff will arrange interviews for students with a variety of organizations.

A student who secures a co-op assignment must register for the non-credit Cooperative Education course which will appear on the student's academic transcript. Registration for Co-op maintains the student's full-time student status. During the period of the co-op assignment, repayment of student loans is deferred. Academic scholarships are also deferred until the student returns to campus and enrolls for classes. The Co-op Program staff provides assistance with registration, financial aid, housing, and health services for all co-op students. The Co-op Program is housed in the Case School of Engineering and is accredited by the Accreditation Council for Cooperative Education.

Practicum Program

The Practicum Program allows students pursuing majors in the College of Arts and Sciences or in the Weatherhead School of Management to include a workplace experience in their undergraduate program. The primary goal of the practicum is the intellectual, personal and professional growth of students in areas related to their academic goals. The practicum provides the student with new skills, insights and experiences that are transferable to the academic setting and/or a future position in the workplace. A practicum is a planned, structured, supervised workplace experience at an approved site and is generally a paid opportunity.

The Practicum Program is an experiential learning arrangement among the student, the employer and the practicum advisor in conjunction with the Career Center. Employers provide appropriate supervision and work related learning. The practicum advisor guides and evaluates the student's experience. All practica developed through the Career Center must be taken for transcript notation and have a faculty member serve as a Practicum Advisor. Students who elect to work in an internship/practicum without enrolling in the course for academic notation will not have the benefits of a full-time student status nor will they be supported by the Practicum Program in any official capacity.

Students are eligible to participate in the practicum program when they have successfully completed 60 credit hours at Case Western Reserve or 30 credit hours for students who entered as transfer students (typically, at the end of the sophomore year). Applicants should have a minimum GPA of 2.0 and be a full-time student. To participate in the program students apply to the Career Center in the semester preceding the work assignment.

A student who has completed all graduation requirements is not eligible for a practicum.
Academic year practica consist of a full-time work assignments for a minimum of fourteen weeks (or equivalent), which falls within an academic semester. Normally, no more than two semester-long practica may be completed by a student. A student doing two practica must spend at least one intervening semester in residence at the university. Students are required to complete pre-practicum assignments as well as develop a Learning Agreement with the student’s practicum advisor. All requirements must be met no later than the last day of final exams during the practicum course.

Students who are engaged in a practicum during the academic year will register for a non-credit practicum course (PRAC 001, PRAC 002 or MGMT 001, MGMT 002). In general, this course will be the primary academic activity of the student. Registration in these courses will maintain full-time student status for purposes such as student loan repayment, maintenance of health insurance, on campus residence and visa status.

The Practicum Program is managed by the Career Center in coordination with academic departments. The practicum of each student will be guided by a faculty member and Career Center career counselor. At the completion of the practicum, the practicum advisor will determine whether the student has satisfactorily completed the experience and will submit a grade of Pass or No Pass. Satisfactory completion is based on an assessment of the completion of all pre- and post-practicum requirements, fulfillment of the requirements set forth in the individualized Learning Agreement and adequate performance in the workplace.

Washington Center Program

Students receive up to 15 hours of credit for work supervised by the Washington Center. The emphasis is on practical experience in the form of a full-time internship (WASH 002A), which provides the opportunity for intensive research and the development of a portfolio (WASH 002B) in the student’s area of major interest. In addition, students participate in a seminar and attend a weekly lecture/discussion group (WASH 002C). The credits earned can be counted as general electives or applied to a student’s major or minor, with the prior consent of the individual department(s).

The Washington Center also offers a variety of academic seminars and symposia during the summer for which credit can be earned.

Students make application through the Department of Political Science. Applications also must have the approval of the Dean of Undergraduate Studies and the student’s major advisor. To be eligible for participation in either program a student must:

1. Be ranked as a junior or first-semester senior in the semester of enrollment in the program.
2. Have completed the Arts and Sciences General Education Requirements before enrollment. (Some exceptions may be made for a student enrolling in the program in the first semester of the junior year.)
3. Have earned a cumulative grade point average of 3.0 or better.

COLLABORATIVE PROGRAMS WITH OTHER COLLEGES

The Binary (3-2) Program in Engineering

Superior students who begin their academic careers at liberal arts colleges and fulfill the required mathematics and science courses may apply for admission to the Binary (3-2) Program. The Binary (3-2) Program assures liberal arts students a smooth transition into engineering programs and selected science programs (astronomy and biochemistry) at Case Western Reserve University. The combination of a liberal arts education—mathematics, science, humanities and social science—followed by a professional orientation in engineering gives the binary student a unique preparation for a career.

Binary applications should be submitted during the junior year. Binary students enter Case Western Reserve University at the end of their junior year as third-year engineering students. After completing the engineering degree requirements, the students are awarded a baccalaureate degree from their liberal arts college and a Bachelor of Science in Engineering from Case Western Reserve University. This dual-degree program normally requires three years of study at the liberal arts college and two years at Case Western Reserve University.

Academic Guidelines

Binary students normally complete 90 semester hours or 135 quarter credit hours in the first three years at a liberal arts institution.

Specifically, these courses should include the following:

1. Mathematics: Courses equivalent to two years of mathematics, i.e., MATH 121, 122, Calculus for Science and Engineering I, II; MATH 223, Calculus for Science and Engineering III; and MATH 224, Elementary Differential Equations.
2. Physics: Courses equivalent to one-and-one-half years of physics, i.e., PHYS 121, Mechanics, with laboratory; and PHYS 122, Electricity and Magnetism, with laboratory.
3. Chemistry: Courses equivalent to one year of chemistry, i.e., CHEM 105, 106 States of Matter, Atomic and Molecular Structure, Thermodynamic Equilibrium and Kinetics.
4. Computer Programming: Courses covering subjects of elementary programming with a laboratory for the development of programming skills in C++ (ENGR 131).
5. Natural Science, Mathematics, or Statistics course, as designated by major department for major student intends to pursue at Case Western Reserve University.
6. Humanities and Social Sciences: Binary students are required to fulfill the humanities/social science requirements of their liberal arts college, which must total at least 21 semester hours.
7. English Composition: Binary students who have met the English composi-
tion requirement of their college are exempt from the ENGL 150 competency requirement.

8. Physical Education: Binary students who have met the physical education requirement of their college are exempt from the Case Western Reserve physical education requirement.

Students may complete courses in one of the basic engineering science areas that will provide background to their studies at Case Western Reserve University. These courses should have the approval of the liaison officer and the director of the Binary Program.

Students who satisfactorily complete three years at the liberal arts institution with an overall 3.00/4.00 average, a 3.00/4.00 in mathematics and science courses, and who are recommended by their liaison officer will be admitted to the third year of the appropriate curriculum and can expect to complete their degree work in approximately two years.

Participating Colleges

Colleges and universities participating in the Binary Program in Engineering with Case Western Reserve University are:

- Albion College, Albion, Michigan
- Allegheny College, Meadville, Pennsylvania
- Baldwin-Wallace College, Berea, Ohio
- Bates College, Lewiston, Maine
- Bethany College, Bethany, West Virginia
- Bethel College, St. Paul, Minnesota
- Capital University, Columbus, Ohio
- Carthage College, Kenosha, Wisconsin
- Centenary College of Louisiana, Shreveport, Louisiana
- Clarion University, Clarion, Pennsylvania
- Colby College, Waterville, Maine
- College of Charleston, Charleston, South Carolina
- College of William and Mary, Williamsburg, Virginia
- College of Wooster, Wooster, Ohio
- Denison University, Granville, Ohio
- DePauw University, Greencastle, Indiana
- Dickinson College, Carlisle, Pennsylvania
- Duquesne University, Pittsburgh, Pennsylvania
- Earlham College, Richmond, Indiana
- Edinboro University, Edinboro, Pennsylvania
- Fordham University, Bronx, New York
- Franklin and Marshall College, Lancaster, Pennsylvania
- Goshen College, Goshen, Indiana
- Heidelberg College, Tiffin, Ohio
- Hiram College, Hiram, Ohio
- Hope College, Holland, Michigan
- Illinois Wesleyan University, Bloomington, Illinois
- John Carroll University, University Heights, Ohio
- Kenyon College, Gambier, Ohio
- Lebanon Valley College, Annville, Pennsylvania
- Marietta College, Marietta, Ohio
- Miami University, Oxford, Ohio
- Monmouth College, Monmouth, Illinois
- Muskingum College, New Concord, Ohio
- North Park College, Chicago, Illinois
- Notre Dame College, South Euclid, Ohio
- Oberlin College, Oberlin, Ohio
- Ohio Wesleyan University, Delaware, Ohio
- Otterbein College, Westerville, Ohio
- Rollins College, Winter Park, Florida
- State University of New York, Brockport, New York
- State University of New York, Cortland, New York
- State University of New York, Fredonia, New York
- State University of New York, Geneseo, New York
- Suffolk University, Boston, Massachusetts
- Texas Wesleyan College, Fort Worth, Texas
- Thiel College, Greenville, Pennsylvania
- Universidad Catolica De Puerto Rico, Ponce, Puerto Rico
- Washington and Jefferson College, Washington, Pennsylvania
- Waynesburg College, Waynesburg, Pennsylvania
- Western Illinois University, Macomb, Illinois
- Westminster College, New Wilmington, Pennsylvania
- Wheaton College, Wheaton, Illinois
- Wheeling College, Wheeling, West Virginia
- Whittier College, Whittier, California
- Wittenberg University, Springfield, Ohio
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts
- Williams College, Williamstown, Massachusetts

Cross Registration in Northeast Ohio

If approved by the Office of Undergraduate Studies, full-time undergraduates in good academic standing may cross-register through the Northeast Ohio Council on Higher Education (NEOCH) program at Baldwin-Wallace College, the Cleveland Institute of Art, Cleveland State University, and Cleveland State University. Case students who participate in the Case-Fisk Exchange pay tuition to Case, pay the Fisk room and board fees, and maintain their student status during the period of the exchange. Information about the exchange program is available from the exchanges advisor in the Office of Undergraduate Studies.

Joint Program in Art Education

The Joint Program in Art Education of Case Western Reserve University and the Cleveland Institute of Art (CIA) enrolls students pursuing the B.S. in Art Education in a program that combines studio art courses at the Cleveland Institute of Art with liberal arts and education courses at Case. Admission to the program requires application to Case and presentation of an art portfolio to the Cleveland Institute of Music, Cleveland State University, Cuyahoga Community College, David Myers College, Hiram College, John Carroll University, Lake Erie College, Lakeland Community College, Lorain County Community College, Notre Dame College of Ohio, and Ursuline College for one course per semester. Approval is normally limited to courses that are not offered at Case Western Reserve University. To cross-register at the Cleveland Institute of Art, a student must have permission from the University's Director of Art Studies.

Fisk University Exchange Program

An exchange program between Fisk University and Case Western Reserve University enables up to four Case students to spend a semester as visiting students at Fisk each year. Up to four Fisk students may spend a semester at Case each year. Fisk University was founded in 1866 as the first integrated, coeducational school in the United States, and at its founding focused on providing a quality liberal arts education to the children of former slaves. Fisk University has a distinguished history as a liberal art institution. Fisk University was the first historically black college to have chapters of the national honorary societies of Phi Beta Kappa and Mortar Board.

Case students who participate in the Case-Fisk Exchange pay tuition to Case, pay the Fisk room and board fees, and maintain their student status during the period of the exchange. Information about the exchange program is available from the exchanges advisor in the Office of Undergraduate Studies.

Joint Program in Art Education

The Joint Program in Art Education of Case Western Reserve University and the Cleveland Institute of Art (CIA) enrolls students pursuing the B.S. in Art Education in a program that combines studio art courses at the Cleveland Institute of Art with liberal arts and education courses at Case. Admission to the program requires application to Case and presentation of an art portfolio to the Cleveland Institute of Art.
Institute of Art; credentials must be acceptable to both institutions. For program details, see the section on Art Education in this bulletin.

Joint Program in Music

All programs in music are conducted jointly by Case Western Reserve University and The Cleveland Institute of Music, and provide the intimacy and specialization of a professional conservatory, together with the resources of a comprehensive university. Students pursuing a major in music or music education take music theory and lessons at The Cleveland Institute of Music, and take music history and other liberal arts and music education courses at Case. Students pursuing the B.A. with a major in music, or the B.S., in Music Education apply to and enroll in Case Western Reserve University, while students seeking the B.M. degree apply to and enroll in The Cleveland Institute of Music. For program details, see the Department of Music section in this bulletin.

Joint Program in Teacher Licensure

Ohio teacher licensure may be attained by those undergraduate students who complete the approved curriculum of the Case Western Reserve University/John Carroll University Joint Program in Teacher Licensure. Adolescence/Young Adult Teacher Licensure is available in Integrated Language Arts (English major), Integrated Social Studies (history major), Integrated Mathematics (mathematics major), Life Sciences (biology major), and Physical Sciences (chemistry or physics major). Multi-age licensure is available in French. The program requires 35 credit hours in professional education: 12 taken at Case Western Reserve University and 23 taken at John Carroll University. For program details, see section on Education in this bulletin.

The undergraduate/graduate programs in art education and music education, and the graduate program in speech-language pathology meet the requirements for teacher licensure, grades pre-K-12. For further information, see departmental information in this bulletin for art history and art, music, and communication sciences.

Reserve Officer Training Corps (ROTC)

Reserve Officer Training Corps (ROTC) programs are available to Case Western Reserve University students through cooperative arrangements with the University of Akron, for Air Force ROTC, and with John Carroll University, for Army ROTC. Each of these universities offers military studies, leadership and training courses. Participating students do not receive academic credit at Case Western Reserve for these courses, but may be exempted from the undergraduate physical education requirement. Students who are not recipients of ROTC scholarships may enroll in the first and second year ROTC courses without incurring any military obligation. University students enrolling in ROTC programs are eligible to compete for ROTC scholarships awarded by the Air Force or the Army. See section on Financial Aid for scholarship information.

Air Force ROTC

The Air Force Reserve Officer Training Corps (AFROTC) program provided by the University of Akron prepares students for service as officers in the United States Air Force. Through courses in history, management, and leadership, and through practical training, students acquire leadership and management skills, and learn about Air Force career opportunities, the role of the military in American society, the history of air power, and national defense policy.

An agreement between Case Western Reserve University and the University of Akron allows full-time Case Western Reserve students to complete aerospace studies courses. The courses are held at the University of Akron, which is approximately 30 miles from Case, and are usually scheduled on one or two afternoons during the week. This arrangement allows Case Western Reserve students to participate in either the four-year or two-year AFROTC program. Students wanting to enter the two-year program in the junior year must contact the professor of aerospace studies before March of the year before their planned entry.

Air Force ROTC scholarships are available on a competitive basis. Information about courses, registration, and scholarships may be obtained from the Department of Aerospace Studies, 9 Schrank Hall South, the University of Akron, Akron, Ohio 44325-0009; telephone: (330) 972-7653.

Army ROTC

The Army ROTC program is designed to prepare young college men and women for service as a commissioned Army officer in either the active duty U.S. Army or the reserve components of the Army Reserve or National Guard. Classes and practical training focus on military skills, officer professionalism, leadership training, and the development of military-related officer and management techniques and procedures.

Students may enroll in Army ROTC classes through cross-registration in the Department of Military Science at John Carroll University, which is approximately five miles from Case Western Reserve. Military science classes are taught at John Carroll University, with some activities also taking place at Cleveland State University or at Case Western Reserve.

Army ROTC scholarships are available on a competitive basis. Information about courses, registration, and scholarships may be obtained from the Department of Military Science (ARMY-ROTIC), John Carroll University, University Heights, OH 44118-4581; telephone: (216) 397-4421.

ACADEMIC ADVISING

Academic advising is an important component of the educational program at Case Western Reserve University. Academic advisors assist students in the exploration of academic opportunities at the university, and in the selection of courses. Advisors may refer students to other sources of information and assistance at the university. Students are expected to initiate and maintain regular contact with
their advisors to address the student’s curricular and career concerns, and to review progress towards graduation. Students are responsible for obtaining required permissions and approvals relating to registration, major and minor declaration, and graduation.

Advisors of First Year Students

All first-year students are assigned a faculty member or administrator who will assist them as they plan a course of study. First year students are encouraged to consult with their advisors about academic options, university rules and regulations, meeting effectively the challenges of college work, and study in graduate or professional school. First year students in the SAGES pilot program are advised throughout their first year by their First Seminar instructor.

Departmental Advisors

Students are encouraged to select a major at the end of their first year. Transfer students are encouraged to select a major as soon as possible after matriculation. When formally declaring a major (and/or minor), a student will visit with the department chairperson or academic representative who will assign the student a faculty departmental advisor. Students with declared majors and minors should meet regularly with their departmental advisors to ensure that they are making satisfactory progress toward graduation and are being made aware of academic and professional opportunities in their field of study.

Advising in the Office of Undergraduate Studies

The deans and advisors in the Office of Undergraduate Studies are available to answer student and faculty questions about university rules, practices, programs, and resources and to meet with students who are interested in study abroad, accelerated undergraduate to graduate and professional school programs, academic awards, and fellowship and scholarship opportunities. All students who have not declared a major should consult with their first year advisor or with one of the advisors in the Office of Undergraduate Studies for advising and schedule approval.

Pre-Professional and Special Program Advisors

Students planning to study at the graduate or professional school level or who are interested in special undergraduate programs at the university are urged to consult the appropriate advisor. Please refer to the Handbook for Undergraduate Students for the listing of pre-professional and special program advisors.

ACADEMIC REGULATIONS

All academic regulations governing undergraduates are administered by the Office of Undergraduate Studies. Academic regulations are subject to change by action of the University Undergraduate Faculty and the various committees responsible for the oversight of curriculum and academic standing. For the latest information consult the student handbook.

When circumstances so warrant, a student may submit to the Office of Undergraduate Studies a petition to waive a specific regulation or requirement.

ACADEMIC INTEGRITY

Students, faculty, and administrators share responsibility for the determination and preservation of standards of academic integrity. Not only must they adhere to their own personal codes of integrity but they must also be prepared to educate others about the importance of academic integrity, to take reasonable precaution to discourage violations of academic integrity, and to adjudicate violations.

For students, education about the importance of academic integrity begins during the admissions process. The centrality of integrity to the academic enterprise is reinforced during new student orientation when students engage in discussion about academic integrity. Specific mention of academic integrity and course-specific guidelines should be presented in all classes. Programs and instruction about academic integrity guidelines also should be offered throughout the students' undergraduate career.

Faculty and students are expected to uphold standards of academic integrity by taking reasonable precaution in the academic arena. Reasonable precaution involves implementing measures that reduce the opportunities for academic misconduct but do not inhibit inquiry, create disruption or distraction in the testing environment, or create an atmosphere of mistrust.

The vitality of academic integrity is dependent upon the willingness of community members to confront instances of suspected wrongdoing. Faculty have specific responsibility to address suspected or reported violations as indicated below. All other members of the academic community are expected to report directly and confidentially their suspicion of violation to a faculty member or a dean or to approach suspected violators and to remind them of their obligation to uphold standards of academic integrity.

Academic Integrity Violations

All forms of academic dishonesty including cheating, plagiarism, misrepresentation, and obstruction are violations of academic integrity standards. Cheating includes copying from another’s work, falsifying problem solutions or laboratory reports, or using unauthorized sources, notes or computer programs. Plagiarism includes the presentation, without proper attribution, of another’s words or ideas from printed or electronic sources. It is also plagiarism to submit, without the instructor’s consent, an assignment in one class previously submitted in another. Misrepresentation includes forgery of official academic documents, the presentation of altered or falsified documents or testimony to a university office or official, taking an exam for another student, or lying about personal circumstances to postpone tests or assignments. Obstruction occurs when a student engages in unreasonable conduct that interferes with another’s ability to conduct scholarly activity. Destroying a student’s computer
file, stealing a student's notebook, and stealing a book on reserve in the library are examples of obstruction.

If a faculty member suspects that an undergraduate student has violated academic integrity standards, the faculty member shall advise the student and the departmental chair and consult with the Dean of Undergraduate Studies about the appropriate course of action. Before speaking with the student, the faculty member also may choose to consult with the chair or dean about academic integrity standards. If the faculty member, in consultation with the dean, determines that the evidence is not adequate to charge the student with a violation, the matter will be dropped. Otherwise, the following procedures will be followed:

First Violations. If the faculty member and the student agree that a violation has occurred, and the violation is determined to be a first violation (the university has no record of previous violations by the student of the university's Standards of Conduct), the faculty member shall choose either to sanction the student or to refer the case to the Academic Integrity Board. If the faculty member chooses to sanction the student, the minimum sanction is failure in the work in question and the maximum sanction is failure in the course. In such cases, the faculty member will be provided with a standard reporting form to be signed by both the student and faculty member.

However, the case will be referred to the assistant vice president for student affairs for integrity board action if either:

1. the student claims not to have violated academic integrity standards or the student disagrees with the sanction imposed by the professor;
2. the faculty member feels that the seriousness of the first offense warrants presentation to the academic integrity board; or
3. the faculty member, after consultation with the dean, prefers to have the academic integrity board investigate or adjudicate the alleged violation, or prefers that the board sanction the student.

The signed report form from a faculty member or the finding of responsibility by the academic integrity board will become part of the student's university judicial file. Students found responsible for a first violation will be required, in addition to any other sanctions imposed, to attend an ethics education program or to complete an ethics exercise as assigned by the dean of undergraduate studies or the assistant vice president for student affairs.

Subsequent violations. If the university judicial file indicates that the student suspected of a violation has been responsible for one or more previous violations of the university's Standards of Conduct, the case will be referred to the assistant vice president for student affairs for academic integrity board action.

Misrepresentation and obstruction. Reports of suspected academic misrepresentation or obstruction occurring in settings other than the classroom will be referred to the Assistant Vice President for Student Affairs for Academic Integrity Board action.

Academic Integrity Board/Adjudication

If a suspected or known violation of academic integrity standards warrants consideration by the academic integrity board, the assistant vice president for student affairs (or his or her designee) will convene the board. The board will be comprised of three students (voting members) appointed by the Undergraduate Student Government, two faculty (voting members) appointed by the Executive Committee of the Faculty Senate and two administrators (non-voting members). One administrator will be a dean from the office of undergraduate studies. The other administrator, the assistant vice president for student affairs or his or her designee, will chair the board. All members of the board may question witnesses. Academic Integrity Board procedure, the vote required for the determination of responsibility, and the evidence standard will be the same as those for the university judicial board.

Should the board find the student not responsible for a suspected violation, the faculty member and the student will be so informed. The faculty member will be asked to evaluate the student's performance in the assignment in question and to issue a grade based on his or her normal grading practices.

If the board finds a student responsible for a violation of academic integrity standards, the board will notify the student and the faculty member. The board can sanction violations by issuing failure in the work in question, failure in the course, university disciplinary warning, university disciplinary probation, university disciplinary suspension, or expulsion.

In cases in which the Academic Integrity Board finds a student responsible for a second or subsequent violation, the minimum sanction will be failure in the course; the maximum penalty will be expulsion.

If the Academic Integrity Board finds a student responsible for misrepresentation or obstruction, the minimum sanction will be university disciplinary probation; the maximum penalty will be expulsion.

Suspected violations of academic integrity standards reported after a student voluntarily withdraws or is academically separated will be investigated and adjudicated. A student who withdraws or is academically separated during the investigation and adjudication of a suspected violation may be asked to appear at a hearing or, if the student fails to appear, have his or her case heard in absentia. If the student is found responsible for a violation, sanctions can be imposed.

In the event that a suspected violation of academic integrity standards is reported after graduation, the assistant vice president for student affairs will make a determination as to the feasibility of investigation and adjudication. Graduation will not preempt investigation or adjudication of a suspected violation when those processes are feasible. If a student is found responsible for a violation and the sanction imposed makes the student ineligible to earn his or her degree, the degree may be revoked.
ATTENDANCE - FINAL EXAMINATIONS

Students are expected to take final examinations at the dates and times specified by the University Registrar.

A student must explain immediately and in writing to the dean an absence from a final examination. If the explanation is acceptable, the dean will authorize the assignment of the grade Incomplete and the administration of a make-up examination by the instructor.

In the event of an unexcused absence from a final examination, a student should be assigned a final grade that assumes a grade of zero on the final examination and is otherwise consistent with the grading policy for the course.

AUDIT

A student may audit a course with the dean's or advisor's approval and the consent of the instructor of the course. An auditor receives no credit for the course.

Registration in a course cannot be changed from audit to credit or the reverse after the end of the drop/add period. However, a student may take for credit a course he or she audited in an earlier semester. At the beginning of the course, the student and instructor should reach agreement regarding the requirements to be met for a grade of AD. The grade of AD is entered on the student's transcript if approved by the instructor of the course. If the instructor does not approve the grade AD, the enrollment is not posted on the transcript.

COURSE LOAD

In order to be classified as a full-time student, a student must enroll for a minimum of 12 semester hours. The normal full-time load is 14-18 semester hours. Continuing students may carry 19-21 hours if they have a cumulative average of 3.20 or higher. To register for 22-23 hours a minimum average of 3.50 is required. A graduating senior who requires an overload in order to complete his or her degree program by the end of a given semester may receive approval for that overload without satisfying the grade point average requirement specified above. Any schedule of more than 18 semester hours requires dean's approval after being approved by the student's advisor.

COURSE REPETITION

Any student who has received an F or W in a course specifically required for his or her curriculum must retake that course at the next regular opportunity unless the student has since passed the course by proficiency examination.

A student desiring the opportunity to repeat a course because of dissatisfaction with the quality of an earlier performance is eligible to do so, but must advise the Office of Undergraduate Studies of his/her intention by completing a Course Repetition Form. Upon completion of the repeated course for an evaluative grade-A, B, C, D, or F-the grade received for the earlier enrollment will be replaced by the designation RPT and will no longer be computed in either the semester or cumulative grade point averages. The only grade posted and averaged for a course on the student record will be that resulting from the most recently completed enrollment in that course. This option may be exercised subject to the following conditions:

1. The repetition must occur within one calendar year of the previous enrollment or, for courses that are not offered annually, in the next semester in which the course is offered.
2. A student may not use the Pass/No Pass Option when repeating a course.
3. An academic action that occurred under the earlier grade is neither reversed nor removed from the record as a result of a change in the semester or cumulative averages that results from the repetition of one or more courses.
4. A student using the option must enroll for a minimum of 12 semester hours for which credit had not previously been earned. Students repeating courses previously passed may lose
their eligibility to receive all forms of federal financial aid if they are not also enrolled in courses comprising 12 additional credit hours.

CREDIT BY EXAMINATION

Advanced Placement/International Baccalaureate Examinations

Students may earn degree credit on the basis of advanced examinations taken while in secondary school; examinations eligible for credit and/or advanced placement include, but are not limited to: College Board Advanced Placement Examinations and International Baccalaureate Higher Level Examinations. Determination of the criteria for granting credit and/or placement is made by the appropriate department. In assigning credit or granting advanced placement for credentials from outside the United States, the university is guided by the placement recommendations and grade equivalencies approved by the National Council on the Evaluation of Foreign Educational Credentials.

Proficiency Examinations

Departments within each academic unit offering undergraduate programs may choose to offer students the opportunity to earn course credit in specific courses by proficiency examination. To qualify for proficiency examination credit for a course, the student’s examination performance must demonstrate knowledge and skills at a level no lower than that of an average student who successfully completes the course. Upon notification from the academic department, the Office of Undergraduate Studies will direct the Office of the Registrar to post credit for the course. The grade will be recorded as PR, and will not be included in a student’s grade point average.

Any student who receives proficiency credit for a course through a proficiency examination administered during a semester when the student is not registered for a full-time schedule (12 or more semester hours) at Case Western Reserve University is charged a fee equal to one-third of the present tuition charge for the course. No fee is charged if the student does not receive credit from the examination.

FINAL EXAMINATIONS

Final examinations are normally required in all courses and must be given during the final examination period at the time assigned by the Registrar. Any exception must be approved by the Dean of Undergraduate Studies. No student will be required to take more than two final examinations on a single day. A student who has three final examinations scheduled for a single day will be assisted by the dean in arranging to take one of those examinations on an alternative day during the final examination period. Similarly, a student with conflicting examinations should seek the assistance of the Dean of Undergraduate Studies in arranging to have the time of one examination changed.

A student must explain immediately and in writing to the dean an absence from a final examination. If the explanation is acceptable, the dean will authorize the assignment of the grade Incomplete and the administration of a make-up examination by the instructor.

In the event of an unexcused absence from a final examination, a student should be assigned a final grade that assumes a grade of zero on the final examination and is otherwise consistent with the grading policy for the course.

FOREIGN LANGUAGE AND MATHEMATICS CREDIT

Credit earned for the first semester of a beginning work (101 level) in a foreign language will not serve for satisfaction of any degree requirement until a student successfully completes the second semester (102 level) of such work.

No credit will be allowed to count towards degree requirements for foreign language or mathematics courses which duplicate work taken earlier in high school or in another institution.

GRADING SYSTEM

See section on Registration.

For grading policy for first year undergraduates, see section on Academic Standing.

Incomplete Grade

Assignment of the Incomplete Grade. The Incomplete grade (I) is assigned by and at the discretion of the instructor when: a) there are extenuating circumstances, explained to the instructor before the assignment of the grade, which clearly justify an extension of time beyond the requirements established for and met by other students in the class, and b) the student has been passing the course and only a small segment of the course, such as a term paper, remains to be completed. It is the student’s responsibility to notify the instructor of the circumstances preventing completion of all assigned work. In the absence of notification or adequate justification the instructor has the authority to assign the student a final grade that assumes a failing grade for the missing work. An Incomplete grade should not be assigned when: a) a student has been absent for much of the semester and/or has done little of the work required for a course, or b) because a student is absent from a final examination, unless the Dean of Undergraduate Studies has authorized the grade.

Changing the Incomplete Grade. The instructor shall submit to the Office of Undergraduate Studies for transmission to the Registrar a final evaluative grade to replace the Incomplete upon completion of the work outstanding by a date established for the student by the instructor. When a student fails to submit the work required for removing the Incomplete by the date established, the instructor shall submit to the Office of Undergraduate Studies for transmission to the Registrar a final grade that assumes a failing performance for the missing work. In the absence of the assignment of a grade by the instructor the Registrar will convert the I to F when the deadline
for making up Incomplete grades from a previous semester has passed.

The amount of additional time allowed a student to make up incomplete work should serve to accommodate the student while being fair to other students in the course. It should be proportional to the duration of a student’s illness or absence and might be no more than a few days or weeks. At the extreme, it should not extend past the eleventh week of the session following the one in which the Incomplete grade was received. In certain cases (such as students on probation) the dean may establish a date for completion of courses with Incomplete grades.

Pass/No Pass Option

Courses elected on a Pass/No Pass basis and completed with a grade of D or higher will be entered with a grade of P on a student’s transcript. Courses taken Pass/No Pass and for which a grade of F is earned will be entered on the transcript with the letter grade NP. Courses completed with letter grade P under this option will be counted for credit toward the baccalaureate. Courses completed with the grade NP do not earn credit. Courses completed with grades P and NP are not included in computing the grade point average.

The Pass/No Pass option is subject to the following regulations:

1. The Pass/No Pass option is exercised during the last three days on which classes are scheduled.
2. It is available only during regular fall and spring semesters to full-time students who are in good standing.
3. It can be exercised for only one course during any semester.
4. It cannot be used for courses taken for satisfaction of core requirements.
5. It cannot be used for courses taken for the satisfaction of requirements of a major or minor concentration.
6. Courses offered only on a Pass/No Pass basis with the approval of the curriculum committee do not affect the student’s use of the Pass/No Pass option.

7. Instructors are not notified of a student’s use of this option. They are required to submit evaluative grades for all students and these are converted to Pass/No Pass in the Registrar’s Office. The meaning of the grades P and NP will be noted on the transcript.

PETITIONS

Petitions for exceptions to undergraduate academic rules must be submitted to the Office of Undergraduate Studies for consideration by the deans committee, the curriculum committee, or the committee on academic standing, as appropriate to the subject of the petition.

PROFICIENCY EXAMINATIONS

See Credit by Examination, above.

PROMOTION

The standards for promotion are:

- To the sophomore class, 27 hours completed
- To the junior class, 60 hours completed
- To the senior class, 90 hours completed

READING DAYS

The last two weekdays preceding the start of the final examination period are set aside as Reading Days to be used by students for completing assignments and preparing for final examinations. These days are not to be used by faculty for scheduling examinations or other course activities that require the attendance of students. They can be used by faculty to schedule review sessions for which attendance is optional.

Beginning in fall 2005, the two fall semester reading days will be distributed so that there will be no more than three consecutive days of final examinations. The first reading day will be the day following the first three days of the final examination period.

RE-ADMISSION AFTER SEPARATION

See section on Academic Standing

RE-ENROLLMENT AFTER VOLUNTARY WITHDRAWAL

Students who have voluntarily withdrawn from the university and have not taken courses elsewhere following their withdrawal may reenroll in any semester. Students who have taken courses elsewhere following withdrawal must provide official transcripts of their work with their request for re-enrollment. Upon re-enrollment following a voluntary withdrawal, students retain the hours earned and quality points for courses completed prior to withdrawal. In the first semester of re-enrollment, their academic status is the status in effect at the time of withdrawal, unless that status is changed by action of the Committee on Academic Standing.

SCHEDULE CHANGES (DROP/ADD)

Changes in course schedules must be submitted to the Registrar’s Office before the end of the second week of classes during the fall and spring semesters and on or before the second day of classes during the summer session.

TRANSFER CREDIT

Students may receive credit by transfer from another accredited college, university, or technological institute in the United States or from institutions of higher education outside the United States under the following conditions:

1. At the time of admission to Case Western Reserve University upon presentation of an official transcript from each institution previously attended. Credit will be awarded for courses equivalent or comparable to those offered by the university and completed with a grade of C or better. Any such
Courses taken prior to the student’s graduation from high school must be listed in the college’s catalog among courses offered for degree credit to the college’s undergraduates, taken in the company of matriculated college students, and organized and taught by college faculty. In addition, to be considered for transfer credit, such courses must not have been used to fulfill high school graduation requirements. The allocation of transfer credit is determined by the Office of Undergraduate Studies in consultation with the appropriate department. The applicability of such transferred work toward the satisfaction of major or minor requirements will be determined by the major or minor department. Students who are eligible to receive transfer credit equivalent to ENGL 150, Expository Writing, are required to take the English placement exam for transfer students.

2. After enrollment in the university, only when approval has been secured in advance from the Office of Undergraduate Studies. After matriculation in the university, undergraduates are not permitted to earn more than 15 semester hours as transient students at other accredited institutions. Credit earned elsewhere after matriculation is not applied toward the 60 hour minimum required in residence. Work taken through the cross registration program (see below) is treated as transfer credit.

Credit is not awarded for work done at an unaccredited institution in the United States except by proficiency examination in those departments offering that opportunity. The award of transfer credit for work done at institutions outside the United States is subject to departmental evaluation and to the recommendations of the National Council on the Evaluation of Foreign Credentials.

A student dismissed for poor scholarship from any institution cannot receive credit by transfer for courses taken in the first two sessions after that dismissal without prior permission of the Dean of Undergraduate Studies.

Grades for courses taken at other institutions will not be entered on the student’s record nor will they be computed in the student’s grade point average.

WITHDRAWAL FROM COURSES

After consultation with a dean in the Office of Undergraduate Studies, a student may withdraw from a course no later than the end of the 11th week of the semester and receive a grade of W. After this date, a student who withdraws from a course normally will receive a grade of F. In unusual circumstances, the dean may permit a student to withdraw from a course after the final date and receive a W. A first year undergraduate who is subject to the grading practices for first year students (see “Good Standing” under Academic Standing, below) may withdraw from a course after the end of the 11th week, but no later than the last day of classes.

Notice of a withdrawal from a course must be transmitted by the student to the Registrar on the appropriate form, signed by the student’s instructor, advisor and dean. Failure to attend class, or providing notice only to the instructor, does not constitute an official withdrawal from a course. Such an unofficial withdrawal normally will result in the student’s being assigned the grade of F.

A student who withdraws from the university or is dismissed during a semester will receive the grade of WD for each course for which he or she is registered at the time of withdrawal.

ACADEMIC STANDING

Good Standing

The First Undergraduate Year: For the first two semesters of full-time enrollment, students who are beginning their college studies will earn credit and grades only for those courses completed with a grade of D or higher. Any courses for which a grade of F, W or NP is assigned will not be included in the computation of the grade point average and will not be posted on the official transcript. This grading policy is not available to part-time or transfer students and does not apply to the summer session. In order to maintain good standing a first-time first year student must earn at Case Western Reserve a minimum of 9 hours and an average of 1.70 or higher in the first semester and a total of 21 hours with a cumulative average of 1.75 or higher by the end of the second semester of full-time enrollment.

Thereafter: Following the first undergraduate year, grades of F will be posted on the transcript and will be used in the computation of the grade point average. Following the first undergraduate year, the requirements for good standing are:

1. A semester grade point average of 1.75 or higher

2. A cumulative grade point average as follows:
   a) for students with 22-40 hours earned, a cumulative grade point average of 1.80
   b) for students with 41-59 hours earned, a cumulative grade point average of 1.90
   c) for students with 60-89 hours earned, a cumulative grade point average of 1.95
   d) for students with 90 or more hours earned, a cumulative grade point average of 2.00

Students with incomplete grades may be placed on probation (incomplete) as described below.

Part-time and transfer students will be subject to the cumulative average requirements that are consistent with their hours earned.

Probation

Students who, at the end of any semester, fail to maintain the standard of performance required for good standing as specified above will be placed on probation. Students placed on probation are ineligible to represent the university in intercollegiate activities and may not hold an elective or appointed office or chair a
Eligibility rules apply to all activities in which students represent the university in any way, official or otherwise. These include intercollegiate athletics, musical or dramatic clubs and performances, oratorical or debating teams, class offices, student government, committee memberships, and publication staffs. Students who are on probation for any reason are ineligible to participate in these activities.

Eligibility is based on full-time status (enrollment for 12 hours or more), and students carrying fewer than 12 semester hours are ineligible to participate in intercollegiate competitions. Eligibility is determined at the end of each session as of the last official date of that session.

Students must complete the work of the previous session with a 2.0 grade point average to be eligible for initiation into a social fraternity or sorority.

The dean or the appropriate committee may at any time declare as ineligible those students whose conduct, attendance, or academic standing is unsatisfactory, or whose participation in student activities is detrimental to their academic work.

PROGRAMS ALLOWING ACCELERATION TOWARD PROFESSIONAL DEGREES

Senior Year in Professional Studies at Case Western Reserve University

B.A. candidates of superior ability and attainment who are admitted to professional studies in Case Western Reserve University by the end of the junior year are able to shorten their entire course of studies by one year through the senior year in professional studies privilege. Application should be made during the second semester of the junior year through the student’s undergraduate dean. The senior year in professional studies privilege is extended to students who attend the School of Dentistry, the School of Medicine, the Frances Payne Bolton School of Nursing, or the Mandel School of Applied Social Sciences of Case Western Reserve University.

A student granted the senior year in professional studies privilege is permitted to substitute the work of the first year
in a professional school for that required during the last year in the undergraduate college. Upon the satisfactory completion of the first year’s work in the professional school, the student will be granted the B.A. To be eligible for the senior year in professional studies privilege, a student must:

1. Be accepted for admission to professional studies in Case Western Reserve University.

2. Meet the following degree requirements:
   
a. Completion of the Arts and Sciences General Education Requirements and two semesters of physical education, unless excused from the latter. Students in the SAGES pilot program need to have completed all SAGES requirements with the exception of the senior capstone, which must be completed by the end of the first year of professional studies.

b. Completion of three-fourths of the requirements for the major, including three-fourths of the courses required in the major department.

c. Completion of 84 hours of arts and sciences courses. These credits may be drawn from those offered by the College of Arts and Sciences as well as those in economics, biochemistry, nutrition or computer science.

In addition to meeting all requirements listed above, students qualifying for the senior year in professional studies privilege must have completed at least 90 semester hours of academic credit, of which the final 60 hours must have been in residence. A student may include in that final 60 hours no more than six semester hours earned in courses completed in other institutions, either by cross registration in regular sessions or by approved transient registration in summer sessions.

Senior Year in Absentia Privilege for Students of Medicine and Dentistry

B.A. candidates of superior ability and attainment who are admitted to a medical or dental school other than Case Western Reserve University’s at the end of the junior year of studies are offered an opportunity to shorten the entire course by one year through the senior year in absentia privilege. Applications should be made during the second semester of the junior year through the student’s undergraduate dean. The senior year in absentia privilege is extended to students who attend medical schools in the United States and Canada approved by the American Association of Medical Schools or dental schools in the United States approved by the American Dental Association. (Students desiring such acceleration through enrollment at Case Western Reserve University’s Schools of Dentistry or Medicine should see the regulations pertaining to the Senior Year in Professional Studies.)

A student granted the senior year in absentia privilege is permitted to substitute the work of the first year of the professional school for that required during the last year in the undergraduate college.

Upon the satisfactory completion of the first year’s work in the professional school, the student will be granted the B.A. To be eligible for the senior year in absentia privilege, a student must:

1. Attain a cumulative grade point average of at least 3.20 in all courses attempted from the date of admission as an undergraduate.

2. Meet the following degree requirements:
   
a. Completion of the Arts and Sciences General Education Requirements and two semesters of physical education, unless excused from the latter. Students in the SAGES pilot program need to have completed all SAGES requirements, including the senior capstone, prior to enrolling in a professional school elsewhere.

b. Completion of three-fourths of the courses required for the major, including three-fourths of the courses required in the major department.

c. Completion of 84 hours of arts and sciences courses. These credits may be drawn from those offered by the College of Arts and Sciences as well as those in economics, biochemistry, nutrition or computer science.

In addition to meeting all requirements listed above, students qualifying for the senior year in absentia privilege must have completed at least 90 semester hours of academic credit, of which the final 60 hours must have been in residence. A student may include in that final 60 hours no more than six semester hours earned in courses completed in other institutions, either by cross registration in regular sessions or by approved transient registration in summer sessions.

For Candidates for the B.S. in Accounting

There are two programs which integrate graduate and undergraduate work in accountancy. These programs are strongly recommended for those individuals planning to become certified accounting professionals, particularly as CPAs (Certified Public Accountants).

Joint B.S. in Accounting/Master of Accountancy (M.Acc.)

This program allows students to begin graduate course work while studying for the award of their undergraduate accounting degree. Undergraduate accounting majors accepted for this opportunity will be permitted to enroll for 6 credit hours of Weatherhead School graduate courses during the senior year. These hours will also be part of the undergraduate business elective requirements. These hours of credit will count toward the satisfaction of the M.Acc. degree program requirements, reducing the graduate program requirements from 36 to 30 hours. Before taking graduate course work, the student must have completed all prerequisites for the course on the undergraduate level and have a ‘B’ average in those prerequisites. Students will complete and be awarded their Bachelor of Science in Accounting degree prior to enrolling in the Master of Accountancy program.
Accelerated B.S. in Accounting/Master of Accountancy (M.Acc.) Program

This program allows motivated students to accelerate their pursuit of both the B.S. and M.Acc. degrees. In addition to applying six credit hours of Weatherhead graduate course work towards their undergraduate degree program, students in this program may begin taking more graduate course work before completing all of their undergraduate degree requirements. To enroll in this program, students must have:

1. Completed 90 hours of undergraduate course work
2. Completed all of the undergraduate Weatherhead General Education Requirements
3. Completed 30 hours of the Weatherhead Management requirements (including 15 hours of the required Accountancy course work)
4. Achieved at least a 3.0 overall GPA

Students in this program will receive both the B.S and the Master's degree at the end of the program. For the first eight semesters of study, the student will register as undergraduates in Case Western Reserve University; thereafter, students will register as graduate students in the graduate professional degree program in the Weatherhead School of Management.

PROGRAMS ALLOWING ACCELERATION TOWARD GRADUATE STUDY

Integrated Graduate Studies Program

The Integrated Graduate Studies (IGS) Program is intended for highly-motivated candidates for the B.A. whose objective is a degree at the master’s or doctor's level. By closely integrating undergraduate and graduate studies, qualified students begin a program of graduate study in their senior year leading to the simultaneous completion of requirements for both the master’s and bachelor’s degrees, each within its specified framework.

Any department, division, or interdepartmental committee that offers a graduate program may, with the approval of the Dean of Graduate Studies, participate in the IGS Program.

A student desiring this opportunity will normally apply for admission to PHASE I of the program in the sophomore year.

PHASE I: Admission to the program is chiefly determined by the estimate of a student’s talents, motivation, and potential for graduate study and independent work. Students may apply for admission to Phase I of the IGS Program through their major department during the second semester of the sophomore year. Contingent upon their completion of 54 semester hours of study, students are admitted to Phase I at the beginning of the junior year on recommendation of the department, division, or interdepartmental committee to which they have applied. During the junior year, IGS students will take between four and six courses in the major field, as advised by their department, to prepare them for the work of Phase II. Students seeking admission to Phase I will be informed by their departments if their admission requirements differ from those specified here.

PHASE II: Admission to graduate study is facilitated by, but not dependent upon, participation in Phase I. On completion of no fewer than 90 semester hours (ordinarily at the end of the junior year), students may be accepted for admission to the School of Graduate Studies. Transfer students are subject to the College of Arts and Sciences residence regulations and must have completed at least 60 semester hours, including the last 30, in residence.

Admission to the graduate school will be approved if the student has met the criteria above, has completed all requirements for the bachelor’s degree except total number of hours, has completed three-fourths of the hours required for the major, including three-fourths of the hours required in the major department, and has completed the Arts and Sciences General Education Requirements or SAGES alternative (with the exception of the Senior Capstone, which must be completed by the end of the first two semesters of graduate study), and two semesters of physical education, unless excused from the latter. In addition, the student must be recommended by the department, division, or interdepartmental committee to which he or she seeks admission.

Upon admission to the School of Graduate Studies, a student will begin a program of study leading to the master’s or doctor’s degree as approved by his or her department or committee and by the Dean of Graduate Studies.

The bachelor’s degree normally will be awarded at the commencement immediately following satisfactory completion of the year of graduate study and attainment of a total of 120 semester hours of credit. Participants in Integrated Graduate Studies are exempt from the Bachelor of Arts degree limit of 42 hours above 100 level in a single department. The master’s or doctor’s degree will be awarded upon satisfactory completion of the requirements for these degrees. In some instances, the bachelor’s and master’s degrees may be awarded simultaneously. The completion of the master’s degree, however, may require an additional semester or summer of course work.

For Candidates for the B.S. in Nutrition

Integrated B.S./M.S. in Nutrition

Admission to the Integrated B.S./M.S. in Nutrition program is subject to the same process and requirements as admission to the Integrated Graduate Studies Program described above. Upon successful completion of the program, students earn the B.S. degree in Nutrition and the M.S. in Nutrition.

For Candidates for the B.S. in Engineering, Computer Science, Mathematics, Natural Sciences, and Statistics

B.S./M.S. Program

The Integrated B.S./M.S. Program is intended for highly-motivated candidates for the B.S. whose objective is a degree at the master’s or doctor's level. Application to the B.S./M.S. program must be made
after completion of 75 semester hours of course work and prior to attaining senior status (completion of 90 semester hours). Generally, this means that a student will submit the application during his/her sixth semester of undergraduate course enrollment and will have no more than two semesters of remaining B.S. requirements to complete. Applicants in engineering or computer science should consult the Associate Dean in the Case School of Engineering. Applicants in mathematics, natural sciences, or statistics should consult the Dean of Undergraduate Studies.

A student admitted to the program may, in the senior year, take up to nine hours of graduate courses that will count towards both B.S. and M.S. requirements. The courses to be double-counted must be specified on the student’s M.S. Program of Study. Students for whom the master’s project or thesis is a continuation and development of the senior project should register for Exxx 651 Thesis (or the appropriate project course) during the senior year and are expected to complete all other courses for the B.S. before enrolling in further M.S. course work and thesis (continuing the senior project). Students for whom the master’s thesis or project is distinct from the senior project will be expected to complete the B.S. degree before taking further graduate courses for the master’s degree.

Programs Allowing Entering Students Conditionally Guaranteed Admission to the University’s Professional Schools

The Pre-Professional Scholars Programs in medicine, dentistry, law, and social work grant to a few outstanding entering first year undergraduates conditional commitments of admission to the appropriate professional school at Case Western Reserve University. These commitments are honored upon successful completion of the requirements established by each professional school. Students admitted to these programs are relieved of much of the anxiety and uncertainty associated with pre-professional studies. Consequently, they feel free to undertake challenging courses of study and pursue a variety of interests as they prepare for professional studies. Pre-Professional Scholars are free to choose any of the bachelor’s degrees available in the university. Participants who wish to change their career goals or apply for admission to other professional schools are free to do so. Students enrolled in the Engineering Core curriculum may have less flexibility in arranging to take some undergraduate courses identified as desirable by the professional schools.

The Six-Year Dental Program gives exceptionally able and committed entering first year undergraduates the opportunity to accelerate their undergraduate and professional studies.

The Early Admission Decision Program in Law gives outstanding students who have completed two years of undergraduate study a conditional commitment of admission to the School of Law. The commitment is honored upon successful completion of the requirements established by the School of Law.

Pre-Professional Scholars Program in Dentistry

Each year, as many as 10 exceptionally well-qualified high school seniors who plan to pursue careers in dentistry are offered places in the Pre-Professional Scholars Program in Dentistry. This program requires eight years: four years of undergraduate study and four years at the School of Dentistry.

Pre-Professional Scholars in Dentistry are free to choose a major in an area of interest in the humanities, social sciences, or natural sciences, but must take the following courses to fulfill admission requirements of the School of Dentistry:

2. Biology: BIOL 214, Genes and Evolution; BIOL 215, Cells and Proteins; and BIOL 216, Organisms and Ecosystems
3. Mathematics: MATH 125, Mathematics I.

They are required to take the Dental Admission Test in the junior year and achieve an acceptable level of performance on the test.

Successful progress through the program and admission to dental studies will be based on the pre-professional scholar’s continuing to fulfill expectations for outstanding personal and academic development and on the scholar’s achievement of cumulative grade point average of 3.0 or higher for his or her work overall, as well as for his or her work in the required sciences. Successful progress in the program will be determined individually and reviewed at regular intervals during the student’s undergraduate career.

Pre-Professional Scholars in Dentistry who wish to accelerate their program may apply for the senior year in professional studies privilege.

Six-Year Dental Program

Each year a few exceptionally well-qualified high school seniors who plan to pursue careers in dentistry are offered places in the Six-Year Dental Program.

The first two years of the program are spent in undergraduate studies. Students are required to earn a minimum of 60 semester hours. They are required to take all of the science and mathematics courses listed above for the Pre-Professional Scholars Program in Dentistry. If Advanced Placement credit is used to satisfy some of these science requirements, a minimum of 30 semester hours in biology, chemistry, physics, and mathematics must be taken during the two years of undergraduate study. Additionally, to meet general education requirements, students must take one year of physical education, ENGL 150, and, from the Arts and Sciences General Education...
Requirements, two courses in the area of Arts and Humanities, two courses in the area of Social Sciences, and one further course in either of the latter areas or in Global and Cultural Diversity. Students in the SAGES pilot program meet the general education requirements by taking one year of physical education, First Seminar, three University Seminars, one course selected from the arts and humanities, and one course selected from the social sciences.

To qualify for the place reserved in the School of Dentistry, a student in the program must achieve the following:

1. A cumulative grade point average of 3.00 or higher for all course work completed.
2. Grades of B or higher in the required courses in biology, chemistry, physics, and mathematics.
3. An average score of 16 or higher on both the academic and PAT portions of the Dental Admission Test of the American Dental Association. The test must be taken no later than April of the second year.

Pre-Professional Scholars Program in Law

Each year, up to 12 exceptionally well-qualified high school seniors who plan to pursue careers in law will be offered places in the Pre-Professional Scholars Program in Law at Case Western Reserve University. Pre-Professional Scholars receive a conditional commitment of admission to the Case School of Law, to be honored upon completion of the bachelor's degree at the university.

The Pre-Professional Scholars in Law are encouraged to gain a wide cultural experience in college, to major in the area that most interests them and to choose courses in which they will learn habits of rigor and logical analysis. The law school encourages applications from all majors, including engineering and the sciences. The School of Law recommends that Pre-Professional Scholars in Law take courses in accounting, economics, history, and philosophy and that they gain as much writing experience as possible, because the ability to write effectively is critical to success in law school and legal practice.

Students admitted to the Pre-Professional Scholars Program in Law will be guaranteed a seat in the School of Law upon graduation from Case Western Reserve University if they satisfy the following requirements:

1. Graduation from Case Western Reserve University with rank in the top quarter of the class.
2. Demonstration of good moral character sufficient for admission to the bar of the State of Ohio.
3. Participation in the Law School Data Assembly Service and an LSAT score at or above the 65th percentile.

Pre-Professional Scholars Program in Medicine

Each year, as many as 25 exceptionally well-qualified high school seniors who plan to pursue careers in medicine are offered places in the Pre-Professional Scholars Program in Medicine. Pre-Professional Scholars are expected to demonstrate successful progress by meeting the following requirements:

1. By the end of the fourth semester, Pre-Professional Scholars in Medicine are expected to attain a cumulative grade point average of 3.60, and to maintain that average for the rest of their undergraduate studies.
2. Pre-Professional Scholars in Medicine are expected to earn grades of B or higher in all required courses in chemistry, biology, physics, and mathematics. By the end of the fourth semester, they should attain a cumulative grade point average of 3.60 for these courses, and should maintain this average for the rest of their undergraduate studies.
3. Pre-Professional Scholars in Medicine are expected to continue to fulfill expectations for outstanding personal development, including, but not limited to, maintaining academic integrity and adhering to the university’s standards of conduct.

Progress is reviewed with each student at regular intervals in the program. At the
end of the third year, Pre-Professional Scholars in Medicine who have met the required levels of performance go through the normal admission procedures for the University Program of the School of Medicine, including submitting an application through the American Medical College Application Service (AMCAS) and an interview. Participants who do not meet the required levels of performance may still be admitted into the University Program of the School of Medicine, but such admission will be subject to review and approval by the School of Medicine’s Admissions Committee.

Successful completion of the Pre-Professional Scholars Program in Medicine guarantees admission only to the University Program of the School of Medicine. Students seeking admission to the Cleveland Clinic Lerner College of Medicine of the Case Western Reserve University School of Medicine must complete a separate application and will be considered in competition with all applicants for that program.

Pre-Professional Scholars Program in Social Work

Each year, as many as 10 high school seniors who plan to pursue careers in social work are offered places in the Pre-Professional Scholars Program in Social Work. The program gives a conditional commitment of admission to the Case Western Reserve University Mandel School of Applied Social Sciences to be honored upon successful completion of the bachelor’s degree.

Admission to the master’s degree program in social work at MSASS is dependent upon the following requirements:

1. Graduation from the university with a cumulative grade point average of 3.0 in the junior and senior years.
2. Completion of a minimum of 24 semester hours in the social and behavioral sciences.
3. Continued evidence of a combination of personal qualities which are considered essential for the professional practice of social work.

Pre-Professional Scholars in Social Work who wish to accelerate their program may apply for the senior year in professional studies privilege.

Application Procedures for Pre-Professional Scholars and Six-Year Dental Programs

Prospective students who wish to apply to any of the Pre-Professional Scholars Programs or to the Six-Year Dental Program should apply for admission through the Office of Undergraduate Admission of Case Western Reserve University. All forms are included in the application booklet.

The application for admission, supporting test scores and high school transcript, must be submitted to the Office of Undergraduate Admission as early as possible, but no later than January 1.

Students who are admitted to the university and are also deemed eligible for consideration for one of the Pre-Professional Scholars Programs or the Six-Year Dental Program will be notified by March 1 and will be invited for interviews at the appropriate professional schools. The basis for selection for these programs will be dedication to the pursuit of the particular profession, a distinguished high school record, high scores on the college entrance examinations (ACT or SAT and three College Board Achievement Tests), a record of personal accomplishments that attests to a student’s maturity, leadership, and interpersonal skills, and an interview with an admissions officer from the appropriate professional school. Decisions on admission to the programs will be communicated on or about April 15.

Students who are not admitted to these special programs are encouraged to pursue their undergraduate studies and to apply in the normal course to the professional school of their choice, including the professional schools of Case Western Reserve University.

NON-DEGREE STUDENTS

Transient (Visiting) Students

A transient student is one who has begun his or her education at another college or university and intends to return there. The university permits full or part-time study as a transient student in the summer as well as during the fall and spring semesters. Enrollment must be for credit-bearing courses. Before enrollment, the transient student must present a statement of good standing from the registrar of his or her home college.

Enrollment is limited to 30 semester hours and is subject to the regulations of the student’s college. Transient students must meet all requirements for prerequisites before being admitted to specific courses.

Transient students are not eligible to receive financial aid from Case Western Reserve University. If the student’s home institution has entered into a consortium agreement with Case Western Reserve University, the student should inquire of the home institution regarding eligibility to receive aid through the home institution.

Applications for enrollment as a transient student may be obtained from the Office of Undergraduate Studies, 357 Sears Building.

Pre-College Scholars

Students enrolled in high school who wish to take courses at Case Western Reserve University will be considered for admission upon application to the Pre-College Scholars program and only with the endorsement of their high school principal or guidance counselor. This program is designed for those who have demonstrated a high degree of academic competence for study in all areas by doing consistent A and B work in an accredited high school curriculum.

Further information concerning the Pre-College Scholars program and the Post-Secondary Enrollment Option Program of the State of Ohio may be obtained
by writing the Office of Undergraduate Studies or by calling (216) 368-2928.

Non-Degree Students

Adults may apply through the Office of Undergraduate Studies to enroll for credit in courses for which their education or experience has qualified them, even though they are not pursuing a baccalaureate degree. These non-degree students may study full or part time and enroll in the same classes as degree students; they are required to perform up to the same academic standards as degree students.

Non-degree students may be eligible for admission to candidacy for a degree program if they meet the requirements for admission to the university. Courses taken for credit as a non-degree student may be applied toward the degree upon acceptance as a degree candidate. A non-degree student who wishes to become a degree candidate must apply through the Office of Undergraduate Admission.

All non-degree students who do not already hold a bachelor’s degree register through the Office of Undergraduate Studies, 357 Sears Building, 216-368-2928.

Persons who already hold degrees and wish to continue their studies without actively pursuing an additional degree are welcome to apply to the School of Graduate Studies.

Continuing Education

The university provides academic, non-credit courses for those who seek self-enrichment and professional advancement. Courses are presented both on and off campus. Special workshops and seminars are designed and presented by faculty and in cooperation with various community groups throughout the academic year. Illustrations of three such programs follow. Participants in these programs are considered students at the university and may obtain student ID cards which entitle them to use the University Libraries, receive a student discount at the bookstore, and take advantage of student rates at campus events. Part-time parking privileges in university assigned parking lots are also available.

Senior Scholars

This program is designed for men and women 50 years of age and older who seek non-credit, university-level courses and the intellectual stimulation provided by being on a college campus.

Three seminars are presented each semester. The majority are taught by university faculty and meet once a week for 11 consecutive weeks. Senior Scholars pay a single fee at the beginning of the academic year which entitles them to two semesters of specially designed seminars and forums. They may participate in all or any parts of the program they choose.

Registration for this program is handled by the Office of Continuing Education, 341 Sears Building, 368-2090.

Special Audit

The Special Audit Program provides the adult student with the opportunity to attend a regular university course as a serious but informal observer at half the regular tuition. This program is available only to those not enrolled in a degree program at Case Western Reserve University. Special audit students receive no grades and no academic credit for the courses attended. No transcripts will be issued, but a certificate of attendance will be provided if requested.

Registration for this program is handled by the Office of Undergraduate Studies. No transcripts are necessary to register.

Alumni/Senior Audit

The Alumni/Senior Audit Program is a special program of the College of Arts and Sciences that provides alumni and senior citizens with the opportunity to attend a regular university course as a serious but informal observer at ten percent of the regular tuition. This program is available only in selected courses and only to those not enrolled in a degree program at Case Western Reserve University. Alumni/senior auditors may not comprise more than 10 percent of the students in a class.

Alumni/senior audit students receive no grades and no academic credit for the courses attended. No transcripts will be issued and an alumni/senior auditor may not enroll for credit in a course previously audited.

Registration for this program is handled by the College of Arts and Sciences, Crawford Hall, 7th floor, 368-4413. No transcripts are necessary to register.

HONORS, PRIZES, AND AWARDS

Dean's Honor Lists

The Dean's Honor Lists consist of the names of those undergraduate students who have distinguished themselves by achieving during the previous semester the grade point averages required with a minimum of 12 hours earned and who have no Fs, NPs, or Incompletes during the same period. Students with a grade point average of 3.75 or higher will be placed on the Dean's High Honors List. Students with a grade point average of at least 3.50 but less than 3.75 will be placed on the Dean's Honors List.

Commencement Honors

Commencement Honors are awarded to the top 35 per cent of the graduating class.

Top 10 per cent — summa cum laude
Next 10 per cent — magna cum laude
Next 15 per cent — cum laude

To be eligible for commencement honors, candidates must have:
1. Earned a minimum of 54 hours for evaluative grades (A, B, C, D) in residence at the university.
2. Attained the required cumulative average in all work for which grades are averaged at the university.

Departmental Honors

Students who participate in departmental honors programs and satisfy the requirements for such a distinction, as specified by the department, may qualify to receive the degree “with departmental honors.”
Phi Beta Kappa
Phi Beta Kappa, a national honor society, recognizes outstanding scholarship in the arts and sciences. The Alpha Chapter of Ohio, one of the first ten established nationally, was established in Western Reserve College in 1847. Students may qualify for election to membership in the second semester of the senior year. A few outstanding students may be elected to membership as juniors.

Tau Beta Pi
Tau Beta Pi is a national honor society which recognizes full-time engineering students for outstanding scholarship, leadership, and service.

Mortar Board
Mortar Board is a national honor society which recognizes full-time senior students for outstanding scholarship, leadership, and service.

Prizes, Awards, and Scholarships
Students are selected by departments or by the deans as recipients of the following awards, which are presented at the Honors Assemblies each spring. Awards made to graduating seniors are listed in the commencement program.

Departmental Awards

Accountancy
The Beta Alpha Psi Award for excellence in Accounting
The Ernst and Young Accounting Achievement Award
The Deloitte and Touche Award to an outstanding junior majoring in Accounting
The Beta Alpha Psi Scholars Recognition Award for outstanding scholarship among members of the Pi Chapter
The Louis Levy Meritorious Service Recognition Award for outstanding service to chapter, school and community
The Skoda, Minotti & Company Award for an outstanding underclassman

The Price Waterhouse Coopers Scholarship Award
The KPMG Peat Marwick Scholarship Award
The Cohen & Co./Beta Alpha Psi Leadership Award
Thomas Dickerson Award for Excellence in Professional Accountancy Studies
The Andrew D. Braden Award for Excellence in Auditing and Financial Reporting
Louis E. Levy Scholars in Accountancy

Anthropology
The Ruth and Newbell Niles Puckett Award to a graduating senior for outstanding achievement in anthropology
The James Dysart Magee Award for the senior year to an outstanding student in social and behavioral sciences who is also enrolled in the Integrated Graduate Studies Program
The Callender Memorial Award for outstanding achievement in anthropology

Art History/Art Studio
The Hazel Gibbs Herbruck Prize for excellence in art education
The Doris Young Hartsock Prize for excellence in art education
The Kennedy Prize for creative work in art
The William Grauer Award for excellence in art studio courses
The Arnold Philip Award for excellence in art
The Charles E. Clemens Prize for outstanding talent and accomplishment in art
The Muriel S. Butkin Art History Prize for overall best performance and highest grade point average by an undergraduate Art History major
The Noah L. Butkin Award for the best term paper on an art history topic written by an undergraduate

Astronomy
The Jason J. Nassau Prize was established by the Cleveland Astronomical Society in 1965 in memory of Professor Emeritus Nassau, former head of the Department of Astronomy, who was a member of the faculty for 41 years. It is awarded annually to a senior student in astronomy selected by the faculty of the department.

Biochemistry
The Harland G. Wood Prize for outstanding performance by a graduating senior majoring in biochemistry who is a candidate for the B.S. in Biochemistry
The Merton F. Utter Prize to a candidate for the B.A. majoring in biochemistry for outstanding achievement

Biology
The Russell M. Lawall Prize in Biological Sciences for excellence in both academics and research in biology
The Francis Hobart Herrick Prize for outstanding biological research and academic excellence in biology
The Ralph A. Spengler, Jr. Award for excellence in plant science
The Michelson-Morley Undergraduate Research Prize in the Biological Sciences for outstanding research presentation, funded by the Howard Hughes Medical Institute
The J. Paul Visscher Memorial Award of the Cleveland Audubon Society to the senior or graduate student who demonstrates outstanding ability and promise in the field of ecology or environmental science
The Flora Stone Mather Alumnae Award in Biology for outstanding academic performance in biology
The Daniel Burke Prize for excellence in both biology and chemistry

Biomedical Engineering
The Mark Bernstein Memorial Award to a senior biomedical engineering major for outstanding achievement in academics
and leadership, contributions to research, and service to the university, department or community

The Biomedical Engineering Chair’s Award for outstanding academic achievement and service to the biomedical engineering community

The Biomedical Engineering Faculty Award for outstanding academic achievement, achievement in sports, and service to the biomedical engineering community

The Biomedical Engineering Research Award for outstanding performance in biomedical engineering research combined with outstanding academic achievement and outstanding achievement in sports

The J. Thomas Mortimer Cooperative Education Award

The Jose Ricardo Alcala Memorial Award for biomedical engineering research

Cristina A. Camardo Award to a biomedical engineering student in recognition of his or her leadership and service within the university community

Chemical Engineering

The Monroe J. Bahnsen Award was established by contributions of friends and associates in memory of Dr. M. J. Bahnsen, Case ’29. It is awarded annually to a senior for achievement in chemical engineering whose work in design and research projects has been outstanding.

The Carl F. Prutton Chemical Engineering Award was established by Kent H. Smith, ’17, Kelvin Smith, ’22, and Vincent K. Smith in honor of Carl F. Prutton, ’20, for many years head of the Department of Chemistry and Chemical Engineering and a consultant to the Lubrizol Corporation. The prize is awarded to the senior whose academic performance merits his or her selection as outstanding.

The William H. Schuette Memorial Award is given to a senior whose major field is chemical engineering and whose academic performance, character, and qualities of leadership merit election as outstanding. The award was established by friends and co-workers in memory of Mr. Schuette, ’33, vice president and general manager of Dow Chemical Company.

The A. W. Smith Prize is presented to the senior in engineering whose major field is chemical engineering, and who has earned the highest record in the junior and senior years in chemical engineering courses. The prize was established by Dr. Carl F. Prutton, ’20, former head of the Department of Chemistry and Chemical Engineering, in memory of Dr. Albert W. Smith, Case 1887, a member of the Case faculty for 40 years.

The Connie Ilcin Award to the student who exhibits outstanding performance in chemical engineering

Chemistry

The W. R. Vezey Prize is awarded to a junior achieving the highest academic record in physical chemistry courses. This prize was established by Dr. Carl F. Prution, Case ’20, honoring W. R. Vezey, for 29 years a member of the Case faculty.

The Olin Freeman Tower Prize for excellence in physical chemistry

The Carl F. Prutton Prize for scholarship in chemistry to a student pursuing a B.S. degree

The Charles F. Mabery Prize is awarded to the undergraduate or graduate student presenting the best thesis on a subject connected with research in the Department of Chemistry. The prize was established in 1928 by Professor Charles F. Mabery, former head of the Department of Chemistry.

The Freshman Chemistry Achievement Award for the highest achievement in freshman chemistry

The Iota Sigma Pi/Frank Hovorka Prize to the woman chemistry major with the highest average after three semesters

The Eli Lilly Award to a sophomore or junior chemistry major pursuing the B.S. degree

The Merck Index Award to an excellent chemistry student

The Hippolyte Gruener Award to a student for merit in chemistry

The Hypercube Scholar Award

Analytical Chemistry Award

Civil Engineering

The Kenneth M. Haber Award to the outstanding senior in Civil Engineering and Science

The Craig J. Miller Memorial Award was established in 1979 by family and friends in memory of Professor Miller. It is given to an undergraduate or graduate student in the general field of civil engineering who has shown outstanding academic achievement.

The Allison C. Neff Memorial Award was established by family and friends in memory of Mr. Neff, ’25, former vice president and central division manager of Armco Drainage and Metal Products, Inc. The award is presented in recognition of high proficiency in professional studies and participation in professional activities to a junior in engineering whose major field is civil engineering.

The Roy Harley Prize to a senior or graduate student in civil engineering promising high potential in the practice of engineering

Classics

The Abraham Lincoln Fuller Prizes for excellence in the study of Greek or Latin

The Emma Maud Perkins Prize for excellence in classical studies

The Crawford Summer Scholarship to the American School of Classical Studies in Athens

Communication Sciences

The National Student Speech-Language-Hearing Association Award for outstanding leadership and achievement in communication sciences
The Outstanding Undergraduate in Communication Studies Award

Economics

The Robert N. Baird Award for academic excellence and leadership in extracurricular activities

The Marvin J. Barloon Book Award for outstanding performance in economics

The James Dysart Magee Award to an outstanding student in economics for the senior year

The Howard T. McMyler Award to an outstanding student majoring in economics

The H. W. Kniesner Prize to an outstanding senior in economics

The Gardiner Scholarship to a student majoring in economics and is also interested in finance

Electrical Engineering and Computer Science

The Chair’s Award to a student in the Department of Electrical Engineering and Computer Science who shows exceptional academic or leadership potential

The Carolyn J. and John A. Massie ’66 Prize for Computer Engineering and Science awarded to the outstanding graduating senior in computer engineering and science based on performance in the Cooperative Education Program

The Andrew R. Jennings Award to a senior for excellence in Computer Engineering and Sciences

The ACM Award to the senior judged by the student chapter of the Association for Computing Machinery most likely to have an outstanding professional career

The National Electrical Engineering Consortium William L. Everitt Award to a student who has excelled in electrical engineering studies

The Phillips Award for the best senior project in electrical engineering or systems and control engineering

The Donald P. Eckman Award was established by the American Automatic Control Council in memory of Dr. Donald P. Eckman, professor of mechanical engineering and first director of the Systems Research Center. It is given to the senior majoring in systems and control engineering with the best overall achievement in his or her undergraduate program.

The Undergraduate Alumni Capital Award in Systems and Control Engineering to a senior for academic excellence and professional promise

The Best Senior Project Award in Systems Control Engineering

The EECS Research Award to the senior demonstrating exceptional research potential

The Eta Kappa Nu-I.E.E.E. Award was established by I.E.E.E. and Eta Kappa Nu honorary fraternity. This award is given to the senior student judged by his or her fellow students to possess the qualities necessary for an outstanding professional career in a general field of electrical engineering.

The W. Bruce Johnson Award was established in 1969 in memory of Dr. W. Bruce Johnson, professor of engineering and head of the Division of Electrical Sciences and Applied Physics. This award is given to the senior who has demonstrated outstanding ability and shows unusual potential for future contributions in the area of electrical sciences and applied physics.

The Electrical Engineering Service Award is given to the senior performing outstanding service to his class.

The Michael L. Wolf Prize was established in 1974 by the family and friends of Michael L. Wolf, a Ph.D. candidate and teacher in electrical engineering.

The National Electrical Engineering Consortium William L. Everitt Award to a student who has excelled in electrical engineering studies

The Phillips Award for the best senior project in electrical engineering or systems and control engineering

The Donald P. Eckman Award was established by the American Automatic Control Council in memory of Dr. Donald P. Eckman, professor of mechanical engineering and first director of the Systems Research Center. It is given to the senior majoring in systems and control engineering with the best overall achievement in his or her undergraduate program.

The Undergraduate Alumni Capital Award in Systems and Control Engineering to a senior for academic excellence and professional promise

The Best Senior Project Award in Systems Control Engineering

The EECS Research Award to the senior demonstrating exceptional research potential

The Senior Project Award

English

The Charles E. Clemens Award for talent and accomplishment in writing

The Finley Foster/Emily M. Hills Poetry Prize for the best poem or group of poems

The Emily M. Hills Award for the best poem or essay written by a woman in the College of Arts and Sciences

The Holden Prize for the best English paper written by an upperclass student

The Kennedy Prize for creative work in English

The Edith Garber Krotinger Prize for excellence in creative writing

The Karl Lemmerman Prize for the best paper by a freshman

The Eleanor Leuser Award for outstanding writing for or about children by a student enrolled in a creative writing course at the university

The Nemet Scholarships for the demonstration of excellence in creative writing

The Harriet Pelton Perkins Prize to an outstanding student majoring in English

The Helen B. Sharnoff Award for formal poetry submitted by undergraduate students

Geological Sciences

The Charles S. Bacon Award for outstanding contributions to the Department of Geological Sciences

The Carol W. Walker Award for an outstanding senior project in the Department of Geological Sciences

The Philip O. Banks Award for outstanding academic achievement in geological sciences

History

The Donald Grove Barnes Award to a senior for excellence in history

The Clarence H. Cramer Award for excellence in research and writing of history
The Annie Spencer Cutter Prize to a senior for outstanding achievement in history
The Sigma Psi Prize for excellence in history
The John Hall Stewart Prize for excellence in historical studies
The History Department Award for outstanding achievement in history

Macromolecular Science and Engineering
The Hal Loranger Award for Polymer Science was established in 1974 by friends as a memorial to Hal Loranger. This award is given to the outstanding senior in polymer science.

The Samuel Maron Memorial Award is given to an undergraduate for excellence in polymer research.

Management
The Roulston Performance Award for outstanding performance in management
The Financial Executive’s Institute Award

The Nellie Chittenden Carlton Prize is awarded to a senior in management whose outstanding work in the general field of economics shows the greater promise of leadership. This prize was established by Professor Frank Tracy Carlton, Case ’95, and his wife, Mrs. Nellie Chittenden Carlton.

The Kevin J. Semelsberger Prize for excellence in management
The Robert O. Berger, Jr. Award to a junior who demonstrates overall achievement in scholarship, as well as notable community participation and leadership
Iris Wolstein Award for Excellence in Business Venture History to a student whose work on projects and/or coursework related to the study of Cleveland business venture history is determined to have made a significant contribution to the understanding of the business development in Northeast Ohio and related environs
Wolstein Family Award for Excellence in Business Venture Study to a student who has completed an entrepreneurial studies minor or sequence and demonstrates high potential for success in venture development

Materials Science and Engineering
The Wesley P. Sykes Prize was established in 1961 by Dr. Wesley Pope Sykes, Case ’16. This prize is awarded to a senior majoring in materials science and engineering who shows outstanding ability in scientific research, especially as evidenced by the quality of his or her senior project.

The Professor Jack F. Wallace Award to the materials science and engineering student who embodies the dedication and spirit of Professor Wallace

Mathematics
The Max Morris Prize was established in 1964 by family, friends, and former students in memory of Professor Max Morris to honor his contribution to the teaching of mathematics. This prize is presented to an outstanding undergraduate student in mathematics who is pursing the B.S. degree.

The Webster Godman Simon Mathematics Award to a sophomore or junior pursuing a B.A. degree, for excellence in mathematics

Mechanical and Aerospace Engineering
The Fred Hale Vose Prize was established by Elmer L. Lindseth, Case ’25, to honor Professor Emeritus Fred Hale Vose, former head of the Department of Mechanical Engineering. It is presented to the senior in mechanical engineering who has demonstrated the greatest promise for professional leadership.

The Gustav Kuerti Award is given to the senior in mechanical and aerospace engineering who has demonstrated the highest level of scholarship.

The Robert and Leona Garwin Prize was established in 1977 by Richard L. Garwin, Case ’47. It is given to a student who had demonstrated theoretical scientific ability with experimental competence and inventive talent.

The Anish Shah ’91 Award to an outstanding senior in mechanical and aerospace engineering based on academic achievement, extra-curricular activities, and community service

Modern Languages
The Emile B. deSauze Award for attaining the highest honors in modern languages and literatures
The French Book Prize to a freshman for outstanding work in French
The Susie Scott Christopher Prize for excellent contributions to the French program
The German Undergraduate Book Prize for high achievement in German
The Folberth German Prize for excellence in German language and literature
The Italian Undergraduate Book Prize for high achievement in Italian
The Spanish Undergraduate Book Prize for high achievement in Spanish
The Chinese Undergraduate Book Prize for high achievement in Chinese
The Japanese Undergraduate Book Prize for high achievement in Japanese
The Russian Undergraduate Book Prize for high achievement in Russian
The Florence Keuerleber Prize to an undergraduate student who has seriously pursued and excelled in the study of a modern language while majoring in another area
The Department of Modern Languages and Literatures Award for outstanding achievement
The Louise Burke French Prize to an outstanding French student

Music
The Charles E. Clemens Prize for talent and accomplishment in music
The Doris Young Hartsock Prize for outstanding performance in music education

The Kennedy Prize for creative work in music

The Arthur H. Benade Prize to a senior with a major other than music who has made a notable contribution to music on campus during his or her undergraduate years

The Joan Terr Ronis Recital Prize to an outstanding undergraduate majoring in music who has made an exceptional contribution to the musical life of the university

The Lyman Piano Award

Nursing

The Bolton Scholar Award for Excellence in Psychiatric/Mental Health Nursing

The Bolton Scholar Award for Excellence in Critical Care Nursing

The Bolton Scholar Award for Excellence in Pediatric Nursing

The Bolton Scholar Award for Excellence in Maternal-Child Nursing

The Bolton Scholar Award for Excellence in Nursing Informatics

The Bolton Scholar Award for Excellence in Nursing Research

The Bolton Scholar Award for Excellence in Acute Care Nursing

The Bolton Scholar Award for Excellence in Community Health Nursing

The Bolton Scholar Award for Excellence in Gerontology

The Director’s Award for Outstanding B.S.N. Graduate

Nutrition

The Mary Eliza Parker Award for excellence in nutrition and dietetics

Philosophy

The Truman P. Handy Philosophical Prizes to outstanding juniors or seniors for excellence in philosophy

Physical Education

The Emily Russell Andrews Award to the senior woman who makes the greatest contribution to the physical education department through scholarship, leadership, participation and service

The Philip K. Nipi Heim Award to the senior man who makes the most outstanding contribution to Case Western Reserve University through the athletic program

The Patricia B. Kilpatrick Award to the four-year varsity participant with the highest grade point average

The Arthur P. Leary Award to the outstanding freshman, sophomore or junior who has demonstrated leadership, good sportsmanship, maintained good academic standing and made contributions to the department and university

The Dorothy L. Hoza Award to the outstanding freshman, sophomore or junior who has made a strong contribution to the women’s intercollegiate sports program, maintained a high level of academic achievement, shown leadership in the team, and contributed service to the department and university

Physics

The B.S. Chandrasekhar Prize awarded upon completion of the junior year to a physics major who has demonstrated superior performance

The Dayton C. Miller Award was established by the late Herbert A. Erf, Case ’26, honoring this internationally renowned physicist who served as professor of physics for 50 years. It is given to an outstanding senior in physics for the best thesis.

The Elmer C. Stewart Memorial Award to an outstanding senior in Physics who has demonstrated achievement in the applications of physics

The Krumhansl Family Prize to an outstanding undergraduate woman for her academic accomplishments in the sciences

The Leslie L. Foldy Award to the outstanding senior in physics

The Senior Award for service and scholarship in physics

The Physics and Society Essay Competition Award to the physics major who writes the best essay on the application of physics to societal problems

Political Science

The Flora Stone Mather Alumnae Award for outstanding academic performance in political science

The James Dysart Magee Award for the senior year, to an outstanding student in social and behavioral sciences enrolled in the Integrated Graduate Studies Program

Psychology

The Stephen Bednarik Memorial Award to an outstanding senior majoring in psychology

The James Dysart Magee Award for the senior year, to an outstanding student in social and behavioral sciences enrolled in the Integrated Graduate Studies Program

The Flora Stone Mather Alumnae Award for outstanding academic performance in psychology

Religion

The Ratner Family Prize to a graduating senior for the highest academic achievement in the study of religion

Sociology

The James Dysart Magee Award for the senior year, to an outstanding student in social and behavioral sciences enrolled in the Integrated Graduate Studies Program

The Schermerhorn Award for an outstanding student in sociology

The Mark Lefton Award for excellence in sociological studies

The Stella Berkeley-Friedman Award to a graduating senior for the highest academic achievement in the study of sociology
The Robert C. Davis Award for demonstrated commitment to sociological studies

Theatert Arts

The Dionysus Award for an outstanding contribution to theater or dance for a student not majoring in theater arts

The Barclay Leatham/Nadine Miles Award for creativity and general excellence in theater

The Music and Drama Club Scholarship to a theater arts major for outstanding contributions to the production program with potential for professional work, given by the Music and Drama Club

The Lily Dreyfuss Memorial Award for excellence in dance

The Samuel Rosenthal Center for Judaic Studies

The Ira and Ruth Bressler Prize to a student who has done outstanding work in the area of Jewish studies

The Eudese and Elmer Paull Prize to one or several undergraduate or graduate students who demonstrate an interest in Jewish studies or Jewish contemporary life

Awards for Study Abroad

The Brookes Friebolin Award to an outstanding student for study in France

The Alice Seagraves Award to outstanding students for study abroad

The Eva L. Pancoast Memorial Fellowship for graduating senior women in the College of Arts and Sciences or women students in the School of Graduate Studies interested in extending their education by foreign travel or study

Collegiate Awards

The Peter Witt Scholarship to a deserving student who demonstrates a vital and active interest in the improvement of life in Cleveland

The Phi Beta Kappa Prize to sophomores with the best academic records in a liberal arts curriculum after three semesters

The Outstanding Sophomore Awards of The Case School of Engineering to the sophomores with the best academic record at the end of three semesters in The Case School of Engineering

The Harriet Levion Pullman Award to a sophomore outstanding in scholarship, leadership, and service

The Bolton Scholar Award for Excellence in Nursing for the student who has attained the highest academic record at the sophomore level

The Delta Phi Upsilon - Junior Award of the College of Arts and Sciences to juniors with the best academic records at the end of five semesters

The Outstanding Junior Awards of The Case School of Engineering to juniors with the best academic records at the end of five semesters in The Case School of Engineering

The Stanley E. Wertheim Prize for an outstanding junior in The Case School of Engineering who has demonstrated leadership skills through involvement in campus or co-op activities

The Bolton Scholar Award for Excellence in Nursing for the student who has attained the highest academic record at the junior level

The Joseph Skigin Memorial Award to an outstanding premedical student for the senior year

The Louis K. Levy Prize for an outstanding junior in the College of Arts and Sciences

The George T. Hunt Awards to a junior and a senior outstanding in leadership, scholarship, and service

The Sylvia Green Rosenberg Award to a part-time or full-time non-traditional student

The Raechelle L. Grier Award to a Case Western Reserve University staff member who is enrolled as a non-degree or as a degree-seeking undergraduate at the university

The Outstanding Sophomore Awards of The Case School of Engineering to the sophomores with the best academic record at the end of three semesters in The Case School of Engineering

The Flora Stone Mather Alumnae Award for outstanding academic performance in the humanities

The P. G. “Jerry” Lind Award for a graduating senior in engineering or science who has made a significant contribution to campus life

Award for Outstanding Senior Capstone Entry in the Senior Capstone Fair

The Carol and Edward Breznyak G’64 Cooperative Education Student of the Year Award to a student in The Case School of Engineering who has demonstrated outstanding performance in the Cooperative Education Program based on industry evaluations, written reports and student initiative

The Robert and Joyce Shaefer Prize to a student from The Case School of Engineering who has made a major contribution to campus publications

The Robert J. Adler Award to the senior student in The Case School of Engineering who, through high scholarship, technical creativity, and service to his or her peers, best exemplifies the ideals and talents of Professor Robert J. Adler

The Robert L. Shurter Prize to a senior for leadership in extracurricular activities in The Case School of Engineering

The Weatherhead School of Management Award to a senior, for outstanding achievement in the Weatherhead School of Management

The Matthew Leskiewicz Award to a senior in the Weatherhead School of Management for outstanding leadership and service

The Bolton Scholar Award for excellence in leadership and community service

The Case Alumni Association Prize for Achievement to the senior with the best academic record in The Case School of Engineering

The Kent H. Smith Award was established in 1961 by Case students and presented by the Case Student Senate to
honor Kent H. Smith, Case ‘17, for his service as a member of the Board of Trustees and as acting president from 1958 to 1961. The award is presented to an outstanding senior displaying extraordinary leadership, character, and scholarship in the Case School of Engineering.

The John Schoff Millis Award to the senior with the best academic record in the College of Arts and Sciences.

The Russell A. Griffin Award to a senior in the College of Arts and Sciences who has made the most significant contribution to campus life.

The Edward J. “Ted” Corcoran Award to a senior for outstanding leadership, character and service.
### 2004 – 2005 Majors/Minors/Sequences for Case Undergraduate Degrees

- **Major** – program of ten or more courses (required)
- **Major** - available only as 2nd major for B.A.; may be sole major for B.A. student who also completes B.S.
- **Minor** – program of five or six courses (optional)
- **Sequence** – program of three courses (required for degrees based on Engineering Core):
  - HA – Humanities and Arts
  - SS – Social Sciences
- **Foundation Curriculum** – for each degree/major a student must complete the foundation curriculum required for that degree/major:
  - GER = General Education Requirements: A&S = based on A&S GER; EC = based on Engineering CORE; FPB=based on School of Nursing GER; SAGES = SAGES Alternative as appropriate to school/degree; WSOM= based on WSOM GER

<table>
<thead>
<tr>
<th>Department Code</th>
<th>Subject</th>
<th>Degree(s)</th>
<th>Available as Major, Minor and/or Sequence</th>
<th>Foundation Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC</td>
<td>Accounting</td>
<td>BS</td>
<td>Major or Minor</td>
<td>WSOM or SAGES</td>
</tr>
<tr>
<td>EAR</td>
<td>Aerospace Engineering</td>
<td>BSE</td>
<td>Major</td>
<td>EC</td>
</tr>
<tr>
<td>AMS</td>
<td>American Studies</td>
<td>BA</td>
<td>Major* or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ANT</td>
<td>Anthropology</td>
<td>BA</td>
<td>Major, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>APM</td>
<td>Applied Mathematics</td>
<td>BS</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ARE</td>
<td>Art Education</td>
<td>BS</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ARH</td>
<td>Art History</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ARS</td>
<td>Art Studio</td>
<td>---</td>
<td>Minor or HA Sequence</td>
<td>---</td>
</tr>
<tr>
<td>AIN</td>
<td>Artificial Intelligence</td>
<td>---</td>
<td>Minor, HA or SS Sequence</td>
<td>---</td>
</tr>
<tr>
<td>ASI</td>
<td>Asian Studies</td>
<td>BA</td>
<td>Major, Major*, minor, or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>AST</td>
<td>Astronomy</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>BAF</td>
<td>Banking and Finance</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>BCH</td>
<td>Biochemistry</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>BIO</td>
<td>Biology</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>EBI</td>
<td>Biomedical Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>ECE</td>
<td>Chemical Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>CHE</td>
<td>Chemistry</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>CHS</td>
<td>Childhood Studies</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>CHI</td>
<td>Chinese</td>
<td>---</td>
<td>Minor or HA Sequence</td>
<td>---</td>
</tr>
<tr>
<td>ECI</td>
<td>Civil Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>CLS</td>
<td>Classics</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>COS</td>
<td>Communication Sciences</td>
<td>BA</td>
<td>Major, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ECM</td>
<td>Computer Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>CMP</td>
<td>Computer Science</td>
<td>BA</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>DAM</td>
<td>Dean’s Approved Major</td>
<td>BA or BS</td>
<td>Individually Designed Major</td>
<td>TBD</td>
</tr>
<tr>
<td>ECO</td>
<td>Economics</td>
<td>BA</td>
<td>Major, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>EAP</td>
<td>Electrical Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>ELN</td>
<td>Electronics</td>
<td>---</td>
<td>Minor (for BA only)</td>
<td>---</td>
</tr>
<tr>
<td>EGR</td>
<td>Engineering – Undesignated</td>
<td>BSE</td>
<td>Major</td>
<td>EC</td>
</tr>
<tr>
<td>EPH</td>
<td>Engineering Physics</td>
<td>BSE</td>
<td>Major</td>
<td>EC</td>
</tr>
<tr>
<td>EGL</td>
<td>English</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ENT</td>
<td>Entrepreneurial Studies</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>Department Code</td>
<td>Subject</td>
<td>Degree(s)</td>
<td>Available as Major, Minor and/or Sequence</td>
<td>Foundation Curriculum</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------</td>
<td>-----------</td>
<td>------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>GNV</td>
<td>Environmental Geology</td>
<td>BA</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>EST</td>
<td>Environmental Studies</td>
<td>BA</td>
<td>Major*, Minor or HA or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ETS</td>
<td>Ethnic Studies</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>EVB</td>
<td>Evolutionary Biology</td>
<td>BA</td>
<td>Major* or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>EFT</td>
<td>Fluid and Thermal Engineering</td>
<td>BSE</td>
<td>Major</td>
<td>EC</td>
</tr>
<tr>
<td>FRC</td>
<td>French</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>FFS</td>
<td>French and Francophone Studies</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>GEO</td>
<td>Geological Sciences</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>GEM</td>
<td>German</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>GES</td>
<td>German Studies</td>
<td>BA</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>GER</td>
<td>Gerontological Studies</td>
<td>BA</td>
<td>Major*, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>HST</td>
<td>History</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>HSP</td>
<td>History and Philosophy of Science</td>
<td>BA</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>HSS</td>
<td>History of Technology and Science</td>
<td>---</td>
<td>Minor or HA Sequence</td>
<td>---</td>
</tr>
<tr>
<td>IST</td>
<td>International Studies</td>
<td>BA</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ITL</td>
<td>Italian</td>
<td>---</td>
<td>Minor or HA Sequence</td>
<td>---</td>
</tr>
<tr>
<td>JPN</td>
<td>Japanese</td>
<td>---</td>
<td>Minor or HA Sequence</td>
<td>---</td>
</tr>
<tr>
<td>JPS</td>
<td>Japanese Studies</td>
<td>BA</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>JDS</td>
<td>Judaic Studies</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>MGT</td>
<td>Management</td>
<td>BS</td>
<td>Major</td>
<td>WSOM or SAGES</td>
</tr>
<tr>
<td>MID</td>
<td>Management Information and Decision Systems</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>EMS</td>
<td>Materials Science and Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>MAT</td>
<td>Mathematics</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>MAP</td>
<td>Mathematics and Physics</td>
<td>BS</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>EMC</td>
<td>Mechanical Engineering</td>
<td>BSE</td>
<td>Major</td>
<td>EC</td>
</tr>
<tr>
<td>MUS</td>
<td>Music</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>MUE</td>
<td>Music Education</td>
<td>BS</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>NAT</td>
<td>Natural Sciences</td>
<td>BA</td>
<td>Major* or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>NUR</td>
<td>Nursing</td>
<td>BSN</td>
<td>Major</td>
<td>FPB or SAGES</td>
</tr>
<tr>
<td>NTR</td>
<td>Nutrition</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>NBM</td>
<td>Nutritional Biochemistry and Metabolism</td>
<td>BA or BS</td>
<td>Major</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>PHI</td>
<td>Philosophy</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>PHY</td>
<td>Physics</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>POS</td>
<td>Political Science</td>
<td>BA</td>
<td>Major, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>POL</td>
<td>Polymer Science and Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>PAR</td>
<td>Pre-Architecture</td>
<td>BA</td>
<td>Major*, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>Department Code</td>
<td>Subject</td>
<td>Degree(s)</td>
<td>Available as Major, Minor and/or Sequence</td>
<td>Foundation Curriculum</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>-----------</td>
<td>------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>PSY</td>
<td>Psychology</td>
<td>BA</td>
<td>Major, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>PPY</td>
<td>Public Policy</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>RLG</td>
<td>Religion</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>RUS</td>
<td>Russian</td>
<td>---</td>
<td>Minor or HA Sequence</td>
<td>---</td>
</tr>
<tr>
<td>SOC</td>
<td>Sociology</td>
<td>BA</td>
<td>Major, Minor or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>SPA</td>
<td>Spanish</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>SPM</td>
<td>Sports Medicine</td>
<td>---</td>
<td>Minor</td>
<td>---</td>
</tr>
<tr>
<td>STA</td>
<td>Statistics</td>
<td>BA or BS</td>
<td>Major or Minor</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>ESC</td>
<td>Systems and Control Engineering</td>
<td>BSE</td>
<td>Major or Minor</td>
<td>EC</td>
</tr>
<tr>
<td>EDT</td>
<td>Teacher Education</td>
<td>BA</td>
<td>Major*</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>THR</td>
<td>Theater/Dance</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>WLT</td>
<td>World Literature</td>
<td>BA</td>
<td>Major, Minor or HA Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
<tr>
<td>WMN</td>
<td>Women's Studies</td>
<td>BA</td>
<td>Major*, Minor or HA or SS Sequence</td>
<td>A&amp;S or SAGES</td>
</tr>
</tbody>
</table>
The School of Graduate Studies (SGS) is the unit through which Case Western Reserve University offers graduate programs in the humanities and social sciences, biological and physical sciences, engineering, and selected disciplines related to professional fields. These programs lead to the degrees of Master of Arts, Master of Fine Arts (theater and dance), Master of Science, Master of Public Health, Master of Engineering and Management, Master of Engineering, Doctor of Musical Arts, and Doctor of Philosophy. Several programs offered jointly with the professional schools and local affiliated institutions lead to dual degrees such as M.A./J.D., M.A./Ph.D., M.A./M.D., M.A./J.D., M.A./M.S.N, M.S./M.D., M.S.S.A./Ph.D., Ph.D./M.P.H., M.P.H., M.S.N./M.P.H., M.B.A./M.P.H., M.D./M.P.H., M.P.H./M.A., and M.D./Ph.D. There are also two combined undergraduate and graduate programs, IGS (Integrated Graduate Studies) and B.S./M.S., which allows undergraduate students to enter graduate study before they complete their undergraduate programs. The School of Graduate Studies, overseeing university-wide standards of quality in admission and performance, presently awards graduate degrees in 70 basic disciplines with Ph.D. programs and 15 others in which the highest degree is the M.A., M.F.A., or M.S. Enrollment in the School of Graduate Studies for Fall 2004, excluding non-degree registrants, totaled 2025, of which 1093 were men, 932 were women, and 704 were international. Of those registrants 367 were new students, 1231 were full-time students, and 794 were part-time students. During the academic year 2002-2003, the school awarded 334 master’s degrees and 176 doctorates.

The Office of Postdoctoral Affairs located within the School of Graduate Studies is responsible for assisting in the development and implementation of all university policies applicable to post-doctoral scholars and for monitoring the application of these policies. Handbooks for both Postdoctoral Scholars and Fellows are available at the SGS and on the website; http://www.case.edu/provost/gradstudies/index.htm

ADMINISTRATION OF THE SCHOOL
Denise M. Douglas (University of Minnesota) 
Associate Dean of Graduate Studies

GRADUATE COMMITTEE
General responsibility for overseeing programs of graduate study and for academic and other general regulations applicable to all graduate students and programs is delegated to the University Faculty Senate Committee on Graduate Studies. Each department, school, or interdisciplinary committee is responsible for its particular graduate programs within the framework of the general regulations. The Committee on Graduate Studies consists of the Dean of Graduate Studies, Associate Dean of Graduate Studies, nine faculty members elected by the University Faculty Senate and four graduate students – three elected by the Graduate Student Senate and one appointed from the professional schools.

GRADUATE STUDENT SENATE
Students in the School of Graduate Studies are represented by a Graduate Student Senate, which consists of one student elected from each department that offers graduate programs. The officers of the senate are elected by the graduate student senators, who also select graduate student representatives to the University Faculty Senate and various campus committees.

FINANCIAL INFORMATION
For financial aid information see the “Financial Information” section of this Bulletin.
probable performance as a graduate student.

6. For departments and programs which require standardized tests, the results of the Graduate Record Examination, the Miller Analogies Test, or the Graduate Management Admission Test. (Contact the department for the tests that are required for the degree programs in that department.)

7. Certain programs require submission of writing samples, portfolios, scheduling of auditions and personal interviews. (Refer to departmental materials for details.)

Admission of International Students

The admissions criteria for international students are the same as U.S. residents except for the following:

1. International students whose first language is not English must be able to speak, read, write and comprehend English. English proficiency must be demonstrated by taking the Test of English as a Foreign Language (TOEFL). A score of at least 550 (paper-based) or 213 (computer-based) or completion of ELS Language Center, Level 112 with a grade of B at Case Western Reserve University is a mandatory requirement for admission and must be on file before registration will be permitted. Some departments may require higher scores.

Sylvan Learning Systems, Inc. administers the computer-based test year-round at permanent testing centers throughout the world. In addition, testing is offered at supplemental centers on specific dates or during specific time periods. For testing at supplemental centers, students must obtain the “Information Bulletin for Supplemental TOEFL Administrations” from TOEFL Services at P.O. Box 6151, Princeton, New Jersey 08541-6151, U.S.A.

Information bulletins are also available overseas at the Institute of International Education overseas branch offices; at the American-Korean Foundation in Seoul, Korea; at many U.S. Embassies.

Applicants are exempt from the TOEFL requirements if they (1) speak English as their native language; (2) have completed a bachelor’s degree or higher at a foreign university where the instruction was in English; (3) have completed six semester hours of sophomore level English literature in a U.S. college or university; or (4) have earned a bachelor’s degree or higher in a U.S. college or university with instruction in the English language.

If a student does not have an acceptable TOEFL score, he or she must contact ELS Language Center at Case. They are authorized to enroll foreign students. Admission to their courses is open to persons who can devote full time to an intensive language-learning program. Only persons who can give evidence of suitable academic background, adequate financial resources to cover living and school expenses, and seriousness of purpose will be approved for admission.

2. To obtain a student visa, international students must demonstrate financial sufficiency by submitting bank statements and other financial documents indicating sufficient funds to support the tuition and living expenses for one academic year.

3. For those students who are to receive financial aid from the department, the amount of funds required will depend on the amount of the aid award. In some cases it will be living expenses, and in others more funds will be required.

When a letter of acceptance for an international student has been issued, a copy is sent to the International Student’s Office where the I-20 is processed and sent to the student who must then obtain a student visa in order to begin study in the U.S. More detailed information can be obtained from the International Students’ Office and from the “Student Affairs” section of the Bulletin.

Admission Status

Full Standing

To be admitted to full standing the applicant must meet all the admissions criteria without conditions or academic provisions. Applicants must have a good academic record, e.g., a B average or rank in the upper third of his or her graduating class at an institution whose status and programs are readily assessed. The applicant will be expected to meet essentially all of the undergraduate prerequisites for the proposed field of graduate study. In addition to evidence of admissibility from transcripts, grade records, letters of recommendation and TOEFL test (English proficiency test for international students only), certain departments require that the applicant submit satisfactory scores on the Graduate Record Examination, the Miller Analogies Test, or the Graduate Management Admission Test.

Ordinarily a bachelor’s degree is required for unconditional admission to the graduate school. Under some circumstances, an admissions committee may recommend admission to the School of Graduate Studies on the basis of an equivalent experience. In this case, final approval for admission by the Dean of Graduate Studies is required.

Provisional Standing

Applicants who have academic deficiencies and do not qualify for admission with full standing are occasionally admitted provisionally. A student may give evidence of ability in his or her chosen field that is sufficiently convincing to warrant provisional admission, but the quantity or quality of the student’s preparation may be difficult to determine with sufficient certainty for admission in full standing. The provisions will be specified by the department to which the student is admitted, and stated in the official letter of admission from the Dean of Graduate Studies. A provisional graduate student is expected to complete appropriate course work and to meet the performance standards of the School of Graduate Studies within the first academic year of study. Although the provisional student’s records will be reviewed each semester, the student’s status will be reconsidered by the department no later than at the end of two semesters of study. At that time, if the student has satisfied the provisions
associated with his or her admission in the judgment of the department and the Dean of Graduate Studies, the student will be given full standing; otherwise, he or she will be separated from further graduate study in that department.

Conditional Standing

Applicants who have missing documentation in their admissions file (such as an official academic transcript with degree posted or official copies of test scores), or who are required to attain higher achievement levels on standard tests such as the GRE or TOEFL, as specified by either the department or the School of Graduate Studies may be admitted conditionally. The condition(s) specified in the letter of acceptance must be satisfied prior to matriculation in the School of Graduate Studies.

Postponement of Matriculation

Applicants are guaranteed admission only for the term specified in the letter of admission. An applicant who is unable to enroll in the semester for which he or she was initially admitted may request to postpone matriculation up to two regular academic semesters. In such cases, the department to which the applicant has applied may accept or reject the applicant's request, and the terms of readmission may differ from the original offer. If a delay of more than two semesters is requested, the applicant’s file must be reviewed and reevaluated by the department. If more than two years elapse since acceptance, the applicant must reapply in the same manner as a new applicant. Because applicant files are only kept for a maximum of two years, all documentation will have to be resubmitted.

Non-Degree Students

Individuals with earned bachelor's degrees that want to enroll in classes for personal enrichment or to satisfy prerequisite course requirements for later admission to graduate programs may enroll as non-degree students through the School of Graduate Studies. A student who wishes to register as a non-degree student should request the appropriate application form from the School of Graduate Studies and submit evidence that a bachelor's degree has been earned. Students may enroll in undergraduate and graduate level courses. However, for graduate (400 level and above) courses, written consent from the instructor must be obtained. Continued in non-degree status is at the discretion of the Dean of Graduate Studies.

Applicants who are interested in transferring course work into graduate degree programs are encouraged to seek early advice from the departments to which they intend to apply to insure that courses taken as non-degree students will satisfy departmental requirements. Non-degree students cannot assume that they will be admitted to any graduate degree program, or that all course work taken will transfer into the program. Only 400 level and higher course work will be considered for graduate transfer. The term of the earliest approved, transferred course will establish the date of entrance into the degree program. Courses transferred from non-degree status must have been taken within five years of the first term of matriculation as a degree seeking student and passed with a grade of B or better. Students considering transfer into a degree program will need to meet a minimum matriculation requirement of two semesters and six semester hours of coursework. Registration information and forms may be found on this web site: http://www.case.edu/provost/gradstudies/index.htm

Non-degree students are not permitted to enroll in more than 21 hours of coursework in one program. In order to continue taking courses in that program, the student must be accepted into the graduate degree program.

A Postgraduate Audit Program allowing registration for coursework is available to individuals who hold M.D., N.D., D.D.S., or Ph.D. and are involved in Case research or clinical programs. (See website for further information and required forms: http://www.case.edu/provost/gradstudies/index.htm.)

PLANNING THE STUDY PROGRAM

Graduate study presupposes a considerable maturity on the part of the student in planning and reaching his or her educational objectives. The effectiveness of the graduate program lies jointly with the individual student and the faculty Advisor or advisory committee through early, substantive planning discussions. The formal requirements set forth in these regulations are intended to aid in the maintenance of uniform minimum standards of performance, to form a basis for planning programs of graduate study, and to provide for efficient management and coordination.

For each graduate student, an official planned program of study consisting of the courses and other requirements for the M.A., M.F.A., M.S., ME, M.P.H., D.M.A., or Ph.D. degrees should be established in consultation with the major faculty Advisor or advisory committee. After the major faculty Advisor and department chair have approved the program of study, it should be submitted to the Dean of Graduate Studies to be placed in the student’s file. At the latest, students enrolled in Master’s programs must submit an approved program of study along with an application to graduate. For doctoral students, it must be submitted when the student advances to candidacy. A revised program of study must be submitted when any change in the original plan occurs. For graduate engineering students, additional details regarding degree program requirements are given in the Engineering section of the Bulletin. The various departments and schools may make such additional regulations concerning programs of study as may be necessary to reach particular academic goals. These regulations must be in writing, with a copy filed in the School of Graduate Studies.

THE ACADEMIC ADVISOR

Each graduate student will have a faculty advisor or advisory committee assigned by the department or professional school to assist the student in planning the pro-
gram of study best designed to enable the student to reach appropriate educational objectives.

ACADEMIC REQUIREMENTS FOR MASTER’S DEGREES

In recognition that the objectives of master’s degrees differ for various departments and for individual students, especially in the importance given to research, two general plans for master’s degrees may be followed:

Plan A
M.A. or M.S. with a thesis based on individual research and a final oral examination.

Plan B
M.A., M.F.A., M.P.H., or M.S. without a thesis but requiring a comprehensive examination and/or a major project to be administered by the academic unit.

The Master’s Thesis (Plan A)

The minimum requirements for the master’s degree under Plan A are 18 semester hours of course work plus a thesis equivalent to at least 9 semester hours of registration, or 21 semester hours of course work plus a thesis equivalent to at least 6 semester hours of registration. Once registered for thesis credit (Course 651), a student must continue 651 registration each succeeding regular semester until graduation. However, if a student is registered for course work or research toward the doctorate in the semester in which the thesis examination is expected to occur, concurrent registration for 651 is not required. At least 18 semester hours of course work, including thesis, must be at the 400 level or higher.

Each student must prepare an individual thesis. Joint theses are not permitted. The written thesis must conform to regulations concerning format, quality, and time of submission as established by the Dean of Graduate Studies. Detailed instructions can be obtained from the School of Graduate Studies and can be found at the following web site: http://www.case.edu/provost/gradstudies/index.htm

For completion of master’s degrees under Plan A, an oral examination (defense) of the master’s thesis is required. This examination is conducted by a committee of at least three members of the university faculty, and the candidate’s thesis Advisor customarily serves as the chair of the examining committee. The other members of the committee are appointed by the chair of the department or curricular program faculty supervising the candidate’s course of study. The examining committee must agree unanimously that the candidate has passed the thesis examination. Because theses are made public immediately upon acceptance, they should not contain proprietary or classified material. When the research relates to proprietary material, the student and Advisor are responsible for making preliminary disclosures to the sponsor sufficiently in advance to permit timely release of the thesis, and these plans should be disclosed when the thesis is submitted to the School of Graduate Studies.

The Master’s Comprehensive (Plan B)

The minimum requirements for the master’s degree under Plan B are 27 semester hours of course work, a comprehensive examination, and in some fields, an approved project. At least 18 semester hours of course work must be at the 400 level or higher.

Each candidate for the master’s degree under Plan B must pass satisfactorily a comprehensive examination to be administered by the department or curricular program committee. The examination may be written or oral or both. A student must be registered during the semester in which any part of the comprehensive examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 600, Comprehensive Examination, before taking the examination.

Engineering students are required to complete 3 to 6 semester hours of Special Problems (Project) course work, which must consist of an engineering project approved by the chair of the department offering the degree program, and may be carried out at the student’s place of employment with nominal supervision by a faculty Advisor or in the departmental laboratories under direct supervision. The project must culminate in a written report and examination by at least three professors including approval by the chair of the department.

Performance evaluation for course 601 (Independent study/Research) is limited to P/NP grading.

Theater students in the M.F.A. program are required to register for six semester hours of Thesis Production (creative project), followed by an oral and written defense.

ACADEMIC REQUIREMENTS FOR DOCTORAL DEGREES

The degree of Doctor of Philosophy is awarded in recognition of in-depth knowledge in a major field and comprehensive understanding of related subjects together with a demonstration of ability to perform independent investigation and to communicate the results of such investigation in an acceptable dissertation.

Curricular Requirements

Within the framework of these general regulations, it is expected that a relevant program of study will be planned for each candidate for the doctorate by the student and the faculty Advisor or advisory committee. Such a program should include appropriate courses, together with work on the doctoral dissertation, and may also include, where relevant, such experiences as field work or practicum.

Although specific requirements vary among departments, students entering with a bachelor’s degree will satisfactorily complete a minimum of 36 semester hours of courses (which may include independent study/research, course 601), tutorials, and seminars. For students entering with an approved master’s degree, completion of at least 18 semester hours of course work is required. A minimum of 18 semester hours of dissertation research
(Course 701) is required for all doctoral students.

Examination Requirements
In order to meet the requirements for the doctorate, a student must pass satisfactorily a general examination (or a series of examinations covering different fields) specified and administered by the student's department or supervising committee. The examination generally precedes advancement to candidacy. A student must be registered during the semester in which any part of the general or qualifying examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 700, General/Qualifying Examination, before taking the examination. A student who fails the examination on the first attempt may be permitted to take the examination a second time within one year at the discretion of the department. Except in unusual circumstances, a student who fails the examination a second time will be separated from further graduate study within the same department or program.

Advancement to Candidacy
The formal acceptance of a student as a candidate for the doctoral degree is the responsibility of the student's department or the committee supervising the doctoral program in accordance with the written procedures of the academic unit. At its discretion the supervising unit may require a student to pass qualifying examinations before candidacy is granted. Generally, advancement to candidacy allows the student to enter the dissertation research phase of the degree program, and occurs after all course work and exam requirements are satisfied. Students are expected to make regular and continuous progress toward the degree. Advancement to candidacy in a Ph.D. program should occur within a maximum of 6 years post-matriculation with a bachelor's degree (no later than at the completion of 36 semester hours of graduate study) and 4 years post-matriculation with a master's degree (no later than at the completion of 18 semester hours of graduate study). Students may continue in pre-candidacy status beyond this time by means of a petition to the School of Graduate Studies by a program director, based on evidence of student progress toward the degree. Individual programs can require advancement to candidacy before the time limit set in this policy.

The Dean of Graduate Studies must promptly be notified in writing of the decision concerning a student's advancement to candidacy, and a copy of the notification must be sent to the student concerned. A student who is refused candidacy status may not undertake further study for credit toward the doctoral degree within the same department or supervising unit. With the approval of both the department concerned and the Dean of Graduate Studies, such a student may:
1. Take additional courses, if required, in order to complete a master's degree in that department.
2. Seek admission to the graduate program of another department.

Course 701 Requirements

Pre- and Post-Candidacy Dissertation Research
When a student has been advanced to candidacy, he or she may begin dissertation research by formally registering for course 701 credits. At the point at which students begin registering for course 701, the department must identify a university faculty member who will serve as the doctoral student's principal research advisor, and formally notify the Dean of Graduate Studies. Students who have been advanced to candidacy may register for 1-9 credits of course 701 each fall and spring semester (or up to 6 credits for the summer when needed). In certain cases, students who have not advanced to candidacy may begin registering for up to 6 credit hours of course 701 at the discretion of the department and upon written notification to the Dean of Graduate Studies. Pre-Candidacy 701 hour(s) can only be taken concurrently with course work. Once a student begins registration of 701 hours, he or she must register for at least one credit hour of 701 each semester until graduation. Once 701 registration begins doctoral students have five consecutive calendar years from the semester of the first credited 701 registration, including leaves of absence, to complete all requirements for the doctorate.

Course 703 Requirements

Dissertation Fellowship and Post-Candidacy Research
Students who have been advanced to candidacy and are within the five-year time limit for completion of the degree, but have not completed the dissertation, can register for 703 upon departmental recommendation and the approval of the School of Graduate Studies. Students will register for up to 8 credit hours for Dissertation Fellowship (703), but must also co-register for a least 1 credit hour of 701 or one credit hour of 701 and a course, with the total registration hours equaling 9 credit hours. No tuition is charged for 703 when accompanied by a paid credit hour(s) of tuition. This Dissertation Fellowship is available for a maximum of 6 consecutive semesters and cannot exceed a total of 36 credit hours. If the dissertation is not completed and defended in the last semester of the fellowship, the fellow must resume registration for course 701 at a minimum of one credit hour each semester through the allowed five-year limit. Registration for 703 cannot be used to postpone the normal timetable for completion of the 18 credit hour 701 requirement.

Foreign Language Requirements
Although there is no general foreign language requirement for the doctorate, each department or supervising committee may set such requirements as are appropriate to the student's program of study. It is the student's responsibility to ascertain the foreign language requirements approved by the supervising unit. Each department must notify the Dean of Graduate Studies in writing of the specific language(s) required and the date of examination determining the student's proficiency in the required language(s).
Dissertation Requirements

All candidates for the Ph.D. degree must submit a written dissertation as evidence of their ability to conduct independent research at an advanced level. The dissertation must represent a significant contribution to existing knowledge in the student’s field, and at least a portion of the content must be suitable for publication in a reputable professional journal or as a book or monograph. Students must prepare their own dissertations. Joint dissertations are not permitted. The written dissertation must conform to regulations concerning format, quality, and time of submission as established by the Dean of Graduate Studies. Detailed instructions can be obtained from the School of Graduate Studies and are posted on the following web site: http://www.case.edu/provost/gradstudies/index.htm

Research work connected with a dissertation is to be carried out under the direct supervision of a member of the university faculty selected by the student in consultation with departmental faculty and approved by the chair of the department.

Two copies of each completed and acceptable dissertation will be deposited in the university library by the School of Graduate Studies. In addition, the student must guarantee the reproduction of the dissertation through University Microfilms, Ann Arbor, Michigan, before certification for the doctorate. Because dissertations are made public immediately upon acceptance, they should not contain proprietary or classified material. When the research relates to proprietary material, the student and Advisor are responsible for making preliminary disclosures to the sponsor in advance to permit timely release of the dissertation. These arrangements must be disclosed when the thesis is submitted to the School of Graduate Studies. (Most forms required may be found at the following web site: http://www.case.edu/provost/gradstudies/index.htm.)

Dissertation Advisory Committee

Each doctoral student is responsible for becoming sufficiently familiar with the research interests of the department or program faculty to choose in a timely manner a faculty member who will serve as the student’s research Advisor. The research Advisor is expected to provide mentorship in research conception, methods, performance and ethics, as well as focus on development of the student’s professional communication skills, building professional contacts in the field, and fostering the professional behavior standard of the field and research in general.

The research Advisor also assists with the selection of at least two other faculty to serve as members of the dissertation advisory committee. At a minimum, the dissertation defense committee must consist of four members of the university faculty, including at least one whose primary appointment is outside the student’s program, department or school. The committee is appointed by the Dean of Graduate Studies upon recommendation of the Chair of the department, division, or curricular program committee.

The student’s dissertation Advisor must be a member of the dissertation advisory committee and may serve as chair. The chair of the committee must be a Case Western Reserve University tenured or tenure-track faculty member in the student’s program. Any tenured or tenure-track Case faculty member, and any full time Case faculty member whose primary duties include research who is authorized to serve on a Ph.D. dissertation committee by the school or college through which they are affiliated with the university, may serve on a Ph.D. dissertation committee. Any appropriate researcher may serve on a Ph.D. committee upon approval by the dean of Graduate Studies of a request by the program or department. A petition with the rationale for the request must be presented to the Dean along with the proposed member’s curriculum vitae. Under special conditions, a former faculty member whose time of leaving the university has not exceeded 18 months may be approved as a voting university member by the Dean of Graduate Studies.

Throughout the development and completion of the dissertation, members of the dissertation defense committee are expected to provide constructive criticism and helpful ideas generated by the research problem from the viewpoint of their particular expertise. Each member will make an assessment of the originality of the dissertation, its value, the contribution it makes, and the clarity, with which concepts are communicated, especially to a person outside the field. The doctoral student is expected to arrange meetings and maintain periodic contact with each committee member. A meeting of the full committee for the purpose of assessing the student’s progress should occur at least once a year until the completion of the dissertation.

Final Oral Examination (Defense of Dissertation)

Each doctoral candidate is required to pass a final oral examination in defense of the dissertation. The examination may also include an inquiry into the candidate’s competence in the major and related fields.

The defense must be scheduled with the School of Graduate Studies no later than three weeks before the date of the examination. The chair of the examining committee should give approval to schedule the defense when the written dissertation is ready for public scrutiny. The candidate must provide to each member of the committee a copy of the completed dissertation at least 10 days before the examination so that the committee members have an opportunity to read and discuss it in advance.

Scheduled defenses are made known through on-campus publication, and any member of the university may be present at that portion of the examination pre-designated as public by the chair of the dissertation advisory committee. Others may be present at the formal defense only by invitation of that chair.

It is expected that all members of the dissertation defense committee by present at the defense. Exceptions to this rule: a) must be approved by petition to the Dean of Graduate Studies and only under extraordinary circumstances, b) no more
than one voting member can ever be absent, c) the absent member must participate through real-time video conferencing at departmental expense; however, if such video conferencing is not available, the absent member may participate through telephone conferencing; and d) the student must always be physically present.

The dissertation advisory committee is responsible for certifying that the quality and suitability of the material presented in the dissertation meet acceptable scholarly standards. A student will be certified as passing the final oral examination if no more than one of the voting members of the committee dissents.

Institutional Review Board (IRB)

The promotion of scholarship and the discovery of new knowledge through research are among the major functions of Case Western Reserve University. If this research is to be meaningful and beneficial to humanity, involvement of human subjects as experimental participants is necessary. It is imperative that investigators in all disciplines strive to protect human subjects. University policy and federal regulations demand compliance. Per federal regulations (45 CFR 46), all research involving human subjects requires submission of an IRB application prior to initiation of research to the Case Western Reserve IRB. THIS INCLUDES ALL RESEARCH CONDUCTED FOR THeses AND DISSERTATIONS THAT INVOLVE HUMAN SUBJECTS.

Each IRB application must have a faculty member noted as the Responsible Investigator. Applications that are not fully completed as instructed will not be accepted. See University Policy on the involvement of Human Participants in Research for guidelines under which investigations involving human subjects may be pursued.

COURSE DESIGNATIONS

Courses numbered 100 to 399 are undergraduate-level courses. Courses numbered 400 and higher are graduate-level courses.

GRADING SYSTEM

See the “University” section of this Bulletin for a list of valid grades for the School of Graduate Studies and their appropriate use in assigning to graduate students. The only grades that can be changed after they have been assigned by the instructor are Incompletes (I). All others will remain permanently on the student’s academic record. Additional work cannot be done to change an existing grade to a higher grade.

There are some grading schemes in the School of Graduate Studies that have important policy implications. They are:

Incomplete (I)

Grades of I should only be assigned for letter graded and Pass/No Pass courses for extenuating circumstances, and only when a student fails to complete a small segment of the course. Students may not sit in the same course in a later semester to complete the work required for the original course. All work for the incomplete grade must be made up, and the change of grade recorded in the Office of the University Registrar, by the date specified by the Instructor, but no later than the last day of class in the semester following the one in which the I was received. Grade changes received after that date must be accompanied by a petition signed by both the advisor and the chair of the department indicating the reason for the late change and must be approved by the Deputy Provost. Unresolved Incomplete grades will remain permanently on the student’s academic record, if the work is not made up by the designated deadline. A student who has a permanent Incomplete for a required course must retake the course in a later term. When an I grade is assigned by the instructor, he or she must also submit to the School of Graduate Studies the completed “Arrangement to Resolve a Grade of Incomplete” form (see: http://www.case.edu/provost/gradstudies/index.htm) indicating the date that the I grade will be resolved. If the student cannot complete the work for the Incomplete by the specified deadline, he or she must petition for an extension which must be endorsed by the instructor, and explain the reasons why the work has not been completed, and include a new date for completion. Students will be allowed only one extension of no more than one additional semester to complete the work for an I grade.

Pass/No Pass (P/NP)

Some graduate courses are graded on a pass or no pass basis, and students need to be aware of the regulations governing letter graded and pass/no pass credits. Of the minimum credit hours required beyond the bachelor’s degree to complete course work requirements, at least 12 credits must be letter graded for the Master’s degree, and at least 24 credits must be letter graded for the Ph.D. degree. For students with approved master’s degrees who are admitted to Ph.D. programs, at least 12 credits of the required minimum of 18 credits of course work must be letter graded. Letter graded courses should be the courses most central to the student’s plan of study. Additional credit hours of letter graded course work may be specified by departmental policy. Performance evaluation for course 601 (Independent study/Research) is limited to P/NP grading.

Satisfactory/Unsatisfactory (S/U)

Grades of Satisfactory (S) and Unsatisfactory (U) are to be used exclusively for three courses: 651 thesis research; 701, dissertation research; and 703, dissertation fellowship. Satisfactory indicates an acceptable level of progress towards completion of the research required for the degree, and Unsatisfactory indicates an unacceptable level of progress towards completion of the research for the degree. Any student who receives a grade of U will automatically be put on academic probation, and if a second U is received, the student will be separated from further study in his or her degree program.
ACADEMIC POLICIES

Graduate Student Rights and Responsibilities

It is the responsibility of the student to become familiar with the general rules and regulations of the university not just those of the School of Graduate Studies. A member of the university community who is accused of violating any of these rules and regulations is subject to university disciplinary action. Due process procedures of adequate notice of all charges and a fair hearing will apply. Case Western Reserve University has established a mechanism whereby students of the university may express a grievance against the actions of other students or members of the faculty and staff. A statement of the policies and procedures to be followed in the case of academic infractions by graduate students may be obtained through the School of Graduate Studies. The policies and procedures governing all other infractions are detailed in the university’s annual Student Services Guide and in the “Student Affairs” section of this Bulletin. The University Office of Student Affairs should be consulted for non-academic infractions.

It is also the responsibility of the student to become acquainted with the general regulations and administrative procedures governing graduate study, together with the departmental or school regulations which apply to the student’s course of study, and, in consultation with the faculty Advisor or advisory committee of the supervising unit, to plan the program and carry out the work in accordance with these regulations and procedures.

Departmental Responsibility for Requirements

Requirements for master’s and doctoral degrees beyond those set forth in these regulations may be established by departments or curricular program committees with the approval of the Dean of Graduate Studies. Individual students may be required to take courses beyond the published requirements in order to successfully complete their degree programs.

In such instances the student must be notified in writing upon matriculation by the chair of the department or curricular program, with a copy to be filed in the School of Graduate Studies.

Maintenance of Good Standing

A student maintains standing in the School of Graduate Studies by registering each fall and spring semester unless on an official leave of absence which has been approved by the School of Graduate Studies. A student is in good standing who meets the standards set by the academic department and the School of Graduate Studies to ensure normal progress toward the fulfillment of the stated requirements at levels of quality without warning or probation or extension of the allowable time limit for degree completion. Students whose quality point averages fall below minimum standards (3.00 for doctoral students; 2.75 for master’s) will automatically be placed on probation until the minimum standards are achieved. In addition, a student will be subject to separation from the university for any of the following reasons:

1. Failure to achieve a quality-point average of 2.50 or higher at the completion of 12 semester hours or 2 semesters of graduate study.

2. Failure to achieve a quality-point average of 2.75 or higher at the completion of 21 semester hours or 4 semesters of graduate study.

3. Failure to receive a grade of S in thesis research 651 or dissertation research 701/703. A student who receives a grade of U in thesis (Course 651) or dissertation research (Courses 701/703) will be placed on probation and be subject to separation. The probationary status will be recorded on the student’s transcript. The student must be removed from probation by the end of the semester immediately following receipt of the grade of U by repeating the course for the same number of credit hours, and achieving a grade of S. Although removal from probation restores the student’s good standing, the grade of U received will not be canceled or substituted by the grade of S subsequently received.

4. Failure of a conditionally or provisionally admitted student to satisfy the conditions or provisions stated in the letter of acceptance by the end of the first academic year (2 semesters) or after 18 credits of course work.

5. Failure to make progress towards degree completion. If the student is not making progress towards degree completion, and it has been judged that the student is unlikely to be successful in working independently and productively toward the completion of the thesis or dissertation research, the department and/or the Dean of Graduate Studies (in consultation with the department) can recommend academic separation.

6. In addition to disciplinary actions based on academic standards, on recommendation of the student’s department or school, the Dean of Graduate Studies can suspend or separate a student from the university for failure to maintain appropriate standards of conduct and integrity. Such a suspension or separation will be implemented only for serious breaches of conduct that threaten to compromise the standards of a department or create concern for the safety and welfare of others. In the event of such suspension or separation, the student will be entitled to an appeal through the grievance procedure of the Graduate School.

Maintenance of Quality-Point Average

In calculating the quality-point average, courses taken as a student in the School of Graduate Studies at the 400 level or above, as well as any courses accepted toward fulfillment of degree requirements
for which quality points are given, will be counted, including courses which may need to be repeated. Unless otherwise stated by the department, a minimum cumulative quality-point average of 2.75 is required for the award of the Master’s degree, and a minimum cumulative quality-point average of 3.00 is required for award of the doctoral degree. Any department, school, or curricular program committee may choose to establish quality standards higher than those stated above if such additional requirements are made known in writing to the students upon matriculation, and are recorded with the Dean of Graduate Studies. In that case, the departmental standards supersede the minimum standards. Students who do not maintain the minimum quality point average will be placed on academic probation until the minimum standard has been achieved.

Residency Requirement

The doctoral residency requirement is intended to insure a period of intensive academic interaction with faculty and peers and of sustained independent research. Graduate students are considered to be in residence when they are fully engaged in academic work. As resident students, they may teach at the university, take graduate courses, assist in course development, and engage in research or in other scholarly activities at the university. Regardless of the nature of the work, the student’s regular presence at the university is expected during fulfillment of the residency requirement.

The formal fulfillment of residency requires continuous registration in at least six consecutive academic terms (fall, spring and/or summer) from matriculation to a period not exceeding five years after the first credited hour(s) of dissertation research (701). The period while students are on a leave of absence do not count towards fulfilling the residency requirement. Within the context of continuity of registration, departments may enact other restrictions. In such instances, the departmental requirements take precedence and must formally be disclosed to the student at matriculation.

This is meant to be a reflection of the appropriate reality that departments and fields have different norms and traditions of graduate study. For example, to fulfill the residency requirement, some departments may require the doctoral student to be registered for 9 or more semester hours of graduate credit in each of two consecutive semesters. Fulfillment of residency by all engineering Ph.D. candidates will be certified by their research Advisors and department chairs based on an assessment of active, concentrated involvement for a period of two consecutive semesters during their pursuit of the doctorate.

Time Limitation

All the requirements for the master’s degree must be completed within five consecutive calendar years after matriculation as a graduate student, including any leaves of absence. Doctoral students have five consecutive calendar years from the semester of the first credited 701 registration, including leaves of absence, to complete all requirements for the doctorate. Any graduate student who fails to complete the requirements within the five-year limit for his or her degree program will be subject to separation from further study unless granted an extension by the Dean of Graduate Studies with the recommendation of the faculty Advisor or advisory committee and approval by the department chair. An extension may be granted if the student and his or her advisor work out a plan of action for degree completion within a specified time frame which must be endorsed by the department chair. Students will be expected to meet all the specified deadlines outlined in the plan of action. The minimum acceptable registration during this extended period for each semester until graduation is three credit hours of 651 or 701, or, for Plan B Master’s students, an appropriate course.

Leave of Absence from Graduate Study

Students undertaking graduate work are expected to pursue their studies according to a systematic plan each year whether registered for full or part-time study. Occasionally a student finds it necessary to interrupt his or her studies before completion of the graduate program. A leave of absence is not to be requested unless the circumstances are such that the student cannot continue graduate study. Under such circumstances, the student must request in writing a leave of absence for a period not to exceed two consecutive regular academic semesters (see web site for forms: http://www.case.edu/provost/gradstudies/index.htm).

In exceptional circumstances, the leave can be extended for another two semesters. However, the maximum amount of leave permitted per graduate program is four semesters. The reason for the leave must be stated clearly, and the request must be submitted to the Dean of Graduate Studies with the written endorsement of the student’s academic department. During a leave of absence the student must not seek aid from faculty members or use of the facilities of the university. This means that students may not take exams or defend theses and dissertations while on a leave. A leave of absence does not extend the maximum time permitted for the completion of degree requirements, and a leave cannot be taken while students are on extension of the five-year limit. At the expiration of the leave the student must resume registration unless formally granted an extension of the leave. Retroactive leaves are not permitted. A student who fails to obtain a leave of absence, or who fails to register following an official leave, must petition the Dean of Graduate Studies for reinstatement in order to resume work as a student in good standing at the university.

A student who is granted a maternity or paternity leave of absence related to infant care, as well as those who must fulfill military duty obligations can petition to extend the five-year time limit associated with completion of the degree. The length of the extension may not exceed two years. International students must check with the Office of International Student Services before petitioning for a leave of absence, as such a leave can affect their visa status.
Withdrawal and Resignation

Students must maintain continuous registration throughout their degree programs unless granted an official leave of absence. Students who fail to register for any academic term will be automatically withdrawn from their programs. Students who are withdrawn from their programs must petition for reinstatement in order to continue graduate study. The petition must be approved by both the student's department and the Dean of Graduate Studies before the student may register for further course work as a student in full standing. In each case of readmission with full standing, the official letter will state the terms of readmission, including future time limits for the degree program, and the past course work that will be credited toward the degree. If more than 24 months have elapsed since the last registration, students may have to resubmit file materials if requested by the School of Graduate Studies.

Transfer of Credit

Transfer of credit from another university toward master's and doctoral degree requirements is awarded for appropriate course work (not applied to another degree program) taken prior to admission. Transfer of credit must be requested in the student's first academic year, and must be appropriate for the student's planned program of study. For master's candidates, transferred credit is limited to six semester hours of graduate-level courses, and no credit for master's thesis may be transferred from another university. No transfer of credit will be awarded towards the Ph.D. degree except by petition, and no credit for the doctoral dissertation may be transferred from another university.

Students who wish to receive credit for courses taken outside the university once they are enrolled must petition for approval. All transfer of credit requires approval from the student's advisor, the departmental chair or graduate committee, and the Dean of Graduate Studies. Such courses must have been taken within five years of first matriculation at Case Western Reserve University and passed with grades of B or better. Seniors of exceptional ability in the undergraduate programs of Case Western Reserve University who have the approval of the Dean of Undergraduate Studies and the Dean of Graduate Studies may apply to receive credit for graduate courses completed in excess of the undergraduate degree requirements. (see forms on website: http://www.case.edu/provost/gradstudies/index.htm)

Changes in Registration

To add or withdraw from courses or to change registration from credit to audit or the reverse, a student must obtain the appropriate official form to submit to the University Registrar in accordance with the dates published each academic term for such actions to be taken. Students must make appropriate changes to their schedules by the end of the first week of classes in order to avoid paying full tuition for courses withdrawn after the final drop/add date. Only complete withdrawal for the semester entitles a student to a percentage refund of the withdrawn courses after the first week of classes. (See the “Financial Information” section of the Bulletin under Refunds). Failure to attend class or merely giving notice to the instructor will not be regarded as official notice of withdrawal or change. When making changes in registration, the international student must be aware of maintaining full-time status. Full-time status requires registration for a minimum of 9 semester hours per semester. Students financed by federal loans must remain registered for at least 6 semester hours (defined as half-time) each semester to maintain continued eligibility for that funding or to initiate such a loan.

Graduation

A candidate for a degree awarded by the School of Graduate Studies must make application for the degree to the School of Graduate Studies by the deadline established for that semester, which is approximately twelve weeks before the commencement date for which the degree is expected to be awarded. Students are encouraged to contact the School of Graduate Studies at the beginning of the semester in which they intend to graduate to obtain a packet of graduation materials. The candidate must meet all the deadlines for completion of degree requirements set forth in the calendar. All candidates must be registered for credit and in good standing during the semester in which the degree is awarded. Payment of tuition, fees, and fines is a prerequisite to the award of a degree.

Delayed Graduation

It is a requirement of the School of Graduate Studies that a student be registered for credit in the semester in which he or she completes all the requirements to graduate in accordance with established deadlines for that semester. For a student engaged in thesis or dissertation research the completion of all requirements to graduate is not easily predicted, making it difficult to adhere to scheduled deadlines. If a student will not be able to meet the degree requirements to graduate in one semester, but will finish before the next semester begins, he or she can petition for a waiver of the requirement to be registered in the semester of graduation. To be granted a waiver of registration students must be registered for the appropriate thesis or dissertation credit hours in the semester (or summer session) immediately preceding the semester of graduation, complete all degree requirements including a current application to graduate, and submit all required materials to the School of Graduate Studies by the last day scheduled for the Drop/Add period of the next semester.

A student who qualifies for the waiver will be awarded the degree at the next graduation without the need to be registered or to pay a special fee. If a student fails to meet the waiver deadline, he or she will be required to register for the appropriate thesis or dissertation credit hours in the next semester, and to reapply for graduation in that semester.

Exceptions to Regulations

Students have the right to petition for exceptions to these regulations. Such a
petition should be addressed to the Dean of Graduate Studies. In most cases the student's department or program committee must endorse the petition.

**Graduate Student Grievance Procedure**

It is the responsibility of the School of Graduate studies to assure that all students enrolled for graduate credit at Case Western Reserve University have adequate access to faculty and administrative consideration of their grievances concerning academic issues. A three-step procedure has been established for graduate students to present complaints about academic actions they feel are unfair.

1. Students with complaints should first discuss their grievances with the person against whom the complaint is directed.

2. In those instances in which this discussion does not resolve a grievance to the student's satisfaction, a complaint should be presented in writing to the Department Chairperson.

3. In the event that a decision still appears to the student, the student may bring the matter to the attention of the Dean of Graduate Studies. The Dean may ask the student to put the complaint in writing. The Dean will then discuss the case with the student and the Department Chairperson to evaluate the particulars and to make a ruling on it.

The Dean of Graduate Studies has the responsibility for the final decision, and the ruling from the Dean's Office will be considered final and binding on the persons involved in the grievance. Additional information about the grievance procedure can be obtained from the School of Graduate Studies.

It should be understood that this grievance procedure relates solely to graduate student complaints concerning academic issues. The procedure for handling complaints about other matters is detailed in the University's Students Services Guide.

**PROCEDURES AND SANCTIONS FOR GRADUATE STUDENT ACADEMIC INFRACTIONS**

Graduate students accused of violating the University's standards of conduct, which are detailed in this Academic Integrity Policy (located on the SGS website: http://www.case.edu/provost/gradstudies/index.htm) are entitled to adequate notice of all charges and to a fair hearing and may subsequently be subject to disciplinary action. The process that is outlined in the Academic Integrity Policy will apply to academic infractions, e.g., cheating on examinations, plagiarism, and other forms of dishonesty in academic activities. Additional information is available from the School of Graduate Studies.
Case School of Engineering

500 Nord Hall
www.engineering.case.edu
cseinfo@case.edu
Phone 216-368-4436; Fax 216-368-6939
Robert F. Savinell, Dean
E-mail rfs2@case.edu

Engineering seeks to create new processes, products, methods, materials, or systems that impact and are beneficial to our society. To enable its graduates to lead the advancement of technology, The Case School of Engineering (CSE) offers 14 degree programs at the undergraduate level (13 engineering degrees plus the B.S. in computer science). At the post-graduate level, CSE offers Master of Science programs and the Doctor of Philosophy for advanced, research-based study in engineering. CSE also offers two specialized degrees at the Master's level: a Master of Engineering specifically for practicing engineers, and an integrated Master of Engineering and Management jointly administered with the Weatherhead School of Management. The faculty and students participate in a variety of research activities offered through the departments and the interdisciplinary research centers of the university.

At the core of its vision, The Case School of Engineering seeks to set the standards for excellence, innovation, and distinction in engineering education and research prominence.

STATEMENT OF EDUCATIONAL PHILOSOPHY

The Case School of Engineering prepares and challenges its students to take positions of leadership in the professions of engineering and computer science. Recognizing the increasing role of technology in virtually every facet of our society, it is vital that engineering students have access to progressive and cutting-edge programs stressing five areas of excellence

• Mastery of fundamentals
• Creativity
• Societal awareness
• Leadership skills
• Professionalism

Emphasizing these core values helps ensure that tomorrow's graduates are valued and contributing members of our global society and that they will carry out the tradition of engineering leadership established by our alumni.

The undergraduate program aims to create life-long learners by emphasizing engineering fundamentals based on mathematics and physical and natural sciences. Curricular programs are infused with engineering creativity, professionalism (including engineering ethics and the role of engineering in society), professional communications, and multi-disciplinary experiences to encourage and develop leadership skills. To encourage societal awareness, students are exposed to and have the opportunity for in-depth study in the humanities, social sciences, and business aspects of engineering. Undergraduate students are encouraged to develop as professionals. Opportunities include the Cooperative Education Program, on-campus research activities, and participation in the student chapters of professional societies. Graduates are prepared to enter the workforce and be strong contributors as practicing engineers, or continue for advanced study in engineering.

At the graduate level, the Case School of Engineering combines advanced classroom study with a rigorous independent research experience leading to significant results appropriate for publication in archival journals and/or presentation at leading technical conferences. Scientific integrity, engineering ethics, and communication skills are emphasized throughout the program.

BRIEF HISTORY

The Case School of Engineering was established on July 1, 1992, by an action of the Board of Trustees of Case Western Reserve University as a professional school dedicated to serving society and meeting the needs of industry, government and academia through programs of teaching and research.

The Case School of Engineering continues the tradition of rigorous programs based on fundamental principles of mathematics, science and engineering that have been the hallmark of its two predecessors, the Case School of Applied Science (founded in 1880) and the Case Institute of Technology (1947). The formation of the Case School of Engineering (CSE) is a re-commitment to the obligations of the gift of Leonard Case, Jr., to serve the citizens of Northern Ohio. CSE has been a leader in many educational programs, being the first engineering school to offer undergraduate programs in computer engineering, biomedical engineering, polymer engineering and systems and control engineering.

ADMINISTRATION

Robert F. Savinell, Ph.D. (University of Pittsburgh)
Dean of the Case School of Engineering and George S. Dively Professor of Engineering
James D. McGuffin-Cawley, Ph.D. (Case Western Reserve University)
Associate Dean of Undergraduate Programs
Joseph M. Mansour, Ph.D. (Rensselaer Polytechnic Institute)
Associate Dean of Research and Graduate Programs
Christine A. Ash, M.B.A. (Bowling Green State University)
Assistant Dean of Curricular Enhancements and External Assessments
David C. Hensel, B.S. (Central Michigan University)
Assistant Dean of Administration and Finance

Anne M. Borchert, B.A. (Vassar College)
Assistant Dean of Development and External Affairs

ENGINEERING DEGREES GRANTED
1. Bachelor of Science in Engineering degree with major designations as follows
   Aerospace engineering
   Biomedical engineering
   Chemical engineering
   Civil engineering
   Computer engineering
   Electrical engineering
   Engineering physics
   Fluid and thermal engineering science
   Mechanical engineering
   Materials science and engineering
   Polymer science and engineering
   Systems and control engineering
2. Bachelor of Science in Engineering without designation, for programs that emphasize interdisciplinary areas or for programs that include some emphasis on non-technical fields.
3. Bachelor of Science in Computer Science
4. Master of Engineering (practice-oriented program)
5. Master of Engineering and Management
6. Master of Science with the following major field designations
   Aerospace engineering
   Biomedical engineering
   Ceramics and materials science
   Chemical engineering
   Civil engineering
   Computer engineering
   Computing and information science
   Electrical engineering
   Engineering mechanics
   Fluid and thermal engineering
   Macromolecular science
   Materials science and engineering
   Mechanical engineering
   Systems and Control Engineering
7. Master of Science without designation.
8. The Doctor of Philosophy without designation (for all programs).

UNDERGRADUATE DEGREE PROGRAMS
In addition to the major department requirements, each engineering undergraduate degree program includes the Engineering Core, which provides a foundation in mathematics and sciences as well as aspects of engineering fundamentals for programs in engineering. The Engineering Core also is designed to develop communication skills and to provide a body of work in the humanities and social sciences. Requirements of the Engineering Core can be found elsewhere in this bulletin.

Details of the specific curricular requirements for the undergraduate majors are described in the respective departmental descriptions.

ADVANCED DEGREE PROGRAMS
Master of Engineering Program
The practice-oriented Master of Engineering Program targets currently employed engineers. The objective of this program is to provide engineers in industry with technical as well as business, management, and teamwork skills. The program differs from a traditional Master of Science degree in engineering by concentrating on current industrial practice rather than on research.

The Master of Engineering Program prepares students to enhance their role as corporate leaders. The program provides an environment in which practicing engineering professionals can address the increasingly wide range of technical, management, financial and interpersonal skills demanded by an ever-expanding and diverse global industry base.

Participants can complete a master’s degree within a two-year (six semester), part-time, program of study. The Master of Engineering program requires 30 credit hours of course work which includes 18 credit hours of core courses and 12 credit hours of technical electives chosen from a focus area. Core courses aim at equipping participants with knowledge on how engineering is practiced in contemporary industry. Technical elective courses provide depth in a chosen specialty area. All courses are held in the late afternoon or evening hours and many are provided in a distance-learning format to minimize disruption at the workplace and home. Because the program makes extensive use of computers, participants need to have access to computer facilities.

The Program
The program consists of a set of six core courses and a four course technical elective sequence (a total of 30 credit hours are required). The core courses provide a common base of study and experience with problems, issues, and challenges in the engineering business environment. The technical course sequence provides an opportunity to update disciplinary engineering skills and to broaden interdisciplinary skills. An in-residence retreat is required of all students on the weekend prior to the summer semester. Up to six transfer credits may be approved for graduate-level courses taken at Case Western Reserve or another accredited university.

Six Core Courses
- Team Leadership, Presentation Skills and Professional Assessment and Development (EPOM 400 A,B and C)
- Applied Engineering Statistics (EPOM 405)
- Engineering Economics/Financial Analysis (EPOM 407)
- Introduction to Business for Engineers (EPOM 401)
- Product/Process Design and Implementation (EPOM 403)
- Master of Engineering Capstone Project (EPOM 409)

Three Technical Electives
Three courses from the chosen technical concentration area are required. The following technical concentration areas are offered:
• Automation, Manufacturing, and Control Systems
• Chemical and Material Processing and Synthesis
• Computer Engineering
• Mechanical Engineering

Master of Engineering and Management Program

The Master of Engineering and Management (MEM) program is designed to meet the needs of students seeking to excel in engineering careers in industry. The MEM degree requires only one calendar year of additional study and may be entered following a student’s junior or senior year. The program prepares engineers to work in different business environments. A rigorous curriculum prepares graduates to build synergy between the technical possibilities of engineering and the profit-loss responsibilities of management. This program evolved after years of research and interviews with more than 110 professionals and 28 corporations in the U.S.

The Program

The program includes 42 credit hours of graded course work. The 10-course core sequence makes up 30 of these hours. Students choose an area of concentration, either technology entrepreneurship or biomedical entrepreneurship, for the remaining 12 credits. The program prepares participants to function as technical leaders with a unique blend of broadened engineering and management skills, which can have a strategic impact on the organization's bottom line. Graduates are uniquely positioned for rapid advancement in technology-based organizations.

Ten Core Courses
• Professional Development (IIME 400)
• Project Management (IIME 405)
• Accounting, Finance, and Engineering Economics (IIME 410)
• Materials and Manufacturing Processes (IIME 415)
• Product and Process Design, Development and Delivery I and II (IIME 430 A and B)
• Information Technology & Systems (IIME 420)
• Understanding People and Change in Organizations (IIME 425)
• Engineering Entrepreneurship I and II (IIME 450 A and B)

Technology Entrepreneurship Concentration
• Design for Manufacturing and Manufacturing Management I & II
• Engineering Statistics and Quality I & II

Biomedical Entrepreneurship Concentration
• Engineering Statistics for Biomedical Applications
• Models for Health Care and Regulatory Affairs

Two courses from the following areas
• Biomedical Imaging: EBME 410, EBME 431, EBME 400, EBME 461
• Biomaterials/Tissue Engineering: EBME 403, EBME 406, EBME 408, EBME 416
• Neuroprostheses: EBME 407, EBME 507, EBME 417
• Cardiac Bioelectricity: EBME 417, EBME 501, EBME 502
• Biomedical Instrumentation and Sensors: EBME 403, EBME 414, EBME 418

Master of Science Degree Programs

Recognizing the different needs and objectives of resident and non-resident graduate students pursuing the master’s degree, two different plans are offered. In both plans, transfer of credit from another university is limited to six hours of graduate-level courses, taken in excess of the requirements for an undergraduate degree, approved by the student’s advisor, the department chair, and the dean of the School of Graduate Studies.

All Master of Science degree programs require the submission of a program of study which must be approved by the advisor, department chairperson and the dean of engineering and which must be submitted before registering for the last nine course credits of the program.

Master’s Thesis Plan

Minimum requirements for the degree of Master of Science in a major field under this plan are

1. Completion of 18 hours of graduate course work. The courses must be approved by the department offering the degree, as well as the dean of engineering.

2. Completion of nine hours of thesis work culminating in a thesis examination given by at least three professors, plus approval by the chair of the department offering the degree. A student with research experience equivalent to a thesis may petition the Graduate Committee of the Case School of Engineering for substitution of nine hours of course work for the thesis requirement. In this case, the thesis examination above is replaced by a similar examination covering the submitted research work and publications.

At least 18 hours of total course work, including up to 9 hours of thesis research, must be at the 400 level or higher.

Master’s Comprehensive Plan

Students may pursue either a project or non-project track under this option. Minimum requirements for the degree of Master of Science in a major field under this plan are

1. Project track: Completion of 27 hours of graduate course work including three to six hours of Special Problems. Special Problems course work must consist of an engineering project approved by the chair of the department offering the degree, and may be carried out at the student’s place of employment with nominal supervision by a faculty advisor, or in the division laboratories under direct supervision.
The project must culminate in a written report and examination by at least three professors plus approval by the chair of the department offering the degree. The Special Problems course may be waived for students who have had industrial design or research experience and who submit sufficient evidence of this experience in the form of a publication or internal report. For these students, a minimum of 27 hours of course work and the final oral examination covering the submitted publications or reports as well as related course material will be required for the master's degree. At least 18 hours of course work including up to six hours of Special Problems must be at the 400 level or higher.

or

2. Non-project track: Students who register for 27 hours, not including Special Problems course work, must pass satisfactorily a comprehensive examination to be administered by the department or curricular program committee. The examination may be written or oral or both. A student must be registered during the semester in which any part of the comprehensive examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 600, Comprehensive Examination, before taking the examination.

UNDESIGNATED MASTER OF SCIENCE DEGREE

A student working toward an undesignated Master of Science degree in engineering must select a department. The student is responsible for submitting a program of study which must have the approval of the student's advisor and department head and the dean of engineering and which must contain a minimum of nine semester hours of course work in the department approving the program. A minimum of 18 semester hours of course work for the degree must be at the 400 level or higher. The student must meet all the requirements of the designated Master of Science degree in engineering.

DOCTOR OF PHILOSOPHY DEGREE

The student's Ph.D. program should be designed to prepare him or her for a lifetime of creative activity in research and in professional engineering practice. This may be coupled with a teaching career. The mastery of a significant field of knowledge required to accomplish this purpose is demonstrated by an original contribution to knowledge embodied in a thesis and by satisfactory completion of a comprehensive course program which is intensive in a specific area of study and includes work in other areas related to, but not identical with, the major field. The necessity for breadth as well as depth in the student's education cannot be overemphasized. To this end, any engineering department may add additional requirements or constraints to ensure depth and breadth appropriate to its field.

No student may be admitted to candidacy for the Ph.D. degree before approval of his or her program of study by the Advisory Committee, the department, and the dean of engineering. After this approval has been obtained, it is the responsibility of the student's department to notify the dean of the School of Graduate Studies of his or her admission to candidacy after the student has fulfilled any additional department requirements. Minimal requirements in addition to the university requirements are

1. The minimum course requirement beyond the B.S. level is 36 credit hours of courses taken for credit, at least 18 hours of which must be taken at Case Western Reserve University. The following courses taken for credit will be acceptable for a Ph.D. program of study
   a. All 400-, 500-, and 600-level courses,
   b. Those 300-level courses approved by the student's department up to a maximum of three beyond the B.S. or a maximum of one beyond the M.S., and
   c. Approved graduate-level courses taken at other institutions
2. A minimum depth in basic science equivalent to six semester hours (for credit) is required. This requirement is to be satisfied by courses that have been previously approved by the faculty of the department in which the student is enrolled.
3. The requirement for breadth is normally satisfied by a minimum of 12 semester hours of courses (for credit) outside the student's major area of concentration as defined by the student's department and does not include courses taken to fulfill the basic science requirement.
4. A minimum of three teaching experiences as defined by the student's department. All programs of study must include departmental 400T, 500T, and 600T courses to reflect this requirement.
5. The minimum requirement for research is satisfied by at least 18 hours of thesis (701) credits.
6. A cumulative quality-point average of 3.0 or above in all courses taken for credit as a graduate student at Case Western Reserve University (excluding grades in thesis research and grades of R) is required for the award of the doctoral degree.

Qualifying Examination

The student must pass a qualifying examination relevant to his or her area of study as designated by the curricular department with which he or she is affiliated. For students who obtain their master's degree from Case Western Reserve University, the qualifying examination should be taken preferably before the end of the student's fourth semester of graduate study but no later than the end of the fifth semester at the university. For students entering with the master's degree, the examination should be taken no later than the end of the third semester at the university.

Program of Study

Each student is required to submit a program of study, detailing his or her course work, thesis schedule, and qualifying examination schedule and indicating that all the minimum requirements of the university and the faculty of the Case School of Engineering are satisfied. This program of study must be approved by
the advisory committee, the department chairperson and the dean of engineering before registering for the last 18 credit hours of the program.

If the student is pursuing the Ph.D. degree without acquiring a master's degree, the program of study should be accompanied by a petition to the dean of engineering to waive the requirement of the master's degree. All required courses taken at the university beyond the B.S. degree should be shown on the program of study with the grade if completed. If the requirements are to be fulfilled other than in the standard ways described above, a memorandum requesting approval should be attached to the program of study.

The program of study must be submitted within one semester after passing the qualifying examination.

UNDERGRADUATE COURSES (ENGR)

ENGR 101. Freshman Engineering Service Project (2)
This course is intended to provide engineering freshman with an initial exposure to engineering problem solving and engineering design in a given technical field or project-driven environment. Small groups of students will be attached to a particular service project, with the assignment of working out and implementing an engineering solution. Collaboration with the Case Engineering Service Group, as well as off-campus service organizations, will provide a source of real-world problems, addressing needs within the greater community, for students to work on. Final engineering reports/presentations, as well as actual prototype solutions (possibly either hardware or software), are expected of each group.

ENGR 131. Elementary Computer Programming (3)
An introductory course in algorithmic problem solving. C++ is used to illustrate how the programming concepts can be used to solve engineering and scientific problems.

ENGR 145. Chemistry of Materials (4)
Application of fundamental chemistry principles to materials. Emphasis is on bonding and how this relates to the structure and properties in metals, ceramics, polymers and electronic materials. Application of chemistry principles to develop an understanding of how to synthesize materials. Prereq: CHEM 111 or equivalent.

ENGR 200. Statics and Strength of Materials (3)
An introduction to the analysis, behavior and design of mechanical/structural systems. Course topics include: concepts of equilibrium; geometric properties and distributed forces; stress, strain and mechanical properties of materials; and, linear elastic behavior of elements. Prereq: PHYS 121.

ENGR 210. Introduction to Circuits and Instrumentation (4)

ENGR 225. Thermodynamics, Fluid Dynamics, Heat and Mass Transfer (4)

ENGR 400C. Graduate Cooperative Education (0)
An academic opportunity designed for graduate students to enhance their classroom, laboratory, and research learning through participation and experience in various organizational/industrial environments where theory is applied to practice. Graduate Cooperative Education experiences may be integrated with the student’s thesis or research project areas, or be solely for the purpose of gaining professional experience related to the student’s major field of study. Registration in this course will serve to maintain full-time student status for the period of time that the student is on a co-op assignment.

GRADUATE COURSES

Master of Engineering Program

EPOM 400A. Engineering Professionalism: Team Leadership in Effective Groups (1)
This course is designed as an experience-based process to increase understanding of teams and group processes especially as they relate to leadership and project management. Students will examine human behavior in groups for the purpose of developing competence in group process management. Groups will become the essential unit for teaching and learning with the instructor serving as the facilitator. Students will be encouraged to examine group process from the perspective of the member, leader, and change agent. In addition, they will develop skills to facilitate and intervene in group processes to assure the achievement of desired group goals and outcomes.

EPOM 400B. Engineering Professionalism: Presentation Skills for Effective Leaders (1)
This course uses a combination of lecture and workshop formats to prepare students to make convincing presentations and hold effective meetings in a business setting. It will address the following: organizing materials, building persuasive argument, developing effective vocal and physical presentation skills that will engage the audience, and develop meeting facilitation skills. Criteria for good presentation and facilitation skills will be standardized in all Master of Engineering core courses. Based on these criteria, standardized feedback can be established and given to reinforce effective performance as well as needed areas of improvement.

EPOM 400C. Engineering Professionalism: Professional Development (1)
The goals of the course are to help students learn methods for assessing their knowledge, abilities, and values relevant to their engineering careers, and to acquiring new professional knowledge and skills throughout their career. Students will initially assess their own values, personality style, and organizational competencies. After learning about emotional intelligence at work, each student will solicit and receive feedback from people at different levels in their organization about their work effectiveness.

EPOM 401. Introduction to Business for Engineers (3)
This course provides an introduction to the business environment for practicing engineers. The course emphasizes the interplay between business and engineering in the context of the competitive marketplace (economics), how engineering proposals are evaluated (finance), the relationship between product and customer (marketing), making effective use of interdisciplinary teams (organizational behavior), and the manufacturing and production process (operations).

EPOM 403. Product and Process Design and Implementation (3)
The course is taught through a series of lectures, class discussions, group projects and case studies. The course aim is to provide a solid understanding of the many aspects of the engineering design process and the management of technology. The course focuses on the engineering and management activities used to develop and bring to market new products and processes. The first part of the course focuses on the techniques used to develop new ideas, the second part focuses on the management of technology and innovation. Prereq: MGMT 421 or permission of instructor.

EPOM 405. Applied Engineering Statistics (3)
In this course a combination of lectures, demonstrations, case studies, and individual and group computer problems provides an intensive introduction to fundamental concepts, applications and the practice of contemporary engineering statistics. Each topic is introduced through realistic sample problems to be solved first by using standard spreadsheet programs and then using more sophisticated software packages. Primary attention is given to teaching the fundamental concepts underlying standard analysis methods.

In this course, money and profit as measures of “goodness” in engineering design are studied. Methods for economic analysis of capital investments are developed and the financial evaluation of machinery, manufacturing processes, buildings, R&D, personnel development, and other long-lived investments is emphasized. Optimization methods and decision analysis techniques are examined to identify economically attractive alternatives. Basic concepts of cost accounting are also covered. Topics include: economics criteria for comparing projects: present worth, annual worth analysis; depreciation and taxation; retirement and replacement; effect of inflation and escalation on economic evaluations; case studies; use of optimization methods to evaluate many alternatives; decision analysis; accounting fundamentals: income and balance sheets; cost accounting. Prereq: EPOM 405.

EPOM 409. Master of Engineering Capstone Project (3)
This is the capstone course for the Master of Engineering Program providing students with the opportunity
to integrate the Program’s topics through an intensive case study project. Interdisciplinary teams are assigned a major engineering project that covers the stages from design concept through development to final manufacture, including business and engineering decision making to maximize market penetration. Topics also include safety, environmental issues, ethics, intellectual property, product liability and societal issues. Prereq: MGMT 421, EPOM 403, EPOM 405, and EPOM 407.

Master of Engineering and Management Program

IIME 400. Professional Development (3)
The goal of the course is to help students learn methods for assessing their knowledge, abilities, and values relevant to engineering and management, and for the acquiring of new professional knowledge and skills throughout their career. Prereq: Senior status in engineering.

IIME 405. Project Management (3)
Project Management is concerned with the management and control of a group of interrelated tasks required to be completed in an efficient and timely manner for the successful accomplishment of the objectives of the project. Since each project is usually unique in terms of task structure, risk characteristics and objectives, the management of projects is significantly different from the management of repetitive processes designed to produce a series of similar products or outputs. Large-scale projects are characterized by a significant commitment of organizational and economic resources coupled with a high degree of uncertainty. Thus, the objective of the course is to understand what are the main issues and problems in the management of projects and to have a thorough knowledge of the conceptual models and techniques available to deal with them. Prereq: Senior status in engineering.

IIME 410. Accounting, Finance, and Engineering Economics (3)
This class uses a combination of class lecture and discussion, in combination with problem-type and case-type assignments, to introduce you to key concepts and tools of financial economics. You are expected to use the resources at your disposal, such as the textbook or the accounting dictionary, to help you understand any unfamiliar concepts. Normally, each class will be divided into two sections. The first part of each class session will be devoted to discussions of selected problems and cases, with focus on the specific topics being covered. The second part of each class will be devoted to prepare you for the following session class assignments. Prereq: Senior status in engineering.

IIME 415. Materials and Manufacturing Processes (3)
A survey course on contemporary and modern materials and their processing, the course begins with a review of traditional materials, including metals, ceramics, plastics, and composites. The evolution of the materials will be traced from their beginnings as raw resources and precursors to finished products. Topics will emphasize modern manufacturing methods and materials. Traditional and modern tools for materials and process characterization will be an important part of the course. Special attention will be directed to examples of statistical methodology and information technology. Visits to local industries and presentations by participating companies will reinforce the information presented in the classroom. Prereq: Senior status in engineering.

IIME 420. Information Technology and Systems (3)
This course is intended to provide students with a perspective of effective use and management of information technology. The primary thrust will be to explain the enabling role of information technology, and how this insight can provide a competitive advantage for industrial organizations in many application areas. In order to accomplish this, technologies such as telecommunications and networking, distributed systems, data management systems, software development, electronic commerce, and the use of multimedia, internet, and web-based systems will be investigated. The impact of these IT technologies for improved industrial productivity and competitiveness. Prereq: Accredited Bachelor’s in Engineering.

IIME 425. People Issues and Change in Organizations (3)
This course is intended to help students assess events occurring in organizations from a behavioral and human resources perspective and to help them develop strategies for managing these events. The course applies knowledge from the fields of organizational behavior and human resource management to provide an understanding and the skills needed to be effective in organizations. The fields of Organizational Behavior and Human Resource Management are devoted to the study of how human beings act in organized settings and how organizations can affect human behavior through a variety of policies, practices, structures, and strategies. In today's environment, organizations are faced with high levels of international competition and an increasing pace of technological, market, and social changes. As an organizational member, you are expected to successfully operate within these increasingly complex demands as well as help create and guide change. The purpose of this course is to provide you with the framework and tools needed to analyze and operate in the changing organization. We will examine some of the features that characterize an emerging organizational form and contrast this to its traditional predecessor. The focus of the course will be on the skills you will need to operate in the "new" organization including skills for being a change agent working in entry level and early career managerial roles. Prereq: Accredited Bachelor's in Engineering plus summer job experience.

IIME 430A. Product and Process Design, Development, and Delivery I (3)
An integrated approach to the teaching of the complex relationship of customer to designer and to manufacturer, this course will be team taught by faculty from WSOM and CSE, with participation of corporate representatives sponsoring projects for the teams. The course will be built on a series of projects, each emphasizing different aspects of the product/process design experience, selected to provide exposure to a wide variety of entrepreneurial activities. The project activities are expected to promote the development of realistic activities of cross-functional teams. Prereq: IIME 430A.

IIME 435A. Design for Manufacturing and Manufacturing Management I (3)
This course introduces concepts for helping make designs more manufacturable and for making the manufacturing process successful through better planning and control. It is related to the product and process design course, in that it picks up where that course stops. The course begins the identification of the need for a manufacturing strategy at the corporate level, including an integrated production system. The product and process design process then considers how to optimize the design for manufacturability. Following that, we study how to plan and control the manufacturing process, given the design for manufacturing. This includes strategic planning decision, such as the location for the manufacturing process, as well as control decisions to facilitate shop floor execution. The course ends with a capstone manufacturing simulation to "put it all together." Prereq: Accredited Bachelor's in Engineering plus experience.

IIME 435B. Design for Manufacturing and Manufacturing Management II (3)
This course introduces concepts for helping make designs more manufacturable and for making the manufacturing process more successful through better planning and control. It is related to the product and process design course, in that it picks up where that course stops. The course begins the identification of the need for a manufacturing strategy at the corporate level, including an integrated production system. The product and process design process then considers how to optimize the design for manufacturability. Following that, we study how to plan and control the manufacturing process, given the design for manufacturing. This includes strategic planning decision, such as the location for the manufacturing process, as well as control decisions to facilitate shop floor execution. The course ends with a capstone manufacturing simulation to "put it all together." Prereq: IIME 435A.

IIME 440A. Engineering Statistics and Quality I (3)
This course focuses on process optimization and control using both qualitative and quantitative techniques. At the completion of the course, the student should have a thorough understanding of the importance of quality in all organizations, as well as the tools to ensure that the required levels of quality are established and maintained. Prereq: Accredited Bachelor’s in Engineering plus experience.

IIME 440B. Engineering Statistics and Quality II (3)
This course focuses on process optimization and control using both qualitative and quantitative techniques. At the completion of the course, the student should have a thorough understanding of the importance of quality in all organizations, as well as the tools to ensure that the required levels of quality are established and maintained. Prereq: IIME 440A.

IIME 446. Models of Health Care Systems (1.5)
This course is for professionals who will pursue their careers in, or associated with, the health care industry; and therefore, need to understand the structure, operations and decision influences in the health care delivery system. The course is intended to develop competence and confidence in the participant's ability to understand and operate in the industry, the largest and, perhaps, the most complex in the United States. It is
applicable to the private and public, profit and not-for-profit sectors. In this course students are introduced to: the different systems of care delivery; their organization and operations; their markets and the nature of the demand for their services; and the dynamics of their interaction among themselves and with other entities in the industry (e.g., payors/insurers, regulators and accreditors, technology and pharmaceuticals suppliers). Prereq: Permission of department. Cross-listed as HSMC 446.

IIME 447. Regulatory Affairs for the Biosciences (1.5)
This mini-course introduces students to the Food and Drug Administration (FDA) and the laws and regulations it enforces. A scientific regulatory agency with far reaching enforcement authority, FDA is the most powerful consumer protection agency in the world. This course will familiarize students with FDA’s mission, philosophy and organizational structure, as well as policy and procedure it uses to ensure the safety and effectiveness of the food, drugs, biologics, cosmetics, medical devices and radiation-emitting products it regulates. Prereq: Enrollment in the MEM Biomedical Entrepreneurship Track or consent of instructor. Cross-listed as BIOS 447 and HSMC 447.

IIME 450A. Engineering Entrepreneurship I (3)
The nature and importance of entrepreneurship is an area of importance to business leaders, educators, politicians, and individual members of the society. It is a driver of economic development and wealth creation in organization units ranging in size from the individual company to entire nations. Technology-based entrepreneurship is particularly important to this economic development due to its impact on productivity and its potential for exponential growth. To create something new and of value to both the organization and the market requires a technical individual who is willing to assume the social, psychic, and financial risks involved and act as a key player in the race to be first, or at least one of the first, companies to entire nations. T echnology-based entre

IIME 450B. Engineering Entrepreneurship II (3)

INTERDISCIPLINARY RESEARCH CENTERS

Interdisciplinary research centers act as intensive incubators for students and faculty doing research and studying applications in specialized areas. Thirteen research centers and research programs at the Case School of Engineering have been organized to pursue cutting-edge research in collaboration with industrial and government partners. The transfer of technology to industry is emphasized in all the centers.

The educational programs of these centers encompass the training of graduate students in advanced methods and strategies, thus preparing them to become important contributors to industry after graduation; the involvement of undergraduates in research; the presentation of seminars that are open to interested members of the community; and outreach to public schools to keep teachers abreast of scientific advances and to kindle the interest of students in seeking careers in engineering.

Case Advanced Power Institute (CAPI) 124 A.W. Smith Building (7217)
www.capiweb.org
phone 216-368-2472; fax 216-368-0953
Thomas A. Zawodzinski, Director
e-mail taz5@case.edu

CAPI is a center for research, education, industry stimulation and outreach activities in energy efficient technologies. The current focus is on various fuel cell technologies. CAPI combines the strengths and legacy of fuel cell related research and development at Case Western Reserve University with new generation of leading scientists and engineers. Specifically CAPI R&D is focused on enabling the commercialization of fuel cells. CAPI activities range from studying the fundamentals of the phenomena taking place within the fuel cell to completing performance and system level studies and mathematical modeling. The CAPI Affiliates Program gives industry the opportunity to work directly with expert fuel cell researchers and state-of-the-art capabilities, at below standard rates. Affiliates are consulted on topic areas critical to CAPI research and have access to results from the research program.

Center for Applied Polymer Research (CAPRI) 422 Kent Hale Smith Building (7202)
http://www.scl.case.edu/cse/emap/Centers/
InfoOnDeptCenters.html#CAPRI
Phone 216-368-4186; Fax 216-368-6329
Anne Hiltner, Director
e-mail pah6@case.edu

CAPRI performs interdisciplinary applied and basic research on structure-property relationships in polymer materials of interest to industry. Recent work of the center has focused on the attributes of polymer blends and alloys and ways to improve their performance, on processing of micro- and nano-layered materials and structures, on polymers for medical applications, and on new thermoplastics and polyolefin systems.

CAPRI conducts an annual symposium to showcase the center facilities and the research of center graduate and undergraduate students and postdoctoral research associates. CAPRI co-sponsors, with the U.S. Army Research Office, the annual ASILOMAR conference, which features discussions of cutting-edge issues related to polymers and their composites.

CAPRI is supported by several federal agencies, as well as industrial sponsors, 12 of whom serve on its advisory board.

Center For Cardiovascular Biomaterials (CCB) 202 Wickenden Building (7207)
http://www.case.edu/affil/CCB/
ccbhome.htm
phone 216-368-3005; fax 216-368-4969
Roger E. Marchant, Director
e-mail rmx4@case.edu

CCB, supported by Case Western Reserve, the University of Cincinnati, and the Cleveland Clinic Foundation, carries out research and development projects to investigate biomaterials and devices for use as cardiovascular implants in patients. The chemical and mechanical interface between the biomaterial and the host body are the focus of major study, with the goals being to improve biologic function and biocompatibility in the response of the human body to implants. Current projects include investigation of thrombosis (blood clotting) and infection mechanisms due to cardiovascular prosthesis, biomimetic design of novel biomaterials for cardiovascular and neural implants; cardiovascular and neural tissue engineering, and long-term biodegradation of elastomeric biomaterials. Atomic force microscopy is being used for molecular-level studies on the structure
and interactions of blood platelets, and plasma glycoproteins and collagen with biomaterials. Studies at the cell and molecular level assist our understanding of the underlying mechanisms, so that novel biomedical interfaces may be designed, prepared, and characterized. CCB was awarded major grants from the Whittaker Foundation and the Ohio Board of Regents to establish a graduate training program in cardiovascular biomaterials. Students conduct research in this field and pursue integrated engineering and medical science courses. The center plans annual symposia at which participating students discuss their work and outside speakers present topical lectures in the field of cardiovascular biomaterials.

Center for Modeling Integrated Metabolic Systems (MIMS)
410 Wickenden (7207)
www.csuohio.edu/mims/
Phone 216-368-4066; Fax 216-368-4969
Gerald M. Saidel, Ph.D., Director
e-mail gms3@case.edu

The thrust of the MIMS Center is mathematical modeling and simulation of metabolic systems in response to stresses associated with hypoxia, exercise, diet, and drug inputs. A general integrative whole-body model relates cellular to tissue metabolism in four major tissue-organ systems: skeletal muscle, brain, heart, and liver. Biomedical research projects incorporate one or more of the metabolic stresses in which the modeling can help quantify mechanisms and predict responses that cannot be directly measured. These projects involve modeling of cell-tissue integration within an organ as well as modeling the integrated, whole-body effects of the combined tissue-organ systems. Critical experimental studies with each of the tissue-organ systems are conducted for model validation. A quantitative understanding of the complexity of cellular metabolism integrated with tissue, organ, and whole-body processes requires sophisticated mathematical models, computer simulations, and validation with experimental data. Physiologically based models incorporate cellular metabolic reactions and transport processes of a large number of chemical species. In general, these dynamic models of spatially lumped and/or distributed systems involve highly nonlinear phenomena. Such models allow quantitative evaluation of metabolic pathways and regulatory mechanisms under normal and abnormal conditions and associated with disease states. Consequently, these models can provide a basis for simulating the integrated effects of altering enzyme contents/activities or substrate concentrations with pharmacological agents.

Center On Hierarchical Structures (CHS)
420 Kent Hale Smith Building (7202)
phone 216-368-4203; fax 216-368-6329
Eric Baer, Director
e-mail exb6@case.edu

The aims of this center are to understand how the unique performance of natural materials arises from precise hierarchical organization, to apply lessons from biology to the design of new hierarchical material systems, and to develop new processes for building complex hierarchical structures. Biological hierarchical paradigms will be used to satisfy societal needs and to solve existing problems.

Cleveland Functional Electrical Stimulation Center
11000 Cedar Avenue, Suite 230
Cleveland, Ohio 44106-3052
http://feswww.fes.case.edu/
phone (800) 666-2353, (216) 231-3257
Voice/TDD; fax (216) 231-3258
P. Hunter Peckham, Director
e-mail pxp2@case.edu

Functional electrical stimulation (FES) is the application of electrical currents to either generate or suppress activity in the nervous system. FES can produce and control the movement of otherwise paralyzed limbs, for standing and hand grasp; activate visceral bodily functions, such as micturition; create perceptions such as skin sensibility; arrest undesired activity, such as pain or spasm; and facilitate natural recovery and accelerate motor relearning. FES is particularly powerful and clinically relevant, since many people with neurological disabilities retain the capacity for neural conduction, and are thus amenable to this intervention.

The center focuses its activities in four major areas: Fundamental studies to discover new knowledge; enabling technologies for clinical application or the discovery of knowledge; clinical research that applies this knowledge and technology to individuals with neurological dysfunction; and transfer of knowledge and technology to the clinical community and to industry.

The Cleveland FES Center was established as a VA RR&D Center of Excellence in 1991 and is based at the Louis Stokes Cleveland VAMC (CVAMC). The center is a consortium with three institutional partners: CVAMC, Case Western Reserve University (Case), and the MetroHealth Medical Center (MHMC). The center accomplishes its mission by integrating and facilitating the efforts of scientists, engineers, and clinicians through common goals and directions in the major clinical areas, and by providing mechanisms to accomplish these goals across the institutional partners.

Ernest B. Yeager Center For Electrochemical Sciences (YCES)
404 White Building (7204)
http://electrochem.case.edu/yeager/default.htm
phone 216-368-4218; fax 216-368-3209
Joe H. Payer, Director
e-mail jhp@case.edu

The Ernest B. Yeager Center for Electrochemical Sciences (YCES) promotes and coordinates research and education in electrochemistry at Case Western Reserve University. Electrochemistry and the technologies derived from it are by their nature highly interdisciplinary. They require expertise in fields as widely divergent as surface physics, solid and liquid state physics, electronics, applied mathematics, polymer science, chemical engineering, and, of course, chemistry.

The center facilitates the undertaking of research projects in electrochemistry of a highly interdisciplinary nature, requiring resources and expertise beyond that of any one faculty research group, and usually involving faculty from several of the participating departments. Eight academic departments of the university participate
in the center. Approximately 35 faculty from these departments are affiliated with the center’s regular members. The center fosters interactions and collaborations among all of the students within these departments who are involved in electrochemical research.

The center serves as an international focal point for electrochemical education. Besides the traditional educating of graduate and postdoctoral students, it offers annual workshops for educating and updating industrial and governmental scientists and engineers. Numerous seminars, special topic symposia and lectureships keep the faculty, students, and the technical community aware of the most recent advances in the field. The center attracts visiting scientists, postdoctoral research associates, and graduate students from the world’s leading academic institutions and industrial and governmental laboratories.

The center is to be viewed as a national resource to which industry and government can turn for research and education in electrochemistry.

Center for Micro and Nano Processing (CMNP)

112 Bingham Building (7200)
http://www.engineering.case.edu/research/inter.html
http://mems.case.edu/
Phone 216-368-2934; Fax 216-368-8738
Chung-Chiu Liu, Director
e-mail cx9@case.edu

CMNP houses a state-of-the-art facility that provides the latest in microfabrication and micromachining processes. The center focuses on the applications of microfabrication and micromachining technology to a wide range of sensors, actuators and other microelectromechanical (MEMS) systems. Application thrusts include healthcare; industrial control, automation and fault detection; portable power generation; and functional materials and structures. In addition to silicon based technology, the center has a unique strength in silicon carbide micromachining that is particularly valuable for applications in harsh environments. Undergraduate students, graduate students, and post-doctoral assistants use the center’s facilities to carry out their research or special projects. Recent developments by researchers in CMNP include Schottky diode based hydrogen sensor, high temperature oxygen sensor, nano-structure tin oxide sensor, inertial sensors, micro-size pressure sensors, wireless telemetric microsystems, miniature displays, micromechanical light modulators, microvalves, and micropumps.

CMNP facilities support a state-wide network, Ohio MEMSNet, for MEMS research and development.

National Center for Microgravity Research on Fluids and Combustion (NCMR)

103 Crawford Hall (7074)
http://mae1.cwru.edu/mae/
Phone 216-368-0748; Fax 216-368-0718
Simon Ostrach, Director
e-mail sostrach@ncmr.org

The Universities Space Research Association (USRA) and Case Western Reserve University have established a National Center for Microgravity Research on Fluids and Combustion (NCMR) under the sponsorship of the National Aeronautics and Space Administration (NASA). NCMR is located on the campus of Case and at Glenn Research Center where it enjoys access to the world-class research facilities of NASA. Housed in the Zero-Gravity Facility of the Space Experiments Laboratory are laboratories for ground research, diagnostics development, a high-bay area, visitor information, flight hardware storage, shipping and receiving and office areas. These facilities enable NCMR and NASA to fulfill the rapidly expanding mission in microgravity research and technology development.

At NCMR, critical path research is conducted in support of NASA’s mission objectives. For long-term manned space exploration, many mission operations and life-support technologies are crucially affected by fluids and transport phenomena. The center’s vision is to become a focal point for microgravity fluids and combustion research that will develop a knowledge base for the design and development of reliable, efficient and cost-effective space systems. A major part of the effort will be to aid in the development of the next-generation technologies that will have to operate for long periods of time in alien environments under extreme conditions. NCMR promotes the idea that “Research for Design” must be performed to compensate for the limited databases available to designers and builders of space hardware. Through research for design, scientists will become intimately involved at an earlier stage of the hardware development process. To promote free-flow of information, NCMR will hold directed in- and outreach workshops with industry that will bring together systems engineers, hardware builders and scientists.

Neural Engineering Center

112 Wickenden (7207)
http://nec.case.edu/
Phone 216-368-3974; Fax 216-368-4872
Dominique Durand, Director
dxd6@case.edu

The research mission of the center is to bring to bear combined tools in physics, mathematics, chemistry, engineering and neuroscience to analyze the mechanisms underlying neuronal function and to solve the clinical problems associated with neuronal dysfunction. Research areas include; quantitative neurophysiology, neural dynamics, neuro-mechanical systems, neural regeneration, neural interfacing, neural prostheses, neural imaging and molecular sensing, neuro-magnetism, and systems neuroscience. The education mission of the center is to provide engineers and scientists with an integrated knowledge of engineering and neuroscience capable of solving problems in neuroscience ranging from the molecules to the clinic. The center is also an outlet for technology transfer of new ideas to be commercialized by industrial partners. The center’s goals are accomplished by fostering interdisciplinary research between clinicians, scientists, students and local industry; educational
Department of Biomedical Engineering

319 Wickenden Building (7207)
Phone 216-368-4063; Fax 216-368-4969
Patrick E. Crago, Chair
e-mail bmedept@case.edu
http://bme.case.edu

BACKGROUND

Biomedical engineering (BME) uniquely advances human health and the biological sciences by creating and applying technology based on phenomena described by the biological and physical sciences. Graduates in biomedical engineering are employed in industry, hospitals, research centers, government, and universities. Biomedical engineers also use their undergraduate training as a basis for careers in business, medicine, law, and other professions.

Biomedical engineering was established in 1968 at Case Western Reserve University. As one of the pioneer programs in the world, we now have a strong and well-established program in research and education with many unique features. It was founded on the premise that engineering principles provide an important basis for innovative and unique solutions to biomedical problems. This philosophy has been the guide for the successful development of our program, which has been emulated by many other institutions. Quantitative engineering for biomedical applications remains the cornerstone of our program and distinguishes it from biomedical science programs. In addition to dealing with biomedical problems at the tissue and organ-system level, our educational programs have a growing emphasis on cellular and subcellular mechanisms for understanding of fundamental processes as well as for systems approaches to solving clinical problems. Current programs lead to the B.S., M.S., combined B.S./M.S., Ph.D., and MD/Ph.D. in biomedical engineering. In all of the BME programs at Case, the goal is to educate engineers who can apply engineering methods to problems involving living systems. The Case School of Engineering and the School of Medicine are located in close proximity on the same campus. The BME faculty carry joint appointments in the two schools and participate in the teaching, research, and decision-making committees of both schools. The department is in close proximity to several major medical centers (University Hospitals, Cleveland Clinic Foundation, VA Medical Center, and MetroHealth Medical Center). As a result, we have an unusually free flow of academic exchange and collaboration in research and education among the schools and institutions. Our BME programs take full advantage of faculty cooperation among university departments, which adds significant strength to our programs.

The educational philosophy is to develop in students

Mastery of Fundamentals

- Acquire a strong integrated background in the fundamentals of mathematical, chemical, physical, and biomedical sciences and engineering.
- Become knowledgeable in a special discipline of biomedical engineering such as biomaterials, tissue engineering, biomechanics, bioelectricity, instrumentation, biomedical imaging, biomedical sensors, modeling, and biomedical systems.
- Measure phenomena relevant to medicine and biology using state-of-the-art instrumentation.
- Describe biomedical phenomena by mathematical modeling.

Creativity

- Design devices, materials, instruments, models, and software for biomedical science and health applications.
- Expand the knowledge base through innovative approaches to biomedical research.

Societal Awareness

- Understand issues presented by the biomedical community, and translate them into solvable engineering problems.
- Recognize the role of biomedical engineering in developing technology for commercial application and economic development of society.

Leadership Skills

- Communicate technical information to both technical and non-technical audiences.
- Work effectively in a team setting with others of differing backgrounds.

Professionalism

- Recognize and respond to biomedical ethical issues.
- Acquire skills for self-instruction and life-long learning.

FACULTY

Primary Appointments

Patrick E. Crago, Ph.D. (Case Western Reserve University)
Professor and Chair; Allen H. and Constance T. Ford Professor
Control of neuroprostheses for motor function; neuromuscular control systems

Cheri Deng, Ph.D. (Yale University)
Professor and Chair; Allen H. and Constance T. Ford Professor
Biomedical Engineering
Research in ultrasound, contrast agents and angiogenesis

Dominique Durand, Ph.D. (University of Toronto, Canada)
Professor
Director, Neural Engineering Center
Neural engineering; neuroprostheses; neural dynamics; electric and magnetic stimulation of the nervous system; neural interfaces with electronic devices; analysis and control of epilepsy

Steven J. Eppell, Ph.D. (Case Western Reserve University)
Associate Professor
Nanoscale instrumentation for biomaterials; bone and cartilage
Jinming Gao, Ph.D. (Harvard University)  
Associate Professor  
Biomolecular engineering; imaging-guided drug delivery; controlled-release drug delivery; elastic biomaterials

Miklos Gratzl, Ph.D. (Technical University of Budapest, Hungary)  
Associate Professor  
Biochemical sensors; fine chemical manipulation of microdroplets and single cells; cancer research and neurochemistry at the single cell level; cost-effective biochemical diagnostics in microliter body fluids

Kenneth Gustafson, Ph.D. (Arizona State University)  
Assistant Professor  
Neural engineering; neural prostheses; neurophysiology and neural control of genitourinary function; devices to restore genitourinary function; functional neuromuscular stimulation

Robert F. Kirsch, Ph.D. (Northwestern University)  
Associate Professor  
Functional neuromuscular stimulation; biomechanics and neural control of human movement; modeling and simulation of musculoskeletal systems; identification of physiological systems

Melissa Knothe Tate, Ph.D. (Swiss Federal Institute of Technology, Zürich, CH)  
Associate Professor (joint with Mechanical and Aerospace Engineering)  
Etiology and innovative treatment modalities for osteoporosis, fracture healing, osteolysis and osteonecrosis

Dmitri E. Kourennyi, Ph.D. (Moscow Institute of Physics and Technology)  
Assistant Professor  
Synaptic transmission and networking in the retina; ion channels; biophysics; pharmacology; modulation; second messengers in neurons; nitric oxide functional and pathological roles; signal processing in the retina

Roger Marchant, Ph.D. (Case Western Reserve University)  
Professor  
Director, Center for Cardiovascular Biomaterials  
Surface modification of cardiovascular devices; molecular level structure and function of plasma proteins; liposome drug delivery systems; mechanisms of bacterial adhesion to biomaterials

J. Thomas Mortimer, Ph.D. (Case Western Reserve University)  
Professor Emeritus  
Neural prostheses; electrical activation of the nervous system; bowel and bladder assist device; respiratory assist device; selective stimulation and electrode development; electrochemical aspects of electrical stimulation

Mark D. Pagel, Ph.D. (University of California, Berkeley, CA)  
Elmer L. Lindseth Assistant Professor  
MRI methods and contrast agents to target functional and molecular biomarkers; high-throughput screening using MRI methods

P. Hunter Peckham, Ph.D. (Case Western Reserve University)  
Professor  
Director, Functional Electrical Stimulation Center  
Neural prostheses, implantable stimulation and control; control of movement; rehabilitation engineering

Andrew M. Rollins, Ph.D. (Case Western Reserve University)  
Assistant Professor, Biomedical Engineering  
Biomedical diagnosis, novel optical methods for high-resolution, minimally invasive imaging, tissue characterization and analyte sensing, real-time microstructural and functional imaging using coherence tomography, endoscopy

Gerald M. Saidel, Ph.D. (The Johns Hopkins University)  
Professor  
Director, Modeling in Metabolic Systems Center  
Mass & heat transport and metabolic analysis in cells, tissues, & organs; mathematical modeling, simulation, parameter estimation; optimal experimental design; metabolic dynamics; minimally invasive thermal tumor ablation; slow release drug delivery

David L. Wilson, Ph.D. (Rice University)  
Professor  
In-vivo microscopic and molecular imaging; medical image processing; image segmentation, registration, and analysis; quantitative image quality of X-ray fluoroscopy and fast MRI; interventional MRI treatment of cancer

Harihara Baskaran, Ph.D. (Pennsylvania State University)  
Assistant Professor, Chemical Engineering, Microvascular tissue engineering, cell migration in wound healing, inflammation, and cancer metastasis

Marco Cabrera, Ph.D. (Case Western Reserve University)  
Assistant Professor, Pediatric Cardiology  
Modeling and control of metabolic processes; metabolic regulation in hypoxia, ischaemia and exercise

Ronald L. Cechner, Ph.D. (Case Western Reserve University)  
Associate Professor, Anesthesiology, University Hospitals  
Microscopic 3-D imaging of tissue

John Chae, M.D. (New Jersey Medical School)  
Associate Professor, Physical Medicine and Rehabilitation  
Application of neuroprostheses in hemiplegia

Hillel J. Chiel, Ph.D. (Massachusetts Institute of Technology)  
Professor, Biology  
Biomechanical and neural basis of feeding behavior in the marine mollusk Aplysia californica; neuromechanical system modeling; analysis of neural network dynamics

David Dean, Ph.D. (City University of New York)  
Associate Professor, Neurosurgery and Anatomy, University Hospitals Morphometrics; craniofacial imaging

Louis F. Dell’Osso, Ph.D. (University of Wyoming)  
Professor, Neurology, VA Medical Center  
Neurophysiological and ocular motor control systems

Pedro J. Diaz, Ph.D. (Case Western Reserve University)  
Assistant Professor, Radiology, MetroHealth Medical Center  
Magnetic resonance imaging; image processing

Claire M. Doeschuk, M.D. (Rush University, Chicago, IL)  
Professor, Rainbow Babies & Children, University Hospitals  
Regulation of the inflammatory response in the lungs, particularly the recruitment of white blood cells, during pneumonia, sepsis, and the acute respiratory distress syndrome
Vikram Dogra, M.D. (University of Madras, India)  
Associate Professor, Department of Radiology, University Hospitals  
Cross sectional imaging, MRI, CT and ultrasound, Tissue and ovarian diseases

Jeffrey L. Duerk, Ph.D. (Case Western Reserve University)  
Professor, Radiology, University Hospitals  
Magnetic resonance imaging: flow visualization

Brian Johnstone, Ph.D. (University College, University of London)  
Associate Professor, Orthopaedics, Case Western Reserve University  
Chondrogenesis, cartilage regeneration, mesenchymal stem cells, tissue engineering and mechanobiology

Michael W. Keith, M.D. (Ohio State University)  
Professor, Orthopaedic Surgery, MetroHealth Medical Center  
Restoration of motor function in hands

Kenneth R. Laurita, Ph.D. (Case Western Reserve University)  
Associate Professor, Cardiology, MetroHealth Medical Center  
Cellular mechanisms of cardiac arrhythmias, fluorescent imaging of transmembrane potential and intracellular calcium; cardiac repolarization; impulse propagation and block; Instrumentation and software for imaging electrical activity

Zhenghong Lee, Ph.D. (Case Western Reserve University)  
Assistant Professor, Radiology, Nuclear Medicine, University Hospitals  
Quantitative PET and SPECT imaging, multimodal image registration, 3D visualization, molecular imaging and small animal imaging systems

R. John Leigh, M.D. (University of Newcastle-Upon-Tyne, U.K.)  
Professor, Neurology, VA Medical Center  
Normal and abnormal motor control of the eye

Jonathan Lewin, M.D., Ph.D. (Yale University)  
Professor, Radiology, University Hospitals  
Magnetic resonance imaging

Raymond F. Muzic, Jr., Ph.D. (Case Western Reserve University)  
Associate Professor, Radiology, University Hospitals  
Experiment design and analysis for positron emission tomography

David S. Rosenbaum, M.D. (University of Illinois, Chicago)  
Associate Professor, Medicine, MetroHealth Medical Center  
Mechanisms of cardiac arrhythmias; cardiac electrophysiology; characterization of genetically engineered mice; prediction and prevention of sudden cardiac death

Mark S. Rzeszotarski, Ph.D. (Case Western Reserve University)  
Associate Professor, Radiology, MetroHealth Medical Center  
Radiological imaging; magnetic resonance imaging, ultrasound

Ronald J. Triolo, Ph.D. (Drexel University)  
Associate Professor, Orthopaedics, VA Medical Center  
Restoration of lower extremity function

Albert L. Waldo, M.D. (State University of New York)  
Professor, Cardiology, University Hospitals  
Cardiac electrophysiology and cardiac excitation mapping

Nicholas P. Ziats, Ph.D. (Case Western Reserve University)  
Associate Professor, Pathology, University Hospitals  
Vascular grafts; vascular cells; blood vessels

Adjunct Appointments

Ravi V. Bellamkonda, Ph.D. (Brown University)  
Adjunct Associate Professor, Department of Biomedical Engineering, Neurological Biomaterials and Therapeutics, Georgia Tech/Emory University, Atlanta, GA  
Neural tissue engineering

Richard C. Burgess, M.D., Ph.D. (Case Western Reserve University)  
Adjunct Professor of Biomedical Engineering (Neurological Computing, Cleveland Clinic Foundation)  
Electrophysiological monitoring; EEG processing

Peter Cavanagh, Ph.D. (University of London at Royal Free Medical School, London, England)  
Adjunct Professor of Biomedical Engineering (Cleveland Clinic Foundation)  
Foot complications of diabetes, bone biomechanics

Brian Davis, Ph.D. (Pennsylvania State University)  
Adjunct Assistant Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)  
Human locomotion and biomechanics

Linda M. Graham, M.D. (University of Michigan)  
Adjunct Professor of Biomedical Engineering (Vascular Surgery and Biomedical Engineering, Cleveland Clinic Foundation)  
Optical coherence tomography of the eye, laser vision correction, corneal wound healing, corneal topography

Joseph Izatt (Massachusetts Institute of Technology)  
Adjunct Associate Professor of Biomedical Engineering, Duke University  
Biomedical optics

J. Lawrence Katz, Ph.D. (Polytechnic Institute of Brooklyn)  
Adjunct Professor (University of Missouri, Kansas City)  
Bone biomechanics and biomaterials; bone mineral crystallography; ultrasonic wave propagation; scanning acoustic microscopy; dental and orthopaedic implants

Jill W. Kawalec, Ph.D. (Case Western Reserve University)  
Adjunct Assistant Professor of Biomedical Engineering (Research Director, Ohio College of Podiatric Medicine)  
Biomaterials and biomechanics of foot prostheses

Kevin L. Kilgore, Ph.D. (Case Western Reserve University)  
Adjunct Assistant Professor of Biomedical Engineering (Orthopaedics, MetroHealth Medical Center)  
Functional electrical stimulation; neuroprostheses
Kandice Kottke-Marchant, Ph.D., M.D. (Case Western Reserve University)
Adjunct Professor of Biomedical Engineering (Hematology, Cleveland Clinic Foundation)
Interaction of blood and materials
William Landis, Ph.D. (Massachusetts Institute of Technology)
Adjunct Professor of Biomedical Engineering (Department of Biochemistry and Molecular Pathology, Northeastern Ohio Universities College of Medicine)
Mineralization of vertebrates, effect of mechanical force on mineralization, calcium transport in mineralization, tissue engineering
Cameron McIntyre, Ph.D. (Case Western Reserve University)
Adjunct Assistant Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)
Theoretical modeling of the interaction between electric fields and the nervous system; deep brain stimulation
George F. Muschler, M.D. (Northwestern University School of Medicine, Chicago, IL)
Adjunct Professor, Dept of Orthopaedic Surgery & Biomedical Engineering, Cleveland Clinic Foundation
Musculoskeletal oncology, adult reconstructive orthopaedic surgery, fracture non-union, research in bone healing and bone grafting materials
Marc Penn, M.D., Ph.D. (Case Western Reserve University)
Adjunct Assistant Professor of Biomedical Engineering (Cardiology and Cell Biology, Cleveland Clinic Foundation)
Myocardial ischemia, vascular biology, cardiac critical care
Kimerly Powell, Ph.D. (Ohio State University)
Adjunct Associate Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)
Image post-processing for detection and diagnosis of breast cancer and quantitative microscopy
Dustin Tyler, Ph.D. (Case Western Reserve University)
Adjunct Assistant Professor
Neural engineering; neural prosthesis; peripheral nerve electrode development and clinical implementation; modeling and simulation of neural stimulation; neuromimetic interfaces; neurocontrol of dysphagia and laryngeal function
Antonie J. van den Bogert, Ph.D. (University of Utrecht)
Adjunct Assistant Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)
Geoffrey D. Vince, Ph.D. (University of Liverpool Medical School, United Kingdom)
Adjunct Assistant Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)
Image and signal processing of intravascular ultrasound images, mechanics of coronary plaque rupture, cellular aspects of atherosclerosis
Michael Wendt, Ph.D. (University of Witten/Herdecke, Germany)
Adjunct Assistant Professor of Biomedical Engineering (Siemens Medical Solutions, USA, Inc.)
Interventional magnetic resonance imaging; wavelet encoding
Guang Yue, Ph.D. (University of Iowa)
Adjunct Assistant Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)
Neural control of movement
Maciej Zborowski, Ph.D. (Polish Academy of Science)
Adjunct Assistant Professor of Biomedical Engineering (Biomedical Engineering, Cleveland Clinic Foundation)
Membrane separation of blood proteins

UNDERGRADUATE PROGRAMS

The Case undergraduate program leading to the Bachelor of Science degree with a major in biomedical engineering was established in 1972. The B.S. program in BME is accredited by the Accreditation Board of Engineering and Technology.

The educational objective of our undergraduate program is to develop in our students problem-solving skills, the ability to think independently, and the ability to assess ideas with an open mind, which will allow them to be successful as they go on in careers in biomedical engineering, to medical school, or to graduate school in biomedical engineering. Specifically, our goal is to develop in students the ability to:

1. Construct models of biomedical systems, and solve them using a combination of modern computer applications and theory
2. Measure physical phenomena relevant to medicine and biology using state-of-the-art instrumentation
3. Design electronic instruments useful to the medical community
4. Understand problems presented by the medical community, and translate them into solvable engineering problems
5. Write effectively in a technical style
6. Speak effectively to both technical and non-technical audiences
7. Work effectively in a team setting

To be successful in developing the subset of skills technical in nature in the list above:
8. Students must be well-trained in biological, mathematical, scientific, and engineering fundamentals

Students, upon graduating from our program, should be:
9. Aware of real-life contemporary biomedical problems
10. Sensitive to biomedical ethical issues
11. Knowledgeable in one of the specialty areas central to the discipline of biomedical engineering

Some B.S. graduates are employed in industry and medical centers. Others continue studies in biomedical engineering and other fields. Students with engineering ability and an interest in medicine may consider the undergraduate BME program as an exciting alternative to conventional premedical programs. The undergraduate program has three major components: (1) Engineering Core, (2) BME Core, and (3) BME Specialty Sequence. The Engineering Core provides a broad background in mathematics, sciences, and engineering. A typical program of study is shown in the table. The BME Core integrates engineering with biomedical science to solve biomedical problems. Hands-on experience in BME is developed through the undergraduate laboratory and project courses. In addition, by choosing a BME Specialty Sequence, the
student can learn in depth about a specific area. This integrated program is designed to ensure that BME graduates are competent engineers. Students may select open electives for educational breadth or depth or to meet entrance requirements of medical school or other professional career choices. BME faculty serve as student advisors to guide students in choosing the program of study most appropriate for individual needs and interests.

Biomedical Engineering Specialty Electives

Common BME specialties are biomaterials (orthopaedic, polymeric, tissue engineering); biomechanics (prosthetics and tissues); bioelectricity; biomedical instrumentation (devices and sensors); biomedical computing and imaging; and biomedical systems and control. Courses for these specialties are presented in the table. Complete descriptions and suggested schedules for approved specialties are available on the department's Web page (bme.case.edu). These specialties provide the student with a solid background in a well-defined area of biomedical engineering. To meet specific educational needs, students may choose alternatives from among the suggested electives or design unique specialties subject to departmental guidelines and faculty approval.

Co-op and Internship Programs

Opportunities are available for students to alternate studies and work in industry as a co-op student, which is integrated in a five-year program. Alternatively, students may obtain employment as summer interns.

Minor in Biomedical Engineering

A minor in BME is offered to students who have taken the Engineering Core requirements. The minor consists of 15 credit hours based on two required courses, EBME 201/EBME 202, and an approved set of three electives chosen from among EBME 303, EMBE 306, EBME 308, EBME 309/359, EBME 310/360, EBME 311, EBME 320, EBME 324 and EBME 350.

B.S./M.S. Program

Undergraduates with a strong academic record may apply in their junior year for admission to the integrated B.S./M.S. program. A senior research project that begins in the summer after the junior year is designed to expand into an M.S. thesis. Also, the student begins to take graduate courses in the senior year. With continuous progress in research during three summers and the academic years, this program can lead to both the B.S. and M.S. in five years.

BME SPECIALTY SEQUENCE CLASSES

To ensure depth in a particular area, students take one of the seven specialty sequences listed below. Students should consult the website of the Department of Biomedical Engineering to learn more about the educational program and to determine the best order for taking courses in a particular sequence.

Biomechanics

EMAE 181, ECIV 310, EMAE 250, EMAE 271, EBME 307, and EMAE 372; and technical electives from EBME 324, EBME 402, EMAE 377, EMAE 350, EMAE 415, and EMAE 370

Biomaterials (polymeric)

EMAC 270, CHEM 223, EMAC 351 and EBME 303; and technical electives from EBME 416, EBME 405, EMAE 377, ECHE 360, EMAC 376, EBME 406, EBME 408, EMAC 276, EMAC 352, EMAE 351, and EMAC 377.

Biomaterials (orthopaedic)

EMSE 201, ECIV 310, EMSE 303, and EMAC 270; and technical electives from EBME 405, EMSE 316, EBME 416, EMSE 202, EMSE 270, EMSE 313, EMSE 411, EMAE 372, EMAC 276, EMAC 250, EBME 303, EBME 406, EBME 408, and EMAE 415

Biomaterials (tissue engineering)

CHEM 223, ECHE 360, EMAC 270, and ECHE 340; and technical electives from EBME 405, EBME 416, EMAC 377, BIOC 307, CBIO 453, EBME 406, EBME 408, ECHE 364, EMAC 376, BIOC 308, and EBME 303.

Biomedial Computing and Imaging

ECES 233, ECES 337, and EBME 320; and technical electives from ECES 281, EBME 431, ECES 375, EBME 324, ECES 340, ECES 391, MIDS 329, EBME 461, ECES 375, ECES 341, ECES 338, and MATH 304

Biomedical Instrumentation (devices)

ECES 245, ECES 281, and ECES 344; and technical electives from EAP 382, EEAP 309, ECES 313, EBME 403, EBME 320, EBME 324, ECES 321, ECES 311, EBME 418, PHYS 326, ECES 282, ECES 322, ECES 344, ECHE 370, ECHE 380, and ECHE 381.

Biomedical Systems and Control

ECES 304, ECES 313, ECES 322, and EMAE 181; and technical electives ECES 306, MATH 201, EBME 324, OPRE 345, EBME 402, EBME 407, EBME 320, MATH 201, OPRE 345, EBME 461, EMBE 307, and ECES 346.

Notes

This gives 129 credits. Varies from sequence to sequence.

GRADUATE PROGRAMS

The objective of our graduate BME program is to educate biomedical engineers for careers in industry, academia, health care, and government, and to advance research in biomedical engineering. The department provides a learning environment that encourages students to apply biomedical engineering methods to advance basic scientific discovery; integrate knowledge across the spectrum from basic cellular and molecular biology through tissue, organ, and whole body physiology and pathophysiology; and to exploit this knowledge to design diagnostic and therapeutic technologies that improve human health. The unique and rich medical,
<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>EBME 105, Introduction to Biomedical Engineering</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>CHEM 111, Chemistry for Engineers</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>MATH 121, Calculus for Science and Engineering I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>ENGR 131, Elementary Computer Programming</td>
<td>(2-2-3)</td>
</tr>
<tr>
<td></td>
<td>ENGL 150, Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>PHED 101, Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(16-5-17)</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Year</th>
<th>ENGR 145, Chemistry of Materials</th>
<th>(4-0-4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>MATH 122, Calculus for Science and Engineering II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>PHYS 121, General Physics I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>H/SS</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>PHED 102, Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(15-3-15)</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Year</th>
<th>EBME 201, Physiology - Biophysics I</th>
<th>(3-0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>MATH 223, Calculus for Science and Engineering III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>PHYS 122, General Physics II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>EBME Specialty Sequence or Science Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>H/SS</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(16-0-16)</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Year</th>
<th>EBME 202, Physiology - Biophysics II</th>
<th>(3-0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sophomore</td>
<td>MATH 234, Intro to Dynamic Systems</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>ENGR 210, Intro to Circuits and Instrumentation</td>
<td>(3-3-4)</td>
</tr>
<tr>
<td></td>
<td>EBME Specialty Sequence or Science Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>H/SS</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(15-3-16)</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Year</th>
<th>EBME 306, Introduction to Biomaterials</th>
<th>(3-0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>EBME 313, Biomedical Engineering Lab</td>
<td>(1-3-2)</td>
</tr>
<tr>
<td></td>
<td>ENGL 398N, Professional Communication</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>EBME 308, Biomedical Systems and Signals</td>
<td>(3-3-4)</td>
</tr>
<tr>
<td></td>
<td>ENGR 225, Thermo, Fluids, Heat and Mass Transfer</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(14-6-16)</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Year</th>
<th>EBME 314, Biomedical Engineering Lab II</th>
<th>(1-3-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>EBME 310, Principles of Biomedical Instrumentation</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>EBME 360, BME Instrumentation Lab</td>
<td>(0-3-1)</td>
</tr>
<tr>
<td></td>
<td>ENGR 200, Mechanics and Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>H/SS</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>EBME Specialty Sequence</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(16-6-18)</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Year</th>
<th>EBME 398, Senior Project</th>
<th>(0-9-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>or EBME 380, Design in BME</td>
<td>(1-6-3)</td>
</tr>
<tr>
<td></td>
<td>EBME Specialty Sequence</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>H/SS</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(12-9-15) or (13-6-15)</td>
</tr>
</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Year</th>
<th>EBME 309, Modeling of Biomedical Systems</th>
<th>(3-0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>EBME 359, BME Computer Simulation Lab</td>
<td>(0-3-1)</td>
</tr>
<tr>
<td></td>
<td>EBME Specialty Sequence</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>H/SS</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Open Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(15-3-16)</td>
</tr>
</tbody>
</table>

a. This is a typical program. Specialty sequences are designed with courses in a desired order that might vary from the one here. Programs must be planned with a faculty adviser in the Department of Biomedical Engineering.

b. This optional course is limited to freshmen. This can be replaced by an open elective.

c. Courses are chosen depending on the BME specialty sequence as listed below.

d. Students take at least one math or science course approved by BME department.

e. STAT 312, STAT 333, or STAT 332 fulfill the statistics requirement. Check with sequence advisor to determine the most appropriate class.
scientific, and engineering environments allow research projects ranging from basic science through engineering design and clinical application.

Numerous fellowships and research assistantships are available to support graduate students in their studies.

**M.S. Programs**

The M.S. program in BME provides breadth in biomedical engineering and biomedical sciences with depth in an engineering specialty. In addition, students are expected to develop the ability to work independently on a biomedical research or design project. The M.S. requires a minimum of 30 credit hours. With an M.S. research thesis (Plan A), a minimum of 21 credit hours is needed in regular course work and nine hours of thesis research (EBME 651). With an M.S. project (Plan B), a minimum of 27 credits hours is needed in regular course work, and three hours of project research (EBME 601).

**Master of Engineering and Management - Biomedical Entrepreneurship**

BME students may apply for the Biomedical Entrepreneurship concentration in the Master of Engineering and Management (MEM) program. The MEM is a joint degree offered by The Institute for the Management and Engineering (TIME) in the Case School of Engineering and the Weatherhead School of Management. The objective of this program is to provide biomedical engineers with the business and management context required to enable them to drive innovation within biomedical companies while serving in a technical capacity.

Students can enter the program as undergraduates. The program does not interfere with undergraduate degree requirements. The curriculum includes courses integrating engineering and management, as well as industrial internships. By making use of summers for both course work and internships, the degree is completed in one additional year beyond the B.S., for a total of five years.

Students should apply through TIME.

**Ph.D. Program in Biomedical Engineering**

For those students with primary interest in research, the Ph.D. in biomedical engineering provides additional depth and breadth in engineering and the biomedical sciences. Under faculty guidance, students are expected to undertake original research motivated by a biomedical problem. Research possibilities include the development of new theory, devices, or methods for diagnostic or therapeutic applications as well as for measurement and evaluation of basic biological mechanisms.

The Ph.D. program requires a minimum of 13 courses beyond the B.S. degree. There are four required core courses (EBME 403, 409, 451, 452). The balance of the courses can be chosen with significant flexibility to meet the career goals of the student, and to satisfy requirements of depth and breadth. Programs of study must include three graduate level courses in biomedical sciences and two courses whose content is primarily mathematical. Two semesters of departmental seminar attendance (EBME 611, 612) and three semesters of teaching experience (EBME 400T, 500T, 600T) are also required. Ph.D. programs of study are reviewed and must be accepted by the Graduate Education Committee and the department chairperson. Eighteen hours of EBME 701 registration are required.

Ph.D. candidacy requires passing certain milestones. A student is advanced to Ph.D. candidacy after passing the Ph.D. Qualifying Exam and obtaining approval of the Ph.D. short proposal. The Ph.D. is completed when the dissertation has been written and defended, and when at least two manuscripts have been submitted for publication and at least one of the two is accepted.

**Ph.D. Program in Biophysics-Bioengineering**

This program, which is administered through the School of Medicine, is jointly sponsored with the Department of Physiology and Biophysics. A full description is available in the section on the School of Medicine.

**Ph.D. Program in Neuroscience-Bioengineering**

This program, which is administered through the School of Medicine, is jointly sponsored with the Department of Neurosciences. A full description is available in the section on the School of Medicine.

**Ph.D./M.D. Programs**

Students with outstanding qualifications may apply to either of two M.D./Ph.D. programs. Students interested in obtaining a combined M.D./Ph.D., with an emphasis on basic research in biomedical engineering, are strongly encouraged to explore the Medical Scientist Training Program (MSTP), administered by the School of Medicine. Alternatively, the Physician Engineer Training Program (PETP) was established to train future physicians who also possess expertise in state-of-the-art engineering medical technologies, with a research focus on applied biomedical engineering. It is expected that graduates of the PETP will have a strong interest in the biomedical industrial sector, clinical medicine, or in academic positions in biomedical engineering, rather than the traditional M.D./Ph.D. career pathway in academic medicine.

Both M.D./Ph.D. programs require approximately seven to eight years of intensive study after the B.S. Interested students should apply for either program through the MSTP office in the Medical School.

**RESEARCH AREAS**

Several research thrusts are available to accommodate various student backgrounds and interests. Strong research collaborations with clinical and basic science departments of the university and collaborating medical centers bring a broad range of opportunities, expertise, and perspective to student research projects.
Biomaterials/Tissue Engineering
Materials for implantation, including neural, orthopaedic, and cardiovascular tissue engineering, biomimetic materials, liposomal and other structures for controlled, targeted drug delivery, and biocompatible polymer surface modifications. Analysis of synthetic and biologic polymers by AFM, nanoscale structure-function relationships of biomaterials.

Biomedical Imaging
MRI, PET, SPECT, CT, ultrasound, acoustic elastography, optical coherence tomography, cardiac electrical potential mapping, human visual perception, image guided intervention, contrast agents. In vivo microscopic and molecular imaging, and small animal imaging.

Biomedical Sensing
Optical sensing, electrochemical and chemical fiber-optic sensors, chemical measurements in cells and tissues, endoscopy.

Neural Engineering and Neural Prostheses
Neuronal mechanisms; neural interfacing for electric and magnetic stimulation and recording; neural dynamics, ion channels, second messengers, nitric oxide, signal processing in the retina; neural prostheses for control of limb movement, bladder, bowel, and respiratory function.

Transport and Metabolic Systems Engineering
Modeling and analysis of tissue responses to heating (e.g., tumor ablation) and of cellular metabolism related to organ and whole-body function in health (exercise) and disease (cardiac).

FACILITIES
The administrative offices of the Department of Biomedical Engineering are located in the Wickenden Building, which houses many BME research laboratories and centers. Major interdisciplinary centers include the Center for Cardiovascular Biomaterials (CCB), the Center for Biomolecular and Nanoscale Engineering for Targeted Therapeutics (BioNETT), the Neural Engineering Center (NEC), and the Center for Modeling Integrated Metabolic Systems (MIMS). The CCB includes laboratories for biomaterials microscopy, biopolymer and biomaterial interfaces, and molecular simulation. The BioNETT Center develops technologies for physical and chemical targeting of therapeutics, and imaging their distribution within the body. The NEC is a major facility for basic research and animal experimentation, with a focus on recording and controlling neural activity to increase our understanding of the nervous system and to develop neural prostheses. The MIMS Center combines mathematical modeling, computer simulation, and in vivo experimentation to quantify relationships between cellular metabolism and physiological responses of tissue-organ systems and the whole body. The Biomedical Imaging Laboratories image structure and function from the molecular level to the tissue-organ level, using many modalities, including ultrasound, MRI, CT, PET, SPECT, bioluminescence, and light. Biomedical Sensing Laboratories includes facilities for electrochemical sensing, chemical measurements in individual cells, and minimally invasive physiological monitoring.

Primary BME faculty also direct laboratories and centers in other locations. The Endoscopy Research Laboratory in University Hospitals is the center for work on optical computed tomography and biophotonics. The Cleveland Functional Electrical Stimulation (FES) Center, with laboratories in three medical centers, develops techniques for restoration of movement in paralysis, control of the nervous system, and implantable technology. It also promotes technology transfer and disseminates information about functional electrical stimulation, and evaluates clinical functionality of neuroprostheses.

The department faculty and students have access to the facilities and major laboratories of the Case School of Engineering and of the School of Medicine. Faculty have numerous collaborations at University Hospitals, MetroHealth Medical Center, VA Medical Center, and the Cleveland Clinic Foundation. These provide extensive research resources in a clinical environment for both undergraduate and graduate students.

BIOMEDICAL ENGINEERING (EBME)
Undergraduate Courses
EBME 105. Introduction to Biomedical Engineering (3)
Biomedical engineering fields of activity. Research, development, and design for biomedical problems, diagnosis of disease, and therapeutic applications.

EBME 201. Physiology-Biophysics I (3)

EBME 202. Physiology-Biophysics II (3)
Biological control systems. Cardiovascular, renal, respiratory, gastrointestinal, and immune systems.

EBME 300. Dynamics of Biological Systems: A Quantitative Introduction to Biology (3)
(See BIOL 300.) Cross-listed as BIOL 300.

EBME 303. Structure of Biological Materials (3)
Structure of proteins, nucleic acids, connective tissue and bone from molecular to microscopic levels. Principles and applications of instruments for imaging, identification, and measurement of biological materials. Prereq: EBME 202. Cross-listed as EMAC 303.

EBME 306. Introduction to Biomedical Materials (3)
Applications of biomaterials in different tissue and organ systems. Relationship between physical and chemical structure of materials and physiological response. Choosing, fabricating and modifying materials for specific biomedical applications. Prereq: EBME 201 and EBME 202.

EBME 307. Biomechanical Prosthetic Systems (3)
Introduction to the basic biomechanics of human movement and applications to the design and evaluation of artificial devices intended to restore or improve movement lost due to injury or disease. Measurement techniques in movement biomechanics, including motion analysis, electromyography, and gait analysis. Design and use of upper and lower limb prostheses. Principles of neuroprostheses with applications to paralyzed upper and lower extremities.

EBME 308. Biomedical Signals and Systems (4)

EBME 309. Modeling of Biomedical Systems (3)
Mathematical modeling of biomedical systems. Lumped and distributed models of electrical, mechanical, and chemical processes applied to cells, tissues, and organ systems. Prereq: EBME 308. Coreq: EBME 359.

EBME 310. Principles of Biomedical Instrumentation (3)
Physical, chemical and biological principles for biomedical measurements. Modular blocks and system
EBME 313. Biomedical Engineering Laboratory I (2)
Experiments for measurement, assisting, replacement, or control of various biomedical systems. Prereq: EBME 201, EBME 202 and ENGR 210. Coreq: ENGL 398N.

EBME 314. Biomedical Engineering Laboratory II (2)
Continuation of EBME 313. Prereq: EBME 201, EBME 202 and ENGR 210.

EBME 320. Medical Imaging Fundamentals (3)
Physical principles of medical imaging. Imaging devices for x-ray, ultrasound, magnetic resonance, etc. Image quality descriptions. Patient risk. Prereq: EBME 201, EBME 202, EBME 308, and EBME 310 or equivalent.

EBME 324. Laboratory Computing in Biomedical Engineering (3)

EBME 350. Quantitative Molecular Bioengineering (3)
The objective of this course is to equip the students with a "molecular toolbox"--a set of quantitative skills that permit rational designs for engineering tissues starting at the molecular level. The course will build on the physical and chemical principles in equilibrium, kinetics, and mass transport. Specific examples in bioengineering systems will be used throughout the course to illustrate the importance of understanding and application of these principles to tissue engineering of skin and cartilage. Prereq: ENGR 225. Cross-listed as ECHE 355.

EBME 359. Biomedical Computer Simulation Laboratory (1)

EBME 360. Biomedical Instrumentation Laboratory (1)
A laboratory which focuses on the basic components of biomedical instrumentation and provides hands-on experience for students in EBME 310. Biomedical instrumentation. The purpose of the course is to develop design skills and laboratory skills in analysis and circuit development. Coreq: EBME 310.

EBME 380. Design for Biomedical Engineers (3)
Design a useful product with potential commercial value. This course offers a design experience that builds on the fundamentals of Biomedical Engineering through the effective use of teams and team design. Prereq: EBME 310.

EBME 396. Special Topics in Undergraduate Biomedical Engineering I (1-18)
(Credit as arranged.) Prereq: Consent of instructor.

EBME 398. Senior Project Laboratory I (3)

EBME 399. Senior Project Laboratory II (3)

Graduate Courses
EBME 400T. Graduate Teaching I (0)
This will provide the Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational opportunity for the student. Prereq: Ph.D. student in Biomedical Engineering.

EBME 402. Muscles, Biomechanics, and Control of Movement (4)

EBME 403. Biomedical Transducers (3)
Analysis and design of transducers: optical, photoelectric, electrochemical, electrical, mechanical, electromechanical, and thermoelectric. Applications to biomedical systems. Prereq: EBME 310 and EBME 360 or consent of instructor.

EBME 405. Materials for Prosthetics and Orthotics (3)

EBME 406. Polymers in Medicine (3)
Distribution of plastic implants in the body, including history and statistics; chemical and physical characteristics of biomedical polymers, including general implant requirements, reactions of the host to implants, reactions of implants to physiological conditions, physiological and biomechanical basis for soft-tissue implants; plastic materials used in medicine and surgery; frontiers in biomedical polymers (current topics directed to the design and development of new biomedical polymers). Prereq: Consent of instructor. Cross-listed as EMAC 471.

EBME 407. Applied Neural Control (3)
Fundamental concepts related to electrical stimulation of the nervous system. Cable equation, currents in volume conductors, electrical models of axons, interaction between axons and electrical fields, tissue damage of electrical stimulation, electrochemistry of electrical stimulation, electrodes for electrical stimulation, applications to neuromuscular, sensory, and other physiological systems. Prereq: EBME 451 and EBME 409.

EBME 408. Tissue and Cellular Engineering (3)
Tissue engineering approach for augmentation or replacement of compromised tissue function in nerve, microvessels, skin and cartilage. Integrative exploration of the use of three-dimensional polymeric scaffolds and drug delivery vehicles, and gene therapy and cellular engineering for functional repair of injured tissues. Prereq: Consent of instructor.

EBME 409. Systems and Signals in Biomedical Engineering (3)

EBME 410. Medical Imaging Fundamentals (3)
Physical principles of medical imaging. Imaging devices for x-ray, ultrasound, magnetic resonance, etc. Image quality descriptions. Patient risk. Prereq: EBME 308 and EBME 310 or equivalent.

EBME 412. Biomedical Signal Processing (3)

EBME 414. Laboratory Computing in Biomedical Engineering (3)
Hardware and software aspects of computer systems for laboratory application. Analog and digital interfacing. Signal conditioning and sample requirements. Computer control of laboratory instruments and data acquisition. Biomedical applications. Prereq: EBME 308 or equivalent.

EBME 416. Bionanomaterials in Drug Delivery (3)
The teaching objective is to provide students with a basic understanding of the principles of design and engineering of well-defined molecular structures and architectures intended for applications in controlled release and organ-targeted drug delivery. The course will discuss the therapeutic basis of drug delivery based on drug pharmacodynamics and clinical pharmacokinetics. Bionanomaterials with specialized structural and interfacial properties will be introduced to achieve drug targeting and controlled release. Prereq: EBME 306.

EBME 417. Structure and Function of Excitable Cells (3)
Ion channels are the molecular basis of membrane excitability in all cell types, including neuronal, heart, and muscle cells. This course presents the structure and the mechanism of function of ion channels at the molecular level. It introduces the basic principles and methods in the ion channel study including the ionic basis of membrane excitability, thermodynamic and kinetic analysis of channel function, voltage clamp and patch clamp techniques, and molecular and structural biology approaches. The course will cover structure of various potassium, calcium, sodium, and chloride channels and their physiological function in neural, cardiac, and muscle cells. Exemplary channels that have been best studied will be discussed to illustrate the current understanding of the molecular mechanisms of channel gating and permeation. Prereq: Consent of instructor.

EBME 418. Electronics for Biomedical Engineering (3)
EBME 427. Movement Biomechanics and Rehabilitation (3)
Introduction to the basic biomechanics of human movement and applications to the design and evaluation of artificial devices intended to restore or improve movement lost due to injury or disease. Measurement techniques in movement biomechanics, including motion analysis, electromyography, and gait analysis. Design and use of upper and lower limb prostheses. Principles of neuroprostheses with applications to paralyzed upper and lower extremities. Term paper required. Prereq: Consent of instructor.

EBME 431. Physics of Imaging (3)
Description of physical principles underlying the spin behavior in MR and Fourier imaging in multi-dimensions. Introduction of conventional, fast, and chemical-shift imaging techniques. Spin echo, gradient echo, and variable flip-angle methods. Projection reconstruction and sampling theorems. Bloch equations, T1 and T2 relaxation times, RF penetration, diffusion and perfusion, flow imaging, MR angiography, and functional brain imaging. Sequence and coil design. Prerequisite may be waived with consent of instructor. Prereq: PHYS 122 or PHYS 124 or EBME 410. Cross-listed as PHYS 431.

EBME 447. Rehabilitation for Scientists and Engineers (3)
Medical, psychological, and social issues influencing the rehabilitation of people with spinal cord injury, stroke, traumatic brain injury, and limb amputation. Epidemiology, anatomy, pathophysiology and natural history of these disorders, and the consequences of these conditions with respect to impairment, disability, handicap and quality of life. Students will directly observe the care of patients in each of these diagnostic groups throughout the full continuum of care starting from the acute medical and surgical interventions to acute and subacute rehabilitation, outpatient medical and rehabilitation management and finally to community re-entry. Prereq: Consent of department.

EBME 451. Molecular and Cellular Physiology (3)
This course is the first in the pair of BME physiology core courses EBME 451 and 452. The emphasis of EBME 451 is on the molecular and cellular mechanisms underlying physiological processes. Structure-function relationship will be addressed throughout the course. The primary goal of the course is to develop understanding of the principles of the physiological processes at molecular and cellular level and to promote independent thinking and ability to solve unfamiliar problems.

EBME 452. Tissue and Organ Systems Physiology (3)

EBME 460. Advanced Topics in NMR Imaging (3)
Frontier issues in understanding the practical aspects of NMR imaging. Theoretical descriptions are accompanied by specific examples of pulse sequences, and basic engineering considerations in MRI system design. Emphasis is placed on implications and trade-offs in MRI pulse sequence design from real-world versus theoretical perspectives. Prereq: EBME 431 or PHYS 431. Cross-listed as PHYS 460.

EBME 461. Biomedical Image Processing and Analysis (3)
Principles of image processing and analysis with applications to biomedical images from the nano-scale to 3D whole organ imaging. Topics include image filtering, enhancement, restoration, registration, morphological processing, and segmentation. Prereq: EBME 409 or equivalent.

EBME 478. Computational Neuroscience (3)
Computer simulation of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as ECECS 478.

EBME 479. Seminar in Computational Neuroscience (3)
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Cross-listed as BIOL 479.

EBME 500T. Graduate Teaching II (0)
This course will provide the Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational opportunity for the student. Prereq: Ph.D. student in Biomedical Engineering. EBME 400T.

EBME 501. Bioelectric Phenomena (3)

EBME 502. Cardiac Excitation, Rhythm, and Control (3)

EBME 503. Biomolecular Forces (3)
Advanced course on the theory, measurement, and analysis of the intermolecular physical forces that dominate cell and molecular interactions in dynamic aqueous systems. The aim of this course is to provide students involved in biomaterials engineering and studies on cell and molecular interactions with (i) a quantitative and fundamental understanding of the intermolecular forces (electrostatic, van der Walls, solvation forces) that direct cell and molecular adhesion, self-assemblying systems (bilayers, cell membranes) and specific and non-specific receptor-ligand binding; (ii) the ability to develop mechanistic models for surface adhesion, self-assembly, cell surface binding and signal transduction; and (iii) skills for measurement and quantitative analysis of forces (nano- to pico-Newton levels) in the “near-surface” (1-10 nm) domain by atomic force microscopy and related force measurement techniques. Prereq: EBME 405 or EBME 406, undergraduate electricity and magnetism, undergraduate physical chemistry, or consent of instructor.

EBME 504. Transport Processes of Biomedical Systems (3)

EBME 507. Motor System Neuroprostheses (3)
Design and implementation of neuroprostheses. Transformation of muscle action into limb movement. Musculoskeletal modeling and simulation. Control of the musculoskeletal system by neural stimulation. Prereq: Consent of instructor.

EBME 513. Biomedical Optical Diagnostics (3)
Engineering design principles of optical instrumentation for medical diagnostics. Elastic and inelastic light scattering theory and biomedical applications. Confocal and multiphoton microscopy. Light propagation and optical tomographic imaging in biological tissues. Design of minimally invasive spectroscopic diagnostics. Prereq: EBME 403 or PHYS 326 or consent.

EBME 517. Quantitative Neurophysiology (3)
The course focuses on the fundamental principles that govern the behavior of ions in biological solutions, on the relation between structure and function in ion channels and synaptic transmission. Computer modeling integrates the various aspects of neuronal function. Prereq: MATH 224, EBME 451, or BIOL 373/473, or permission of department. Prereq: MATH 224, EBME 451, or BIOL 373/473, or permission of department.

EBME 519. Parameter Estimation for Biomedical Systems (3)

EBME 523. Chemical and Optical Sensors (3)
Fundamental electrical, electrochemical, and optical measurement techniques, and selective biological membranes based on ion, enzyme, and immuno-reactions. Sensor stability and response time. Prereq: EBME 403.

EBME 550. Neuremechanics Seminar (0)
Current research in neomechanical systems, including movement control in natural organisms, biologically inspired robots, and hybrid (artificial/natural) neural prosthetic systems. Presentations by students, faculty, and visiting scholars. Cross-listed as BIOL 550, ECECS 550, and EMAE 550.

EBME 600T. Graduate Teaching III (0)
This course will provide the Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience in teaching undergraduate or graduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations.
also develop new materials (ceramic com-
posites and electronic chips, for example) as well as biochemicals and pharmaceu-
ticals. The breadth of training in engine-
ering and the sciences gives chemical en-
gineers a particularly wide spectrum of career opportunities. Chemical engi-
neers work in the chemical and materials
related industries, in government, and are
readily accepted by graduate schools in
engineering, chemistry, medicine, and law
(mainly for patent law). The Bachelor of
Science degree is accredited by the Engi-
neering Accreditation Commission of the
Accreditation Board for Engineering and
Technology.

The department offers Bachelor of
Science in Engineering, Master of Sci-
ence, and Doctor of Philosophy degree
programs that provide preparation for
work in all areas of chemical engineer-
ing. Breadth sequences in biochemical
engineering, biomedical engineering,
computing, electrochemical engineering,
and the sciences gives chemical
materials, environmental engi-
neering, management/entrepreneurship,
polymer science, systems and control,
or advanced studies provide depth and
specialization for undergraduates major-
ing in chemical engineering. A special
biochemical engineering track is available,
where students integrate eight biochem-
istry, biology, and bioengineering courses
into the normal chemical engineering
curriculum. In addition, for students with
a strong interest in polymer engineering,
a minor in macromolecular science can
be integrated with the chemical engi-
neering curriculum. Chemical engineer-
ing undergraduates are members of the
student chapter of the American Institute
of Chemical Engineers (AIChE). The
AIChE chapter sponsors social events,
field trips to local industry, technical pre-
sentations by outside speakers, and em-
ployment counseling. Information about
the AIChE can be obtained through the
department, the chapter president or the
chapter advisor. There are 15 full-time
faculty members pursuing active research
programs. The research of the faculty is
aimed at advanced and cutting-edge areas
of chemical engineering.

FACULTY

Peter N. Pintauro, Ph.D. (University of
California, Los Angeles)
Professor and Department Chair
Electrochemical engineering, membrane
fabrication, membrane transport modeling,
organic electrochemical synthesis, fuel cell
John Anderson, Ph.D. (University of
Illinois) Professor, Provost, and University
Vice President
Membrane and colloidal science, electrokinetic
phenomena, bioengineering, polymers at
interfaces
John C. Angus, Ph.D. (University of
Michigan)
Kent Hale Smith Professor Emeritus of
Engineering
Chemical vapor deposition of diamond,
electrochemistry of diamond gallium nitride
synthesis
Harithara Baskaran, Ph.D. (The
Pennsylvania State University)
Assistant Professor
Transport Phenomena in Biology and
Medicine
Robert V. Edwards, Ph.D. (Johns Hopkins
University)
Professor
Laser anemometry, mathematical modeling,
data acquisition
Donald L. Feke, Ph.D. (Princeton
University)
Professor Deputy Provost and Vice President
for Academic Programs.
Colloidal phenomena, dispersive mixing, fine
particle processing
Robert E. Harris, Ph.D. (Northeastern
University), M.B.A. (Case Western Reserve
University)
Adjunct Professor of Engineering
Process design, process synthesis, analysis,
design and simulation
Uziel Landau, Ph.D. (University of
California, Berkeley)
Professor
Electrochemical engineering, modeling of
electrochemical systems, electrodeposition,
batteries and fuel cells
Chung-Chiu Liu, Ph.D. (Case Institute of
Technology)
Wallace R. Persons Professor of Sensor
Technology and Control
Electrochemical sensors, electrochemical
synthesis, electrochemistry related to electronic
materials

Department of Chemical
Engineering

116 A.W. Smith Building (7217)
Phone 216-368-4182; Fax 216-368-3016
Peter N. Pintauro, Chair
e-mail: pnp3@case.edu
http://www.case.edu/cse/eche/

The profession of chemical engineering
involves the analysis, design, operation and
control of processes that convert
matter and energy to more useful forms,
ensuring processes at all scales from the
molecular to the macroscale. Traditionally,
chemical engineers are responsible for
the production of basic chemicals, plastics,
and fibers. However, today’s chemical
engineers are also involved in food and
fertilizer production, synthesis of
electronic materials, waste recycling, and
power generation. Chemical engineers
also develop new materials (ceramic com-

opportunity for the student. Prereq: Ph.D. student in
Biomedical Engineering, EMBE 500T.

EBME 601. Research Projects (1-18)

EBME 602. Special Topics (1-18)
Prereq: Consent of instructor.

EBME 607. Neural Engineering Topics (1)
The goal of this class is to explore topics in Neural
Engineering not covered in the curriculum. A single
topic will be chosen per semester. Four speakers with
expertise in the chosen area will be invited to the
campus. Each speaker will give a seminar and participate in
a 2-hour workshop/journal club on the specific topic.
The students will be assigned one or two seminal pa-
pers written by the speaker prior to the visit. Students
will take turns presenting these papers to the rest of the
class. The paper and the topic will then be open for
discussion. At the end of the semester, the students will
collaborate to write a single review article in a publish-
able format on the topic of the semester.

EBME 611. BME Departmental Seminar I (0)
Required of all first-year graduate students in BME.

EBME 612. BME Departmental Seminar II (0)
Continuation of EBME Departmental Seminar I.
Required of all first-year graduate students in BME.

EBME 621. BME Research Rotation I (0)
Opportunity for trainees to participate in BME
research under supervision of faculty.

EBME 622. BME Research Rotation II (0)
Opportunity for trainees to participate in BME
research under supervision of faculty.

EBME 651. Thesis M.S. (1-18)

EBME 701. Dissertation Ph.D. (1-18)
Ph.D. candidates only.

EBME 703. Dissertation Fellowship (1-8)
Daniel Lacks, Ph.D. (Harvard University)
C. Benson Branch Professor of Chemical Engineering
Molecular simulation, statistical mechanics

J. Adin Mann, Jr., Ph.D. (Iowa State University)
Professor
Surface phenomena, interfacial dynamics, colloid science, light scattering, biomimetics, molecular electronics

Heidi B. Martin, Ph.D. (Case Western Reserve University)
Nord Assistant Professor of Engineering
Conductive Diamond Films; Electrochemical Sensors; Chemical Modification of Surfaces for Electrochemical and Biomedical Applications; Biomaterials; Microfabrication of Sensors and Devices

Syed Qutubuddin, Ph.D. (Carnegie Mellon University)
Professor
Surfactant and polymer solutions, separations, nanoparticles, novel polymeric materials, nanocomposites

Robert F. Savinell, Ph.D. (University of Pittsburgh)
George S. Dively Professor and Dean of Engineering
Electrochemical engineering, electrochemical reactor design and simulation, electrode processes, batteries and fuel cells

Gary E. Wnek, Ph.D. (University of Massachusetts)
Joseph F Toot, Jr. Professor
Electroactive and ionically conducting polymers, electrostatic polymer processing, biomaterials

Thomas A Zawodzinski, Ph.D. (State University of New York at Buffalo)
Ohio Eminent Scholar in Fuel Cells and F. Alex Nason Professor of Engineering
Fuel cells, transport and electrochemistry in energy conversion and storage devices, NMR spectroscopy and imaging, transport/structure property relationships in polymer electrolytes, self-assembly chemistry

UNDERGRADUATE PROGRAMS

The Case School of Engineering prepares and challenges its students to take leadership positions in engineering and computer science. The increasing role of technology in virtually every facet of our culture — communications, transportation, construction, health care, the environment, and even our system of wealth distribution — makes it vital that engineering-oriented students have access to progressive and cutting-edge programs stressing the following five areas of excellence:

- Mastery of Fundamentals
- Creativity
- Societal Awareness
- Leadership Skills
- Professionalism

The Department of Chemical Engineering expands these more general objectives as follows:

Mastery of Fundamentals
- A strong background in the fundamentals of chemistry, physics, and mathematics.
- A sound education in chemical engineering fundamentals, including mass and energy balances, separation processes, reaction engineering, thermodynamics, transport processes, and control.
- Training in computers as tools of the profession, including experience with spreadsheets, simulators, computer-aided design software, and mathematics/statistics packages.

Creativity
- Comprehensive design experiences involving problem definition, literature searching, synthesis, economics, communications, teamwork, project management, equipment choice, and safety.
- Laboratories that provide hands-on experience with equipment, design of experiments, data/statistical analysis, and reinforcement of fundamental physical concepts.
- Opportunities for individualized research experiences.

Societal Awareness
- Understanding of the technological and human resource needs of industry, government, and society.
- A sufficiently broad education to understand the impact of engineering on society
- Opportunities to explore other cultures and learning environments through the Junior Year in Edinburgh program and the summer Chemical Engineering Laboratory course at University College London.

Leadership Skills
- Multiple and integrated opportunities to develop written and oral communication skills.
- Develop specialized knowledge in a series of breadth electives, such as biomedical engineering, biochemical engineering, computing, electrochemical engineering, electronic materials, environmental engineering, management/entrepreneurship, polymer science, control, or research.
- Leadership roles in group-based course activities encouraging a “can do” positive attitude and developing skills in teamwork.

Professionalism
- A commitment to excellence and unquestioned integrity.
- An understanding of safety and ethical issues, and the environmental consequences of the practice of chemical engineering.
- Opportunities for professional development through the Cooperative Education Program.

Elective Sequences

A distinctive feature of the chemical engineering program is the three-course breadth elective sequence taken during the junior and senior years that permits a student to major in chemical engineering and, at the same time, pursue an interest in a related field. Nine elective sequences have standing departmental approval: biochemical engineering, biomedical engineering, computing, electrochemical engineering, electronic materials, environmental engineering, management/entre-
BACHELOR OF SCIENCE IN ENGINEERING DEGREE
Major in Chemical Engineering

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>PHYS 121 General Physics I Mechanics(^a)</td>
<td>(4-3-4)</td>
</tr>
<tr>
<td>CHEM 111 Principles of Chemistry I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-6-15)</td>
</tr>
</tbody>
</table>

| **Spring**                    |                        |
| PHYS 122 General Physics II Electricity and Magnetism\(^a\) | (4-3-4)               |
| ENGR 145 Chemistry of Materials                                   | (4-0-4)               |
| MATH 122 Calculus for Science and Engineering II                 | (4-0-4)               |
| ENGR 131 Elementary Computer Programming                          | (2-2-3)               |
| Humanities/Social Science Elective                                 | (3-0-3)               |
| PHED 102 Physical Education Activities                            | (0-3-0)               |
| **Total**                     | (17-8-18)             |

| Sophomore Year               |                        |
| **Fall**                     |                        |
| CHEM 223/323 Organic Chemistry                  | (3-0-3)               |
| MATH 223 Calculus for Science and Engineering III               | (3-0-3)               |
| ENGR 225 Thermodynamics, Fluids, Heat and Mass Transfer        | (4-0-4)               |
| ECHE 260 Introduction to Chemical Systems                        | (3-0-3)               |
| ECHE 151 Chemical Engineering at Case                            | (1-0-0)               |
| Humanities/Social Science or Science Elective II\(^b\)           | (3-0-3)               |
| **Total**                     | (17-0-16)             |

| **Spring**                   |                        |
| Science Elective II\(^b\)    | (3-0-3)               |
| MATH 224 Differential Equations                                  | (3-0-3)               |
| STAT 313 Statistics for Experimenters                           | (3-0-3)               |
| ECHE 363 Chemical Engineering Thermodynamics                    | (3-0-3)               |
| Humanities/Social Science Sequence I                            | (3-0-3)               |
| **Total**                     | (15-0-15)             |

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ECHE 360 Transport Phenomena for Chemical Systems</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ECHE 367 Process Control</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGR 210 Circuits and Instrumentation</td>
<td>(2-2-4)</td>
</tr>
<tr>
<td>CHEM 290 Advanced Chemical Laboratory Methods</td>
<td>(1-6-3)</td>
</tr>
<tr>
<td>Breadth Elective Sequence I(^d) or Humanities/ Social Science Elective or Breadth Elective Sequence I(^d)</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(14-8-18)</td>
</tr>
</tbody>
</table>

| **Spring**                   |                        |
| ECHE 361 Separation Processes                                    | (3-0-3)               |
| ECHE 365 Measurements Laboratory                                | (0-3-3)               |
| ENGL 398N Professional Communications                          | (3-0-3)               |
| ECHE 364 Chemical Reaction Processes                            | (3-0-3)               |
| Humanities/Social Science Sequence II                           | (3-0-3)               |
| **Total**                     | (12-3-15)             |

<table>
<thead>
<tr>
<th>Senior Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ECHE 398 Process Analysis and Design</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ECHE 362 Chemical Engineering Laboratory</td>
<td>(0-4-4)</td>
</tr>
<tr>
<td>Materials Elective(^e)</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Breadth Elective Sequence II(^d)</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(12-4-16)</td>
</tr>
</tbody>
</table>

| **Spring**                   |                        |
| ECHE 399 Chemical Engineering Design Project                     | (3-0-3)               |
| CHEM 336 Physical Chemistry II                                   | (3-0-3)               |
| ENGR 200 Statics and Strength of Materials                      | (3-0-3)               |
| Breadth Elective Sequence III\(^d\)                             | (3-0-3)               |
| Science Elective II\(^b\) or Humanities/ Social Science         | (3-0-3)               |
| Humanities/Social Science Sequence III                           | (3-0-3)               |
| **Total**                     | (18-0-18)             |

| Hours required for graduation: | 131-133 |
| (depending on breadth elective sequence) | |

a. Selected students may be invited to take PHYS 125, 126 General Physics I, II Honors in place of PHYS 121,122.

b. Science Elective I and II. Students must take any two of the following courses—PHYS 221 General Physics III. Modern (F, Sp), CHEM 224/324 Organic Chemistry II (Sp), or BIOL 205 Chemical Biology (Sp).

c. One materials elective is required. Suggested courses include EMAC 270 Introduction to Polymer Science (F, Sp); EMAC 276 Polymer Properties and Design (F, Sp); EMSE 314 Electrical, Magnetic, Optical Properties of Materials (F); EMSE 316 Applications of Ceramic Materials; or course approved by the chemical engineering faculty.

d. A three course (nine credit hours minimum) breadth sequence (approved by the Chemical Engineering faculty). Preapproved sequences include biochemical engineering, biomedical engineering, computing, electrochemical engineering, electronic materials processing, environmental engineering, management/entrepreneurship, polymer science, systems and control, and advanced study (B.S./M.S.).
APPROVED BREADTH ELECTIVE SEQUENCES

Biochemical Engineering (Advisor: Dr. Qutubuddin)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOC 307, General Biochemistry (4)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>BIOL 343, Microbiology (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>ECHE 340, Biochemical Engineering (3)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

Biomedical Engineering (Advisor: Dr. Baskaran)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBM 201, Physiology-Biophysics I (3)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>EBM 202, Physiology-Biophysics II (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>EBM 309, Modeling of Biomedical Systems (3)</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>EBME 201, Physiology-Biophysics I (3)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>EBME 202, Physiology-Biophysics II (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>EBME 309, Modeling of Biomedical Systems (3) or EBME 310, Biomedical Instrumentation (3)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

Computing (Advisor: Dr. Edwards)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECES 281 Logic Design and Computer Organization (4)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>EEC 233, Introduction to Data Structures (4)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>EEC 346, Engineering Optimization (3)</td>
<td>Fall, senior</td>
</tr>
</tbody>
</table>

Electrochemical Engineering (Advisor: Dr. Landau)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 380 Electrochemical Technology (3)</td>
<td>Fall, junior or Spring, junior</td>
</tr>
<tr>
<td>ECHE 381 Electrochemical Engineering (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>ECHE 383 Chemical Engineering Applied to Microfabrication and Devices (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>EEC 309 Electromagnetic Fields I (3)</td>
<td>Fall, Spring</td>
</tr>
<tr>
<td>EEC 321 Semiconductor Elec. Dev. (4)</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>EMSE 411, Environmental Effects on Materials Behavior (3)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

Electronic Materials (Advisor: Dr. Liu)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECHE 383 Chemical Engineering Applied to Microfabrication and Devices (3)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>ECHE 309 Electromagnetic Fields I (3)</td>
<td>Fall, Spring</td>
</tr>
<tr>
<td>EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>EEC 321 Semiconductor Electronic Devices (4)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

Environmental Engineering (Advisor: Dr. Pintauro)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 368 Environmental Engineering (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>ECIV 362 Solid and Hazardous Waste Management (3)</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>GEOL 436 Aquatic Chemistry (3)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>ECIV 460 Environmental Remediation (3)</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>ECIV 464 Environmental Engineering Microbiology (3)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

Management Entrepreneurship (Advisor: Dr. Harris)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCT 303/403, Survey of Accounting (3)</td>
<td>Fall, junior</td>
</tr>
<tr>
<td>BAFI 353, Corporation Finance (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>plus one additional course selected from MKMR 301, Marketing Management (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>ENTP 311, New Venture Creation (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>ENTP 310 Entrepreneurial Financing (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>ENTP 295 Entrepreneurial Behavior (3)</td>
<td>Fall, senior</td>
</tr>
</tbody>
</table>

Polymer Science (Advisor: Dr. Mann)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMAC 270, Introduction to Polymer Science (3)</td>
<td>Fall, Spring</td>
</tr>
<tr>
<td>plus any two courses selected from EMAC 276, Polymer Properties and Design (3)</td>
<td>Fall, Spring</td>
</tr>
<tr>
<td>EMAC 376, Polymer Engineering (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>EMAC 377, Polymer Processing (4)</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>EMAC 378, Polymer Production and Technology (3)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

Systems and Control (Advisor: Dr. Lacks)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEC 346, Engineering Optimization (3)</td>
<td>Spring, junior</td>
</tr>
<tr>
<td>EEC 281 Logic Design and Computer Organization (4)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>EEC 306, Control Engineering II</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>or ECHE 463, Model Based Control (3)</td>
<td></td>
</tr>
</tbody>
</table>

Advanced Study Sequence (Advisor: Dr. Edwards)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 460, Thermodynamics (3)</td>
<td>Spring, senior</td>
</tr>
<tr>
<td>or ECE 475, Chemical Engineering Analysis (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>ECE 651 Master’s Thesis (3)</td>
<td>Fall, senior</td>
</tr>
<tr>
<td>ECE 651 Master’s Thesis (3)</td>
<td>Spring, senior</td>
</tr>
</tbody>
</table>

e. In these sequences, coordinate your choice of breadth electives with your choice for the Materials Elective.

f. This sequence is designed for students entering the five-year B.S./M.S. program. Students taking this sequence should rearrange the scheduling of the elective sequence and humanities/social science courses in the junior and senior years to accommodate these courses.
and Polymer Production are available. Polymer Processing and Characterization is available for students majoring in engineering, two five-course minor sequences, Polymer Processing and Characterization, and Polymer Production are available.

**Polymer Production and Characterization**

EMAC 270: Introduction to Polymer Science (F, Sp)
EMAC 376: Polymer Engineering (F, Sp)
EMAC 377: Polymer Processing (F)
EMAC 372: Polymer Processing and Testing Laboratory (Sp)
EMAC 575: Polymer Rheology

**Polymer Production**

EMAC 270: Introduction to Polymer Science (F, Sp)
EMAC 272: Polymer Analysis Laboratory (Sp)
EMAC 276: Polymer Properties and Design (Sp)
EMAC 378: Polymer Production and Technology (Sp)
EMAC 398: Polymer Sci. and Engr. Project (F, Sp)

**Minor in Polymer Engineering**

For students wanting to pursue an interest in polymers, but major in chemical engineering, two five-course minor sequences, Polymer Processing and Characterization, and Polymer Production are available.

**EMAC 372: Polymer Processing and Testing Laboratory (Sp)**

**EMAC 575: Polymer Rheology**

**Biochemical Engineering Concentration**

Biochemical engineering can be defined as the application of chemical engineering principles to systems that utilize biomolecules or bio-organisms to bring forth biotransformation. Biochemical engineering applications are versatile, ranging from waste-water treatment to production of therapeutic proteins. For students with an interest in biochemical engineering, but who want to major in chemical engineering, an eight course sequence (26-27 credit hours) has been incorporated into the standard chemical engineering curriculum.

**Two Science Electives (7 credit hours):**
- BIOL 300: Dynamics of Biological Systems (3)
- BIOL 303: Principles of Chemical Biology (4)

**Four Breadth Electives (13 credit hours):**
- BIOC 307: General Biochemistry (4)
- BIOL 343: Microbiology (3)
- ECHE 340: Biochemical Engineering (3)
- BIOL 301: Biotechnology Lab: Genes and Genetic Engineering (3)

**Two Advanced BioElectives (6-7 credit hours) to replace the materials elective and CHEM 302/336, to be selected from:**
- BIOC 308: Genes and Genetic Engineering (3)
- BIOL 334: Proteins and Enzymes (4)
- BIOL 382: Drugs, Brain and Behavior (3)
- EVHS 401B and EVHS 402B: Biochemical Toxicology (3)

**Five-Year Combined B.S./M.S. Program**

This program offers outstanding undergraduate students the opportunity to obtain an M.S. degree, with a thesis, in one additional year of study beyond the B.S. degree. (Normally, it takes two years beyond the B.S. to earn an M.S. degree.) In this program, an undergraduate student can take up to nine hours of graduate credit that simultaneously satisfies undergraduate requirements. Typically, students in this program start their research leading to the M.S. thesis in the fall semester of the senior year. The department endeavors to support such students through the following summer and academic year at the normal stipend for entering graduate students. The B.S. degree is awarded at the completion of the senior year. Application for admission to the five year B.S./M.S. program is made after completion of five semesters of course work. Minimum requirements are a 3.2 grade point average and the recommendation of the department.

**Five-and-One-Half Year Cooperative B.S./M.S. Program**

The cooperative bachelor’s/master’s program enables outstanding students who are enrolled in the cooperative program to earn an M.S. in one semester beyond the B.S. degree. Students complete six credits of a graduate project (ECHE 660) during the second co-op period and follow an Advanced Study elective sequence. The courses ECHE 460, ECHE 461, and an agreed-upon mathematics course are used to satisfy both graduate and undergraduate requirements. At the end of the fifth year, the student receives the B.S. degree. Upon completion of an additional 12 credits of graduate work the following semester, the student receives the M.S. degree. Application for admission to the five-and-one-half-year co-op B.S./M.S. program is made during the second semester of the junior year (this semester is taken in the fall of the fourth year). Minimum requirements are a 3.2 grade point average, good performance in the previous co-op assignment, and the recommendation of the department.

**GRADUATE PROGRAMS**

**Master of Science Program**

Each M.S. candidate must complete a minimum of 27 hours of graduate-level credits. These credits can be distributed in one of two ways.

**Plan A.**

Students electing Plan A take 19 hours of graduate-level course work (six courses plus ECHE 401, Chemical Engineering Communications) and complete at least nine credit hours of M.S. thesis research.
Plan B.

Part-time students, and those in the 5-and-a-half-year B.S./M.S. cooperative program, may opt for Plan B, which requires completion of 24 credit hours (eight courses) of approved graduate course work and a three credit hour project replacing the M.S. thesis. In special cases, a student may be permitted to complete a six credit project. In this case only seven courses will be required.

All M.S. students are required to take the following courses: ECHE 460, Thermodynamics of Chemical Systems (3); ECHE 461, Transport Phenomena (3); ECHE 462, Chemical Reaction Engineering (3); and ECHE 475, Chemical Engineering Analysis (3) or an equivalent graduate-level math course. The other courses should be technical graduate-level courses selected after consultation with the advisor. In special circumstances, e.g., students have taken a similar or complementary course at another university, one of the required courses may be waived from the Program of Study. All full-time M.S. students are expected to do some teaching as part of their education. Also, at various points during their thesis research, students will be required to present seminars and reports on their progress.

Master of Engineering Program

The Department of Chemical Engineering also participates in the practice-oriented Master of Engineering program offered by the Case School of Engineering. In this program, students complete a core program. The Department of Chemical Engineering participates in the Chemical and Materials Processing and Synthesis sequence.

Doctor of Philosophy Program

The degree of Doctor of Philosophy is awarded in recognition of deep and detailed knowledge of chemical engineering and comprehensive understanding of related subjects together with a demonstration of the ability to perform independent investigations, to suggest new areas for research, and to communicate results in an acceptable manner. The minimum course requirements for the Ph.D. degree in chemical engineering are as follows:

**Depth Courses**

All programs of study must include ECHE 401, Chemical Engineering Communications (1); ECHE 460, Thermodynamics (3); ECHE 461, Transport Phenomena (3); and ECHE 462, Chemical Reaction Engineering (3), plus a minimum of three other chemical engineering courses.

**Breadth and Basic Science Courses**

A minimum of four courses outside the department must be taken. These can be chosen from other engineering departments and the departments of mathematics, chemistry, physics, biology, and geological sciences. A minimum of two elective courses must be in mathematics.

**Comments on Ph.D. Guidelines**

The department anticipates that from time to time special cases will arise which are exceptions to the above guidelines, e.g., a student may have taken a graduate-level thermodynamics course at another school. In these cases, the student must attach a statement to the program of study justifying the departure from the guidelines. It should be noted that the above guidelines are a minimum requirement. A total of 13 courses (37 credit hours) is typical for the Ph.D. degree. It is expected that the elective courses will form a coherent whole with a concentration in one area, e.g., systems, polymers, surface science, etc., rather than a smattering of introductory courses in many diverse subjects. All programs are chosen with the approval of the student’s faculty advisor.

**Other Requirements for the Ph.D. Degree**

Students who wish to enter the Ph.D. program must pass a general examination covering material through the beginning graduate-level courses. A thesis proposal and an independently generated proposal are also required. All Ph.D. students must satisfy the residency requirements of the university and the Case School of Engineering. Some teaching also is required. In addition, at various points in the course of the dissertation research, students will be required to prepare reports and seminars on their work, and defend their dissertation. The Chemical Engineering Graduate Student Handbook contains a more detailed description of the department’s Ph.D. requirements and a time schedule for their completion.

**Current Research Topics**

Research in the department is sponsored by a variety of state and federal agencies, by private industry, and by foundations. Current active research topics include:

**Electrochemical Engineering**

- Fuel cell technology
- Membrane synthesis and modeling
- Bipolar discrete electrodes
- Microelectronic materials, fabrication and processing
- Solid-state electrochemical and biomedical sensors
- Modeling of electrochemical systems, batteries and fuel cells
- Microfabrication by electrodeposition
- Electrodeposition of semiconductors and alloys
- Diamond electrodes
- Corrosion protection

**Biochemical Engineering**

- Biotransport
- Design of microvascular flow analogs
- Predictive methods for cancer metastasis potential
- Sensors for neurologically active molecules
- Biotelemetric micro systems

**Advanced Materials Processing**

- Combustion and plasma synthesis of thin films
- Low pressure synthesis of diamond
- Synthesis of bulk gallium nitride
- Aerosol synthesis
- Fine particle processing strategies
• Colloidal route to nanoparticles
• Monolayers and ultrathin films
• Computation of phase diagrams
• Langmuir Blodgett multilayers
• Polymeric surfactants and polymer-substrate interactions
• Polymer nanocomposites
• Molecular simulations
• Statistical mechanics of materials

Process Engineering
• Separations using acoustic fields
• Process monitoring
• Separation using microemulsions
• Carbon dioxide sequestration
• Process intensification using centrifugal fields
• Spreading phenomena
• Rheology of emulsions and coatings, microemulsions and micelles
• Membrane separations

FACILITIES
The department is housed in the Albert W. Smith Building on the Case Quad-rangle. Professor Smith was chair of industrial chemistry at Case from 1911 to 1927. Under his leadership a separate course of study in chemical engineering was introduced at Case in 1913. Professor Smith was also a close associate of Herbert Dow, the Case alumnus who founded Dow Chemical in 1890 with the help and support of Professor Smith. The Albert W. Smith Chemical Engineering Building contains two classrooms, one designed for computer and television instruction; the undergraduate Unit Operations Laboratory; reinforced concrete, vertically vented chamber for hazardous and high-pressure research; a constant temperature and humidity room; an instrument room; and the normal complement of offices and research laboratories. The department has unusually strong facilities for electrochemical and fuel cell research, for microfabrication, and for chemical vapor deposition and thin film synthesis. In addition, a full range of biochemical, analytical and materials characterization instrumentation is available in the Case School of Engineering. Analytical instrumentation is available within the Department of Chemical Engineering, the Department of Chemistry, and the Materials Research Laboratory.

CHEMICAL ENGINEERING (ECHE)

Undergraduate Courses
ECHE 151. Introduction to Chemical Engineering at Case (0)
Introduction to the Chemical Engineering Department and its activities: faculty and faculty research areas, breadth elective sequences, cooperative education, Summer Lab in London, Junior Year in Edinburgh, industrial employment opportunities, non-traditional employment opportunities. Required of Chemical Engineering students before their junior year.

ECHE 250. Honors Research I (1-3)
A special program which affords a limited number of students the opportunity to conduct research under the guidance of one of the faculty. At the end of the first semester of the sophomore year, students who have a strong interest in research are encouraged to discuss research possibilities with the faculty. Assignments are made based on mutual interest. Subject to the availability of funds, the faculty employs students through the summers of their sophomore and junior years, as members of their research teams.

ECHE 251. Honors Research II (1-3)
(See ECHE 250.) Prereq: ECHE 250.

ECHE 260. Introduction to Chemical Systems (3)
Material and energy balances. Conservation principles and the elementary laws of physical chemistry applied to chemical processes. Developing skills in quantitative formulation and solution of word problems.

ECHE 340. Biochemical Engineering (3)
Chemical engineering principles applied to biological and biochemical systems and related processes. Microbiology and biochemical linked with transport phenomena, kinetics, reactor design and analysis, and separations. Specific examples of microbial and enzyme processes of industrial significance. Prereq: BIOC 307 and BIOL 343 and ECHE 364.

ECHE 355. Quantitative Molecular Bioengineering (3)
The objective of this course is to equip the students with a “molecular toolbox”–a set of quantitative skills that permit rational designs for engineering tissues starting at the molecular level. The course will build on the physical and chemical principles in equilibrium, kinetics, and mass transport. Specific examples in bioengineering systems will be used throughout the course to illustrate the importance of understanding and application of these principles to tissue engineering of skin and cartilage. Prereq: ENGR 225. Cross-listed as EMBE 350.

ECHE 360. Transport Phenomena for Chemical Systems (4)

ECHE 361. Separation Processes (3)
Analysis and design of separation processes involving distillation, extraction, adsorption, absorption, and membrane processes. Design problems and the physical and chemical processes involved in separation. Equilibrium stage, degrees of freedom in design, graphical and analytical design techniques, efficiency and capacity of separation processes. Prereq: ECHE 260 and ECHE 363.

ECHE 362. Chemical Engineering Laboratory (4)
Experiments in the operation of separation and reaction equipment, including design of experiments, technical analysis, and economic analysis. Experiments cover distillation, liquid-liquid extraction, heat transfer, fluidized beds, control, membrane separations, and chemical and electrochemical reactors. Prereq: ECHE 360, ECHE 361, ECHE 363, and ECHE 364.

ECHE 362L. Chemical Engineering Laboratory in London (4)
A version of ECHE 362 taught during the summer at University College of London. Prereq: ECHE 360, ECHE 361, ECHE 363, and ECHE 364.

ECHE 363. Thermodynamics of Chemical Systems (3)
First law, second law, phase equilibria, phase rule, chemical reaction equilibria, and applications to engineering problems. Thermodynamic properties of real substances, with emphasis on solutions. Thermodynamic analysis of processes including chemical reactions. Prereq: ECHE 260 and ENGR 225. Coreq: MATH 224.

ECHE 364. Chemical Reaction Processes (3)

ECHE 365. Measurements Laboratory (3)
Laboratory introduction to the measurement process in engineering. Matching measurements to approximate and exact physical models is stressed. Extraction of physical parameters and estimation of the errors in the parameter estimates is an important part of the course. Example projects cover steady and unsteady state heat transfer, momentum transfer, and the first law of thermodynamics. Prereq: ECHE 360.

ECHE 367. Process Control (4)
Feedback control of chemical processes. The course involves extensive use of computer software and all exams are taken using the computer. Topics include: analysis of linear dynamical systems using Laplace transforms, derivation of unsteady state mathematical models of simple chemical processes, dynamic simulation of linear and nonlinear models, design of PID controllers by model inverse methods, tuning of controller to accommodate process model uncertainty, two degrees of freedom controllers, feed-forward and cascade control. Prereq: MATH 224.

ECHE 380. Electrochemical Technology (3)
Fundamentals of modern electrochemical technology and the engineering principles involved. Basics of classical electrochemistry; thermodynamics and kinetics. Engineering aspects of transport phenomena, scaling, and design as applied to electrochemical industries. Practical examples from metal finishing, batteries and...

**ECHE 381. Electrochemical Engineering (3)**

Engineering aspects of electrochemical processes including current and potential distribution, mass transport and fluid mechanical effects. Examples from industrial processes including electroplating, industrial electrolysis, corrosion, and batteries. Prereq: ECHE 260 or permission of instructor. Cross-listed as ECHE 480.

**ECHE 383. Chemical Engineering Applied to Microfabrication and Devices (3)**

Silicon based microfabrication and micromachining require many chemical engineering technologies. Microfabricated devices such as sensors are also directly related to chemical engineering. The applications of chemical engineering principles to microfabrication and micromachining will be introduced. Oxidation processing, chemical vapor deposition, etching and patterning techniques, electroplating and other technologies will be discussed.

**ECHE 396. Special Topics in Chemical Engineering (3)**

Five-year B.S./M.S. students use this course for thesis research.

**ECHE 397. Special Topics in Chemical Engineering (3)**

Five-year B.S./M.S. students use this course for thesis research.

**ECHE 398. Process Analysis and Design (3)**


**ECHE 399. Chemical Engineering Design Project (3)**

A capstone course for chemical engineering seniors. Uses material taught in previous and concurrent courses in an integrated fashion to solve chemical process design problems. Emphasis is placed on applying modern computer based design tools. Practicality, economics, scheduling, decision making with uncertainty, and proposal and report preparation. Numerous small exercises and one comprehensive process design project done by the class. Prereq: ECHE 398.

**Graduate Courses**

**ECHE 400T. Graduate Teaching I (0)**

All Ph.D. students are required to take this course. The experience includes elements from the following tasks: development of teaching or lecture materials, teaching recitation groups, providing laboratory assistance, tutoring, exam/quiz/homework preparation and grading, mentoring students. Prereq: Entering Ph.D. student in Chemical Engineering.

**ECHE 401. Chemical Engineering Communications (1)**

Introductory course in communication for Chemical Engineering graduate students: preparation of first proposal for thesis, preparation of technical reports and scientific papers, literature sources, reviewing proposals, and manuscripts for professional journals, and making effective technical presentations.
Examples of such facilities are transportation systems, schools and office buildings, commercial buildings, and industrial plants. Civil engineers can choose from a broad spectrum of opportunities in industry and consulting practice as well as research and development in firms in which civil engineers often participate as owners or partners. Employment can be found among a wide variety of industrial, governmental, construction, and private consulting organizations. There is a large demand for civil engineers nationally. The program at Case Western Reserve University is built around small classes, good faculty-student relationships and advising, and a program flexible enough to meet students’ personal career aims.

The Department of Civil Engineering of the Case School of Engineering offers an accredited Bachelor of Science degree in Civil Engineering with courses in almost all the traditional civil engineering subjects. The graduate program offers the Master of Science and Doctor of Philosophy degrees in structures, engineering mechanics, geotechnical and environmental engineering. A cooperative education program involving participating engineering firms is available for both undergraduate and graduate students.

An active research program gives the students opportunities to participate in projects related to design, analysis, and testing. Projects are in areas such as computational mechanics, probabilistic design, bridges, dynamics and wind engineering, response of concrete and steel structures, fracture mechanics, static and dynamic behavior of soils, earthquake engineering, subsurface and ex-situ remediation, colloid behavior in environmental systems, and contaminated sediment dynamics.

MISSION STATEMENT

Our mission is to prepare students for leadership roles in civil and environmental engineering. The department will provide facilities and research expertise to advance the state of the civil engineering profession within the mission of the Case School of Engineering. Students will be taught to address problems building on solid technical foundations while taking advantage of advanced technologies. Our graduates will adhere to high technical and ethical standards, in service to the public. Graduates will be prepared for the pursuit of advanced learning in civil engineering and related fields, as well as for the practice of civil and environmental engineering at the highest professional levels.

FACULTY

Robert L. Mullen, Ph.D. (Northwestern University), P.E.
Frank H. Neff Professor and Chair
Computational mechanics; finite elements; boundary elements
Roberto Ballarini, Ph.D. (Northwestern University)
Professor

Department of Civil Engineering

Bingham Building (7201)
Phone 216-368-2950; Fax 216-368-5229
Robert L. Mullen, Chair
rlm@case.edu
http://eciv/www.case.edu/civil/


Civil engineering is concerned with the environment and with the planning, design, and construction of facilities for meeting the needs of modern society. Examples of such facilities are transportation systems, schools and office buildings, bridges, dams, land reclamation projects, water treatment and distribution systems, commercial buildings, and industrial plants. Civil engineers can choose from a broad spectrum of opportunities in industry and consulting practice as well as research and development in firms in which civil engineers often participate as owners or partners. Employment can be found among a wide variety of industrial, governmental, construction, and private consulting organizations. There is a large demand for civil engineers nationally. The program at Case Western Reserve University is built around small classes, good faculty-student relationships and advising, and a program flexible enough to meet students’ personal career aims.

The Department of Civil Engineering of the Case School of Engineering offers an accredited Bachelor of Science degree in Civil Engineering with courses in almost all the traditional civil engineering subjects. The graduate program offers the Master of Science and Doctor of Philosophy degrees in structures, engineering mechanics, geotechnical and environmental engineering. A cooperative education program involving participating engineering firms is available for both undergraduate and graduate students.

An active research program gives the students opportunities to participate in projects related to design, analysis, and testing. Projects are in areas such as computational mechanics, probabilistic design, bridges, dynamics and wind engineering, response of concrete and steel structures, fracture mechanics, static and dynamic behavior of soils, earthquake engineering, subsurface and ex-situ remediation, colloid behavior in environmental systems, and contaminated sediment dynamics.

MISSION STATEMENT

Our mission is to prepare students for leadership roles in civil and environmental engineering. The department will provide facilities and research expertise to advance the state of the civil engineering profession within the mission of the Case School of Engineering. Students will be taught to address problems building on solid technical foundations while taking advantage of advanced technologies. Our graduates will adhere to high technical and ethical standards, in service to the public. Graduates will be prepared for the pursuit of advanced learning in civil engineering and related fields, as well as for the practice of civil and environmental engineering at the highest professional levels.

FACULTY

Robert L. Mullen, Ph.D. (Northwestern University), P.E.
Frank H. Neff Professor and Chair
Computational mechanics; finite elements; boundary elements
Roberto Ballarini, Ph.D. (Northwestern University)
Professor

Mechanics of solids, including civil engineering materials, advanced composites, microelectromechanical systems, mollusks, and bone. Mechanics education
Dario A. Gasparini, Ph.D. (Massachusetts Institute of Technology), P.E.
Professor
Structures; wind and earthquake engineering; applied random processes
Arthur A. Huckelbridge, D.Eng. (University of California, Berkeley), P.E.
Associate Professor
Structures; design and dynamics; earthquake engineering; bridge engineering
Aaron A. Jennings, Ph.D. (University of Massachusetts), P.E.
Professor
Environmental and geoenvironmental engineering, groundwater contamination, hazardous waste management, uncertainty analysis for environmental models
Vassilis P. Panoksalitis, Ph.D. (University of California, Berkeley)
Associate Professor
Constitutive modeling of civil engineering materials; thermomechanics of solids; viscoelasticity, plasticity, damage mechanics; fatigue; computational mechanics
Adel S. Saada, Ph.D. (Princeton University), P.E.
Professor
Mechanics of materials; static and dynamic mechanical behavior of soils; foundation engineering
Karen L. Skubal, Ph.D. (University of Michigan)
Assistant Professor
Bioremediation of recalcitrant organic pollutants in soils and aquifers; environmental microbiology
Xiangwu Zeng, Ph.D. (Cambridge University)
Associate Professor
Geotechnical earthquake engineering; centrifuge modeling; foundation vibration

SECONDARY FACULTY

Thomas P. Kicher, Ph.D. (Case Institute of Technology)
Arthur P. Armington Professor Emeritus of Mechanical and Aerospace Engineering
Elastic stability; plates and shells; composite materials; dynamics; design, failure analysis

Mechanics of solids, including civil engineering materials, advanced composites, microelectromechanical systems, mollusks, and bone. Mechanics education
Dario A. Gasparini, Ph.D. (Massachusetts Institute of Technology), P.E.
Professor
Structures; wind and earthquake engineering; applied random processes
Arthur A. Huckelbridge, D.Eng. (University of California, Berkeley), P.E.
Associate Professor
Structures; design and dynamics; earthquake engineering; bridge engineering
Aaron A. Jennings, Ph.D. (University of Massachusetts), P.E.
Professor
Environmental and geoenvironmental engineering, groundwater contamination, hazardous waste management, uncertainty analysis for environmental models
Vassilis P. Panoksalitis, Ph.D. (University of California, Berkeley)
Associate Professor
Constitutive modeling of civil engineering materials; thermomechanics of solids; viscoelasticity, plasticity, damage mechanics; fatigue; computational mechanics
Adel S. Saada, Ph.D. (Princeton University), P.E.
Professor
Mechanics of materials; static and dynamic mechanical behavior of soils; foundation engineering
Karen L. Skubal, Ph.D. (University of Michigan)
Assistant Professor
Bioremediation of recalcitrant organic pollutants in soils and aquifers; environmental microbiology
Xiangwu Zeng, Ph.D. (Cambridge University)
Associate Professor
Geotechnical earthquake engineering; centrifuge modeling; foundation vibration

Robert L. Mullen, Ph.D. (Northwestern University), P.E.
Frank H. Neff Professor and Chair
Computational mechanics; finite elements; boundary elements
Roberto Ballarini, Ph.D. (Northwestern University)
Professor

Mechanics of solids, including civil engineering materials, advanced composites, microelectromechanical systems, mollusks, and bone. Mechanics education
Dario A. Gasparini, Ph.D. (Massachusetts Institute of Technology), P.E.
Professor
Structures; wind and earthquake engineering; applied random processes
Arthur A. Huckelbridge, D.Eng. (University of California, Berkeley), P.E.
Associate Professor
Structures; design and dynamics; earthquake engineering; bridge engineering
Aaron A. Jennings, Ph.D. (University of Massachusetts), P.E.
Professor
Environmental and geoenvironmental engineering, groundwater contamination, hazardous waste management, uncertainty analysis for environmental models
Vassilis P. Panoksalitis, Ph.D. (University of California, Berkeley)
Associate Professor
Constitutive modeling of civil engineering materials; thermomechanics of solids; viscoelasticity, plasticity, damage mechanics; fatigue; computational mechanics
Adel S. Saada, Ph.D. (Princeton University), P.E.
Professor
Mechanics of materials; static and dynamic mechanical behavior of soils; foundation engineering
Karen L. Skubal, Ph.D. (University of Michigan)
Assistant Professor
Bioremediation of recalcitrant organic pollutants in soils and aquifers; environmental microbiology
Xiangwu Zeng, Ph.D. (Cambridge University)
Associate Professor
Geotechnical earthquake engineering; centrifuge modeling; foundation vibration
BACHELOR OF SCIENCE IN ENGINEERING DEGREE
Major in Civil Engineering

Freshman Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>Open elective or Humanities/Social Science</td>
</tr>
<tr>
<td>CHEM 111 Principles of Chemistry for Engineers</td>
</tr>
<tr>
<td>CMPS 131 Elementary Computer Programming</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open elective or Humanities/Social Science</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engineering II</td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities</td>
</tr>
<tr>
<td>PHYS 121 General Physics I: Mechanics</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>Humanities or Social Science Sequence I</td>
</tr>
<tr>
<td>ECIV 160 Surveying and Computer Graphics</td>
</tr>
<tr>
<td>EECS 251 Numerical Methods I</td>
</tr>
<tr>
<td>ENGR 200 Statics and Strength of Materials</td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III</td>
</tr>
<tr>
<td>PHYS 122 General Physics II: Electricity and Magnetism (4-0-4)</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities or Social Science Sequence II</td>
</tr>
<tr>
<td>ECIV 310 Strength of Materials</td>
</tr>
<tr>
<td>EMAE 181 Dynamics</td>
</tr>
<tr>
<td>ENGR 210 Introduction to Circuits and Instrumentation</td>
</tr>
<tr>
<td>MATH 224 Elementary Differential Equations</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>Humanities or Social Science Sequence III</td>
</tr>
<tr>
<td>ECIV 211 Civil Engineering Materials</td>
</tr>
<tr>
<td>ECIV 320 Structural Analysis I</td>
</tr>
<tr>
<td>ENGL 398N Professional Communications for Engineers</td>
</tr>
<tr>
<td>ENGR 225 Thermodynamics, Fluid Mechanics, Heat and Mass Transfer</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 322 Structural Design I</td>
</tr>
<tr>
<td>ECIV 330 Soil Mechanics</td>
</tr>
<tr>
<td>ECIV 351 Engineering Hydraulics and Hydrology</td>
</tr>
<tr>
<td>ECIV 368 Environmental Engineering</td>
</tr>
<tr>
<td>Approved Elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>Humanities or Social Science Elective</td>
</tr>
<tr>
<td>ECIV 340 Construction Management</td>
</tr>
<tr>
<td>ECIV 398 Civil Engineering Senior Project</td>
</tr>
<tr>
<td>Approved Elective</td>
</tr>
<tr>
<td>Approved Elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities or Social Science Elective</td>
</tr>
<tr>
<td>ECIV 360 Civil Engineering Systems</td>
</tr>
<tr>
<td>PHYS 221 or approved Natural Sciences substitute</td>
</tr>
<tr>
<td>Approved Elective</td>
</tr>
<tr>
<td>Open Elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Hours required for graduation: 129

a. One of these courses must be a humanities/social science course.
b. Must be part of an approved sequence.
c. May substitute EMAE 250.
working for organizations in all areas of design and construction, students can gain an invaluable knowledge of the way the industry functions. This experience lets them gain more from their education and makes them more attractive to prospective employers upon graduation.

A cooperative education program is also available, which requires the student to spend two full semesters working full-time in an engineering capacity with a contractor, consulting engineer, architect, or materials supplier during the course of his or her education. The aim of the program is to enable students to make their education more meaningful by gaining familiarity with the industry they will work in after graduation and to help students finance their education.

The accredited undergraduate program in civil engineering at Case Western Reserve University has been designed so that the student chooses a sequence of four or more approved elective courses. The sequence is intended to give students the chance to pursue in some depth a particular area related to their careers as civil engineers. Samples of courses from which elective sequences could be chosen follow the civil engineering curriculum in this bulletin. In addition, the students are required to do a senior project in their area of interest.

Students enrolled in other majors may elect to pursue a minor in civil engineering or in environmental engineering. A minimum of 15 credit hours is required. The approval of the department is required.

Most classes at Case Western Reserve University are small, and the student has close contact with the faculty. Students have an opportunity to gain practical experience as well as earn a supplemental income by assisting faculty members on consulting work during vacation periods.

EDUCATIONAL OBJECTIVES

Mastery of Fundamentals:
- Graduates will master the fundamentals of mathematics and the sciences that form the basis for engineering.
- Graduates will have a thorough knowledge of the technical requirements for the practice of the profession of civil engineering and be prepared for advanced scholarship.

Creativity:
- Graduates will be proficient in state-of-the-art analytical and computational techniques for the modeling, analysis and design of civil engineering systems.
- Graduates will be aware of the critical role that innovation has played, and will continue to play, in the profession of civil engineering.

Societal Awareness:
- Graduates will have an understanding of the legal, social, economic, and environmental constraints within which the civil engineering profession must function.
- Graduates will be aware of the special role the profession of civil engineering plays in the protection of public health, safety and welfare.

Leadership Skills:
- Graduates will be aware of the legal, moral and ethical standards expected of leaders in the profession of civil engineering.
- Graduates will be able to function effectively and lead professional teams as well as work independently.
- Graduates will develop their written and oral communication skills, including the use of modern electronic tools such as presentation software, the World Wide Web, and e-mail.

Professionalism:
- Graduates will be aware of the moral, ethical and technical standards expected of the practitioners in the profession of civil engineering.
- Graduates will be prepared for and aware of the necessity for a lifetime of learning and continued professional growth including professional registration.

Samples of courses from which elective sequences could be chosen

The approved electives constitute a sequence of four courses in one of the major areas of civil engineering. They are chosen by the student to coincide with his or her interests.

Structural Engineering
ECIV 321: Structural Analysis II (3)
ECIV 323: Structural Design II (3)
ECIV 405: Solid Mechanics I (3)
ECIV 406: Constitutive Modeling Theories (3)
ECIV 411: Applied Elasticity (3)
ECIV 415: Structural Modeling and Experimental Methods (3)
ECIV 420: Finite Element Analysis (3)
ECIV 421: Advanced Reinforced Concrete Design (3)
ECIV 422: Advanced Structural Steel Design (3)
ECIV 423: Prestressed Concrete Design (3)
ECIV 430: Foundation Engineering (3)

Geotechnical Engineering
ECIV 323: Structural Design II (3)
ECIV 405: Solid Mechanics I (3)
ECIV 406: Constitutive Modeling Theories (3)
ECIV 411: Applied Elasticity (3)
ECIV 420: Finite Element Analysis (3)
ECIV 430: Foundation Engineering (3)
ECIV 431: Special Topics in Geotechnical Engineering (3)
ECIV 433: Soil Dynamics (3)
GEOL 110, 119: Physical Geology (3), Lab (1)
GEOL 330: Geophysical Field Methods (4)

Engineering Mechanics
ECIV 405: Solid Mechanics I (3)
ECIV 406: Constitutive Modeling Theories (3)
ECIV 411: Applied Elasticity (3)
ECIV 420: Finite Element Analysis (3)
ECIV 433: Soil Dynamics (3)
EMAE 372: Relation of Materials to Design (3)

Environmental Engineering
ECIV 361: Water Resources Engineering (3)
ECIV 362: Solid and Hazardous Waste Management (3)
ECIV 370: Unit Operations and Processes in Environ. Engineering (3)
ECIV 450: Environmental Engineering Chemistry (3)
ECIV 460: Environmental Remediation (3)
GEOL 220: Environmental Geology (3)
GEOL 321: Hydrogeology (3)

Construction Engineering and Management

Two of the four elective courses must be from within civil engineering.
ACCT 303: Survey of Accounting (3)
BAFI 355: Corporate Finance (3)
BLAW 329: Law and Management (3)
ECIV 341: Construction Scheduling and Estimating (3)
ECIV 430: Foundation Engineering (3)
ECON 361: Managerial Economics (3)
LHRP 251: Industrial Relations and Administrative Practices (3)
LHRP 311: Labor Problems (3)

MINOR IN CIVIL ENGINEERING

Students enrolled in other majors may elect to pursue a minor in Civil Engineering. A minimum of 15 credit hours is required, as follows:

Required Course

ENGR 200: Statics and Strength of Materials (3)

Select a minimum of 12 credit hours from one of the following areas (approval of the department is required):

Solid Mechanics
ECIV 310, Strength of Materials (3)
ECIV 405, Solid Mechanics I (3)
ECIV 406, Constitutive Modeling Theories (3)
ECIV 411, Applied Elasticity (3)
ECIV 415, Structural Modeling and Experimental Methods (3)
ECIV 420, Finite Element Analysis (3)

Structural and Geotechnical Engineering
ECIV 320: Structural Analysis I (3)
ECIV 321: Structural Analysis II (3)
ECIV 322: Structural Design I (3)
ECIV 323: Structural Design II (3)

ECIV 330: Soil Mechanics (4)
ECIV 430: Foundation Engineering (3)
ECIV 433: Soil Dynamics (3)

Construction Engineering and Management

Two of the courses must be
ECIV 340: Construction Management (3), and
ECIV 341: Construction Scheduling and Estimating (3)
Two or more courses chosen from
ACCT 303, BAFI 355, BLAW 329, ECON 361, LHRP 251, LHRP 311.

MINOR IN ENVIRONMENTAL ENGINEERING

Select a minimum of 15 credit hours from the following list of courses (approval of the department is required):

Environmental Engineering
GEOL 321: Hydrogeology (3)
ECIV 351: Engineering Hydraulics and Hydrology (3)
ECIV 361: Water Resources Engineering (3)
ECIV 362: Solid and Hazardous Waste Management (3)
ECIV 368: Environmental Engineering (3)
ECIV 370: Unit Operations and Processes in Environ. Engineering (3)
ECIV 450: Environmental Engineering Chemistry (3)
ECIV 460: Environmental Remediation (3)

Computer use is an integral part of the civil engineering curriculum. From required courses in computer programming and numerical analysis to subsequent use and development of civil engineering programs, the student fully utilizes the computer as a planning, analysis, design, and managerial tool.

All sequences are constructed to provide a balance of marketable skills and theoretical bases for further growth. With departmental approval, other sequences can be developed to meet students’ needs.

GRADUATE PROGRAM IN CIVIL ENGINEERING

The graduate programs in structural engineering, geotechnical engineering, engineering mechanics and environmental engineering prepare students for careers in industry, professional practice, research and teaching. Experience has shown that job opportunities are excellent for students who receive advanced degrees in civil engineering at Case Western Reserve University. Recent advanced degree recipients have found positions in universities, consulting firms, petroleum companies, plant design firms, and aerospace firms, among others.

Each student’s program of course work and research is tailored to his or her interests, in close consultation with the faculty advisor. For students working toward the Master of Science degree there are two possible plans, A and B. In Plan A, a research thesis is required. In Plan B, a project and additional course work are substituted for the thesis. For students working toward the Doctor of Philosophy degree a research thesis is required.

GRADUATE PROGRAM IN ENGINEERING MECHANICS

The graduate program in engineering mechanics prepares the student for a career in research and analysis in solid and computational mechanics. Courses in mechanics of solids, applied plasticity, damage mechanics, viscoelasticity, viscoplasticity, stability, dynamics, finite elements and boundary integral methods, computational mechanics, constitutive methods, fracture mechanics, plates and shells give the student the necessary knowledge and skill to study the behavior of modern materials and structures as well as advance the state of the art. For more information, contact the chair of the Department of Civil Engineering.

FACILITIES

Bingham Structures Laboratory

The major component of this laboratory is a 14-foot by 60-foot structural test slab,
which is the top flange of a 12-foot-deep reinforced concrete box girder. Load and tiedown points are provided by three-inch diameter holes spaced at two-foot centers. Loading is accomplished by hydraulic jacks. The laboratory also contains 200k, 50k, 25k universal testing machines, and two 55k MTS hydraulic actuators with a controller and a separate hydraulic service manifold system.

Fracture Mechanics Laboratory
This laboratory is equipped with two MTS servo-hydraulic materials test systems. Capabilities include fracture toughness evaluation of various materials, crack growth kinetics under different loading histories, and microstructural damage analysis and micromechanics studies. The second MTS unit is capable of applying simultaneous axial and torsional loads. An environmental chamber is available. There is equipment available for fracture surface characterization and image analysis, and a grinding-polishing unit.

Structures and Materials Models Laboratory
This laboratory is a facility for both instructional and research use. Small-scale models made of different materials (steel, concrete, wood, plastic) are tested to study the response of the prototype structural elements and/or assemblies. It is equipped with four 42-inch by 72-inch steel testing tables and aluminum reaction frames, and a series of portable strain indicators and companion switch and balance units.

Bingham Concrete Laboratory
A well-equipped concrete laboratory is available for undergraduate instruction. A 100 percent humidity room is available for curing concrete specimens. Other equipment includes a concrete mixer, screening equipment, air entrainment meter, facilities for prestressing specimens, and 400k axial compression machine.

Environmental Engineering Laboratory
This laboratory is one in a suite of new laboratories that support environmental engineering teaching and research. The facilities include a teaching laboratory, advanced instrumentation laboratory, remediation research laboratory, and electronic classroom/software laboratory. The Environmental Engineering laboratory is equipped for conventional Standard Methods analysis of water, wastewater, soil, solid waste and air samples (pH meters, furnaces, ovens, incubators, hoods, etc.) and for anaerobic and aerobic microbiology work. The lab also offers generous bench top space for student teams to explore laboratory procedures and provides direct access to research, instrumentation, and computational facilities.

Environmental Instrumentation Laboratory
This laboratory is equipped for state-of-the-art analysis of sophisticated environmental contaminants. The room supports a computer controlled Dionex DX-500 IC/HPLC system, computer controlled Varian SPECTRAA 200/SIPS 10 (flame and furnace) AA system, and computer controlled Hewlett Packard 6890 GC/MS analysis system for organic and inorganic pollutant analysis. Where appropriate, machines have been equipped with autosamplers to improve productivity.

Remediation Research and Colloid Science Laboratory
This laboratory is designed to support physical research on the applied science and design of remediation engineering and the analysis of colloidal particles. The laboratory provides a modeling floor for the assembly of laboratory scale remediation schemes, and provides immediate access to instrumentation and computational facilities for data analysis.

Soil Mechanics Laboratory
This laboratory has a full array of both instructional and research units. Notable are automated triaxial units for generalized extension and compression tests; units permitting simultaneous application of hydrostatic, axial, and torsional static and dynamic stresses; a cubical device for true triaxial testing, units by means of which one dimensional consolidation in the triaxial cell can be automatically achieved; and various pore pressure force and deformation measuring devices. Tests are monitored and instantly evaluated by data-acquisition computer systems. Also available is a longitudinal and torsional resonant column device and a large size oedometer equipped with bender elements. The laboratory has a SP2000 high-speed camera to study dynamic phenomena and a Bioquant surface analyzer to study fabric. A 20 g-tons fully automated centrifuge with a servo-hydraulic earthquake shaker is in operation. A controlled climate room is in regular use.

The Asphalt Concrete Laboratory
This laboratory is properly equipped to prepare and test (following ASTM standard specifications) both cylindrical and beam asphalt concrete specimens. Engineering and material properties of asphalt concrete specimens—such as Marshall stability, resilient modulus, Poisson’s ratio, fracture toughness, and fatigue characteristics, among others—can be determined in a controlled temperature environment between 20°F and 100°F.

Image Processing Laboratory
The department has a new Image Processing Laboratory for development of automatic visual inspection methods for pavements, structures and other materials. Equipment available includes:
- Spectral Dynamics Corp. SD330A Real Time Spectrometer
- Ariel DSP-16 two-channel, 16-bit A/D system with two megabytes of memory/50kHZ conversion rate
- Ariel TMS320025 Processing Board for real-time FFT
- Matrox MVP-AT Display System with 1,024 x 1,024 pixel display with 16.7 million simultaneous colors (with NP accelerator)
- PC/AT 486 and Pentium-class computers with interconnection to data-acquisition equipment
- HP scanner
- Spin Physics SP2000 high-speed video camera and recorder. Maximum
research. The laboratory is supplemented by other facilities provided by the university. The Neff laboratory has Pentium class computers running Windows NT operating system. All of the computers in the Neff lab can act as independent workstations or provide access via a fiber-optic link to other campus computers.

**Computational Mechanics Laboratory**

This laboratory includes seven Sun workstations, running Unix, for graduate instructional and research use. The workstations are connected to the network via a fiber-optic link.

**RESEARCH**

Research under way in civil engineering includes work in analytical, design and experimental areas, and is sponsored by industry, state, and federal government sources. Major areas of research interest are:

**Structures**
- Random vibration
- Engineering materials
- Behavior of reinforced and prestressed concrete
- Wind engineering
- Small-scale modeling under static and dynamic loads
- Earthquake analysis and design of structures
- Fatigue strength of reinforced concrete bridge decks
- Finite element methods
- Boundary element method
- Passive and active control of the vibration of structures
- Transient response of nonlinear structures
- Blast loading of structures
- Engineering mechanics
- Adaptive finite element and boundary element methods
- Transient response of nonlinear layered composites
- Modeling of micro electromechanical systems
- Finite element and boundary element modeling of piezoelectric material
- Biomechanics of the human mid face and mandible
- Finite element modeling of coupled systems
- Fracture mechanics of brittle matrix composites
- Modeling of concrete, geomaterials, and asphalt concrete
- Constitutive theories and numerical implementation; plasticity, viscoplasticity, viscoelasticity and damage mechanics
- Shape memory alloys, smart materials
- Finite deformation viscoelasticity and numerical implementation; application to rubber materials
- High- and low-cycle fatigue
- Fracture mechanics of steel, concrete, and ceramics
- Plasticity of metal matrix composites
- Structural mechanics of implants
- Geotechnical/Pavement materials
- Static behavior of anisotropic clays and sands
- Soil liquefaction
- Fracture of over consolidated clay
- Bifurcation and shear banding in soils
- Centrifuge modeling of static and dynamic soil behavior
- Dynamic soil structure interaction
- Video imaging analysis of pavement surface distress
- Non-destructive testing evaluation of soils and pavement materials
- Micromechanical behavior of asphalt concrete under fatigue loading
- Measurement of dynamic soil properties
- Vibration of high-speed trains
- Stability of tailings dams
- Environmental engineering
- Environmentally conscious manufacturing
- Remediation of “old” metal-contaminated soils
- Ex-situ “heap” remediation
- Brownfields/structural remediation
- Environmental modeling/software development
- Environmental decision analysis
- Geoenvironmental engineering
- Preferential pathway flow development
- Environmental fluid mechanics
- Sediment remediation
- Contaminated sediment dynamics
- Colloid-facilitated contaminant transport in porous media
- In-situ remediation of non-aqueous phase liquids
- Influence of remediation techniques on hydraulic conductivity in clay soils
- Forces at clay-water-contaminant interfaces
- Environmental microbiology
- Bioremediation

**CIVIL ENGINEERING (ECIV)**

**Undergraduate Courses**

**ECIV 160. Surveying and Computer Graphics (3)**
Principles and practice of surveying; error analysis, topographic mapping, introduction to photogrammetry and GIS; CAD Laboratory.

**ECIV 211. Civil Engineering Materials (3)**

**ECIV 300. Undergraduate Research (3)**
Research conducted under the supervision of a sponsoring Civil Engineering faculty member. Research can be done on an independent topic or as part of an established on-going research activity. The student will prepare a written report on the results of the research. Course may fulfill one technical elective requirement. Prereq: Consent of the instructor and department.

**ECIV 310. Strength of Materials (3)**

**ECIV 320. Structural Analysis I (3)**

**ECIV 321. Structural Analysis II (3)**

**ECIV 322. Structural Design I (3)**

**ECIV 323. Structural Design II (3)**
Continuation of ECIV 322. Torsion of concrete members, reinforcing steel details, compression reinforced flexural members, two-way slabs, slender columns, torsion of steel members, lateral and local buckling.
of steel members, plate girders, prestressed concrete design and wood design. Design laboratory. Prereq: ECIV 320 and ECIV 322.

ECIV 330. Soil Mechanics (4)
The physical, chemical, and mechanical properties of soils. Soil classification, capillarity, permeability, and flow nets. One dimensional consolidation, stress and settlement analysis. Shear strength, stability of cuts, embankments, retaining walls, and footings. Standard laboratory tests performed for the determination of the physical and mechanical properties of soils. Laboratory. Prereq: ECIV 310.

ECIV 340. Construction Management (3)
Selected topics in construction management including specifications writing, contract documents, estimating, materials and labor, bidding procedures and scheduling techniques. The course is augmented by guest lecturers from local industries.

ECIV 341. Construction Scheduling and Estimating (3)
The focus is on scheduling, and estimating and bidding for public and private projects. This includes highways as well as industrial and building construction. The use of computers with the latest software in estimating materials, labor, equipment, overhead and profit is emphasized. Prereq: ECIV 340 and consent of instructor.

ECIV 351. Engineering Hydraulics and Hydrology (3)
Application of fluid statics and dynamics to Civil Engineering Design. Hydraulic machinery, pipe network analysis, thrust, hammer, open channel flow, sewer system design, culverts, fl ow gauging, retention/detention basin design. Applied hydrology, hydrograph analysis and hydraulic routing will also be introduced. Coreq: ENGR 225.

ECIV 360. Civil Engineering Systems (3)

ECIV 361. Water Resources Engineering (3)
Water doctrine, probabilistic analysis of hydrologic data, common and rare event analysis, flood forecasting and control, reservoir design, hydrologic routing, synthetic streamflow generation, hydroelectric power, water resources quality, water resources planning. Prereq: ECIV 351.

ECIV 362. Solid and Hazardous Waste Management (3)

ECIV 368. Environmental Engineering (3)
Principle and practice of environmental engineering. Water and waste water engineering unit operations and processes including related topics from industrial waste disposal, air pollution and environmental health.

ECIV 370. Unit Operations and Processes in Environmental Engineering (3)
Physical, chemical, and biological operations and processes for the treatment of water supplies and municipal, industrial, and hazardous waste streams. Emphasis will be given to theoretical understanding and analysis of the involved processes and the design of treatment operations. Laboratory. Prereq: ECIV 368.

ECIV 396. Civil Engineering Special Topics I (1-3)
Special topics in civil engineering in which a regular course is not available. Conferences and report. Prereq: Consent of instructor.

ECIV 397. Civil Engineering Topics II (3)
Special topics in civil engineering in which a regular course is not available. Conferences and report. Prereq: Consent of instructor.

ECIV 398. Civil Engineering Senior Project (3)
A project emphasizing research and/or design must be completed by all civil engineers.

Graduate Courses

ECIV 400T. Graduate Teaching I (0)
This series of three courses will provide Ph.D. students with practical experience in teaching at the University level and will expose them to effective teaching methods. Each course assignment will be organized in coordination with the student's dissertation advisor and the department chairperson. Assignments will successively require more contact with students, with duties approaching the teaching requirements of a faculty member in the Ph.D. student's area of study. Prereq: Ph.D. students in Civil Engineering.

ECIV 405. Solid Mechanics I (3)

ECIV 406. Constitutive Modeling Theories (3)

ECIV 411. Applied Elasticity (3)

ECIV 415. Structural Modeling and Experimental Methods (3)
Types of structural behavior, structural modeling, dimensional analysis and simulation requirements. Experimental stress analysis review. Fabrication, instrumentation and testing of small-scale models (steel, plastic, aluminum, wood). Materials and techniques. Case studies of models in design. Prereq: ECIV 211, ECIV 320 and consent of instructor.

ECIV 420. Finite Element Analysis (3)

ECIV 421. Advanced Reinforced Concrete Design (3)
Properties of plain and reinforced concrete, ultimate strength of reinforced concrete structural elements, flexural and shear design of beams, bond and cracking, torsion, moment redistribution, limit analysis, yield line analysis of slabs, direct design and equivalent frame method, columns, fracture mechanics concepts. Prereq: ECIV 322 and consent of instructor.

ECIV 422. Advanced Structural Steel Design (3)
Selected topics in structural steel design including plastic design, torsion, lateral buckling, torsional-flexural buckling, frame stability, plate girders, and connections, including critical review of current design specifications relating to these topics. Prereq: ECIV 322.

ECIV 423. Prestressed Concrete Design (3)
Design of prestressed concrete structures, mechanical behavior of concrete suitable for prestressing and prestressing steels, load balancing, partial prestressing, prestressing losses, continuous beams, prestressed slab design, columns. Prereq: ECIV 323 or ECIV 421 and consent of instructor.

ECIV 424. Structural Dynamics (3)
Modeling of structures as single and multidegree of freedom dynamic systems. The eigenvalue problem, damping, and the behavior of dynamic systems. Deterministic models of dynamic loads such as wind and earthquakes. Analytical methods, including modal, response spectrum, time history, and frequency domain analyses. Prereq: ECIV 321 and consent of instructor.

ECIV 425. Structural Design for Dynamic Loads (3)
Structural design problems in which dynamic excitations are of importance. Earthquake, wind, blast, traffic, and machinery excitations. Human sensitivity to vibration, mechanical behavior of structural elements under dynamic excitation, earthquake response and earthquake-resistant design, wind loading, damping in structures, hysteretic energy dissipation, and ductility requirements. Prereq: ECIV 424.

ECIV 426. Structural Reliability (3)

ECIV 427. Theory of Structural Stability (3)

ECIV 430. Foundation Engineering (3)

ECIV 431. Special Topics in Geotechnical Engineering (3)
Static and dynamic horizontal loading of piles; dynamics of pile driving; behavior of a group of piles includ-

ECIV 432. Mechanical Behavior of Soils (3)
Soil stresses and stresses in a half space-tridimensional consolidation and sand drain theory; stress-strain relations and representations with rheological models. Critical state and various failure theories and their experimental justification for cohesive and noncohesive soils. Laboratory measurement of rheological properties, pore water pressures, and strength under combined stresses. Laboratory. Prereq: ECIV 330 and consent of instructor.

ECIV 433. Soil Dynamics (3)

ECIV 435. Rock Mechanics and Design (3)
Physical properties and classification of intact rock and rock masses, rock exploration, engineering properties of rock, stresses in rock near underground openings. Rock tunneling, rock slope stability, bolting, blasting, grouting and rock foundation design. Prereq: ECIV 330.

ECIV 437. Pavement Analysis and Design (3)
Analysis and design of rigid and flexible airfield and highway pavements. Pavement evaluation and rehabilitation, overlay design. Prereq: ECIV 330.

ECIV 450. Environmental Engineering Chemistry (3)
Fundamentals of inorganic, organic, and physical chemistry with emphasis on the types of problems encountered in the environmental engineering field. Equilibria among liquid, gaseous, and solid phases; kinetics to the extent that time permits. A strong mathematical approach is taken in solving the equilibrium and kinetic problems presented. Equilibrium speciation software for solution of more complex problems. Topics that will be covered in the course include chemical equilibrium, acid/base reactions, mathematical problem solving approach, graphical approaches, titration curves, solubility of gases and solids, buffering systems, numerical solution of equilibrium problems, thermodynamics, oxidation-reduction reactions, principles of quantitative chemistry and analytical techniques, introduction to the use of analytical instrumentation, and chemical kinetics. Prereq: ECIV 368 or consent of instructor.

ECIV 460. Environmental Remediation (3)
Evolution of proactive environmental engineering to recover contaminated air, water, and soil environments. Lake and river remediation, contaminated sediments, indoor air quality, chemical spills, underground storage tanks, contaminated soils, solid and hazardous waste sites, superfund remediation. Prereq: ECIV 368 or consent of instructor.

ECIV 464. Environmental Engineering Microbiology (3)
This course presents an introduction to microbiology and microbial processes in natural and engineered environmental systems. Topics include redox chemistry and the stoichiometry of microbial reactions, biogeochemical cycling of nutrients and elements, microbial classification, cell metabolism, enzyme and growth kinetics, microbial ecology and diversity, biodegradation of environmental pollutants, and methods and applications in microbial ecology and environmental bioremediation.

ECIV 500T. Graduate Teaching II (0)
This series of three courses will provide Ph.D. students with practical experience in teaching at the University level and will expose them to effective teaching methods. Each course assignment will be organized in consultation with the student's dissertation advisor and the department chairperson. Assignments will successively require more contact with students, with duties approaching the teaching requirements of a faculty member in the Ph.D. student's area of study. Prereq: Ph.D. student in Civil Engineering.

ECIV 505. Solid Mechanics II - Advanced Elasticity (3)
Boundary value problems in linear and nonlinear elasticity using complex variables, Green's functions, and integral transform techniques; thermoelasticity; wave propagation; micromechanics and the equivalent inclusion method; dislocations; composite materials; thin films; energy methods. Prereq: ECIV 405 or consent of instructor.

ECIV 510. Computational Mechanics (3)

ECIV 520. Random Processes in Engineering (3)
Random vectors and second moment theory. Time and frequency domain characterization of random processes and fields. Poisson and Markov processes. Random vibration. The first passage problem. Digital simulation of random processes and analysis of time series. Applications focus on stochastic models for phenomena such as earthquakes, wind turbulence, ocean waves, traffic flow, and others related to civil engineering. Prereq: Consent of instructor.

ECIV 521. Stochastic Materials Behavior (3)
Applications of random processes to characterization of material structure; elements of quantitative stereology; micromechanical stochastic modeling of stress-strain behavior and static strength; modeling of fatigue strength and crack growth; stochastic simulation of material structure and deformation processes. Prereq: ECIV 405 or ECIV 411, CIV 520 or consent of instructor.

ECIV 560. Environmental Engineering Modeling (3)

ECIV 561. Groundwater Analysis (3)
Principles of mass transport through porous media, formulation of saturated and unsaturated flow equations in alternative coordinate systems, analytical and numerical solutions of flow equations, application of existing groundwater software, analysis of solute transport problems.

ECIV 583. Theory of Plates and Shells (3)
Analysis of flat plates subjected to various load and boundary conditions; coupled bending membrane response resulting from both material properties and large deformations; momentless theory of shells, classically bending analysis of shells of revolution, and higher order shell theory. Prereq: ECIV 411.

ECIV 584. Theory of Plasticity and Damage Mechanics (3)

ECIV 585. Fracture Mechanics (3)
Crack tip fields, stress intensity factors, singular solutions, energy changes with crack growth, cohesive zone models, fracture toughness, small scale yielding, experimental techniques, fracture criteria, J-integral, R-curve, fatigue cracks, fracture of composites, dynamic fracture. Prereq: ECIV 405, ECIV 411 and consent of instructor.

ECIV 587. Advanced Mechanics Seminar (3)
Advanced topics in mechanics of solids. Thermodynamics with internal variables; thermoelasticity; plasticity; gradient theories; finite theories of plasticity; damage mechanics; endochronic plasticity; non-linear fracture mechanics; probabilistic mechanics. Prereq: ECIV 406, ECIV 420, ECIV 505 or consent of instructor.

ECIV 600T. Graduate Teaching III (0)
This series of three courses will provide Ph.D. students with practical experience in teaching at the University level and will expose them to effective teaching methods. Each course assignment will be organized in consultation with student's dissertation advisor and the department chairperson. Assignments will successively require more contact with students, with duties approaching the teaching requirements of a faculty member in the Ph.D. student's area of study. Prereq: Ph.D. student in Civil Engineering.

ECIV 601. Independent Study (1-18)
Plan B.

ECIV 611. Civil Engineering Graduate Seminar (0)
Distinguished outside speakers present current research in various topics of Civil Engineering. Graduate students also present technical papers based on thesis research.

ECIV 651. Thesis M.S. (1-18)
Plan A.

ECIV 660. Special Topics (1-18)
Topics of special interest to students and faculty. Topics may be those covered in a regular course when the student cannot wait for the course to be offered.

ECIV 701. Dissertation Ph.D. (1-18)

ECIV 703. Dissertation Fellowship (1-18)
Department of Electrical Engineering and Computer Science

305 Olin Building (7071)
Phone 216-368-2800; Fax 216-368-2801
Mehran Mehrugany, Chair
e-mail chair@eecs.case.edu
http://www.eecs.case.edu

A Department of Electrical Engineering and Computer Science (EECS) spans a spectrum of degree programs and research areas that combine topics from materials, devices, and circuits; applied physics, control, signals and systems; and software and computation to enhance connectivity, creativity, productivity, knowledge, information, education, training, perception, health, entertainment, reliability, safety, and memory in our lives. EECS disciplines are, for example, responsible for developing microprocessors and personal computers, and the operating systems, computer software, and Internet applications that run on them. EECS disciplines are also responsible for the telecommunications advancements in our world, as well as many of the sensors that enhance our safety and convenience.

EECS is at the heart of a modern university profoundly impacting medicine, arts, sciences, business, law, social behavior, etc. EECS drives intellectual property generation (70 percent of top-50 companies in number of patents awarded in 2002 are EECS companies). EECS drives wealth generation (EECS companies have a total US Equity Market capitalization of $3 trillion). Many other industries build on EECS. For example, healthcare builds on EECS technology and the pace consistently increases (e.g., medical informatics, bioinformatics, system biology, data mining and visualization, micro-nano systems, electronics-instrumentation, imaging, robotics, etc.). EECS drives job creation (Dept. of Labor Statistics on job growth by 2012 estimates 0.94M in EECS versus 0.11M in mechanical and civil engineering combined and less than 0.01M in biomedical, macromolecular, and materials engineering combined.

EECS at Case supports four synergetic degree programs: computer science, computer engineering, systems and control engineering, and electrical engineering. Each degree program leads to the Bachelor of Science degree at the undergraduate level. All engineering degree programs in the department are accredited by the Accreditation Board for Engineering and Technology (ABET). The computer science degree program is accredited by the Computing Sciences Accreditation Board (CSAB). The department also offers a Bachelor of Arts in computer science for those students who wish to combine a technical degree with a broad education in the liberal arts. At the graduate level, the department offers Master of Science and Doctor of Philosophy degrees in electrical engineering, systems and control engineering, computer engineering, and computing and information sciences (i.e., computer science). For supplemental information to this bulletin as well as the latest updates, please visit the department website.

DEPARTMENT STRUCTURE

EECS at Case, like many other EECS departments, is organized internally into two informal divisions: Computer Science and Electrical and Computer Engineering. The associate chair of Computer Science (CS) is Professor Meral Ozosyoglu (cschair@eecs.case.edu). The associate chair of Electrical and Computer Engineering is Professor Frank Merat (ecechair@eecs.case.edu).

EDUCATIONAL PHILOSOPHY

The EECS department is dedicated to developing high-quality graduates who will take positions of leadership as their careers advance. We recognize that the increasing role of technology in virtually every facet of our society, life, and culture makes it vital that our students have access to progressive and cutting-edge higher education programs stressing excellence in:

- mastery of fundamentals
- creativity
- social awareness
- leadership skills
- professionalism.

Emphasizing these core values helps ensure that tomorrow’s graduates are valued and contributing members of our global society and that they will carry on the tradition of engineering leadership established by our alumni.

Our goal is to graduate students who have fundamental technical knowledge of their profession and the requisite technical breadth and communication skills to become leaders in creating the new techniques and technologies which will advance their fields. To achieve this goal, the department offers a wide range of technical specialties consistent with the breadth of electrical engineering and computer science, including recent developments in the field. Because of the rapid pace of advancement in these fields, our degree programs emphasize a broad and foundational science and technology background that equips students for future developments. Our programs include a wide range of electives and our students are encouraged to develop individualized programs which can combine many aspects of electrical engineering and computer science.

FACULTY

Electrical and Computer Engineering Division

Michael S. Branicky, Sc.D. (Massachusetts Institute of Technology)
Associate Professor
Intelligent systems and control, hybrid systems, learning, real-time and distributed control over networks, applications to robotics and flexible manufacturing

Marc Buchner, Ph.D. (Michigan State University)
Associate Professor
Digital signal Processing, wavelets, joint time frequency analysis
M. Cenk Cavusoglu (University of California, Berkeley)
Assistant Professor
Medical robotics, human-machine interfaces, haptics, teleoperation; computer graphics/virtual environments: surgical simulation, physical modeling; systems and control theory: intelligent control, modeling and simulation of biological systems

Vira Chankong, Ph.D. (Case Western Reserve University)
Associate Professor
Large-scale optimization; logic-based optimization; multi-objective optimization; optimization applications in radiation therapy treatment planning, medical imaging, manufacturing and production systems, and engineering design problems

Steven L. Garverick, Ph.D. (Massachusetts Institute of Technology)
Associate Professor
Mixed-signal integrated circuit design, microelectromechanical system integration, sensor/actuator interfacing, data conversion, wireless communication, analog neural network circuits, medical instrumentation

M. Behnam Malakooti, Ph.D. (Purdue University)
Professor
Intelligent architectures and networks, artificial neural networks, biological systems, intelligent decision making, design and multi-objective optimization of manufacturing/production/operations systems

Mehran Mehregany, Ph.D. (Massachusetts Institute of Technology)
Goodrich Professor of Engineering Innovation and Chair of EECS
Silicon and silicon carbide micro/nano systems technology (including MEMS/NEMS), micromachining and microfabrication technologies, materials and modeling issues related to MEMS/NEMS and in some cases integrated circuits technologies, MEMS packaging

Frank Merat, Ph.D. (Case Western Reserve University)
Associate Professor and Associate Chair of ECE
Wireless networks, RF communications, optical MEMS devices, computer vision and image processing, neural networks

Mihajlo D. Mesarovic, Ph.D. (University of Belgrade)
Cady Staley (Hanna) Professor of Systems Engineering and Mathematics
Complex systems theory, global issues and sustainable development, systems biology

Wyatt Newman, Ph.D. (Massachusetts Institute of Technology)
Professor
Mechatronics, high-speed robot design, force and vision-based machine control, artificial reflexes for autonomous machines, rapid prototyping, agile manufacturing

C.A. Papachristou, Ph.D. (Johns Hopkins University)
Professor
VLSI design and CAD, computer architecture and parallel processing, design automation, embedded system design

Daniel Saab, Ph.D. (University of Illinois at Urbana-Champaign)
Associate Professor
Computer architecture, VLSI system design and test, CAD design automation

N. Sreenath, Ph.D. (University of Maryland)
Associate Professor
Systems Biology, large-scale and hierarchical systems, sustainable development, integrated assessment, global and environmental policy issues (water resources and global climate change), control theory applications, medical informatics

Mehran Tabib-Azar, Ph.D. (Rensselaer Polytechnic Institute)
Professor
Semiconductor material and device characterizations, optical signal processing, novel high-frequency and high-power devices and circuits, novel super-resolution near-field imaging probes, quantum computing, nanotechnology applications in electronics and biology

Darrin Young, Ph.D. (University of California, Berkeley)
Assistant Professor
Wireless sensing technology, micromachined sensors, micromachined RF high-Q passive devices, integrated low power and low noise analog circuits

Massood Tabib-Azar, Ph.D. (Rensselaer Polytechnic Institute)
Professor
Semiconductor material and device characterizations, optical signal processing, novel high-frequency and high-power devices and circuits, novel super-resolution near-field imaging probes, quantum computing, nanotechnology applications in electronics and biology

Computer Science Division

Randall D. Beer, Ph.D. (Case Western Reserve University)
Professor
Computational neuroscience, autonomous robotics

George W. Ernst, Ph.D. (Carnegie Institute of Technology)
Associate Professor
Learning problem solving strategies, artificial intelligence, expert systems, program verification

Shudong Jin, Ph.D. (Boston University)
Assistant Professor
Computer networks and protocols, multimedia networking, Internet content delivery and performance evaluation

Vincenzo Liberatore, Ph.D. (Rutgers University)
Assistant Professor
Distributed Systems, Internet computing, randomized algorithms

Gultekin Ozsoyoglu, Ph.D. (University of Alberta, Canada)
Professor
Databases, multimedia computing, digital libraries
Z. Meral Ozsoyoglu, Ph.D. (University of Alberta, Canada)  
Professor and Associate Chair of CS  
Database systems, database query languages and optimization, data models, index structures, bioinformatics  
Adjunct Faculty

Andy Podgurski, Ph.D. (University of Massachusetts, Amherst)  
Associate Professor  
Software engineering methodology and tools, software testing and reliability assessment, computer security, distributed system design  
Adjunct Faculty

Limin Wang, Ph.D. (Princeton University)  
Assistant Professor  
Robustness and performance of network systems and protocols, DDoS protection, large scale distributed systems and operating systems  
Adjunct Faculty

Lee J. White, Ph.D. (University of Michigan)  
Professor  
Software testing: regression testing, GUI testing, specification-based testing, testing of object-oriented software  
Adjunct Faculty

Jiong Yang, Ph.D. (University of California, Los Angeles)  
Assistant Professor  
Data mining, bioinformatics, database systems, and distributed systems  
Adjunct Faculty

GQ (Guo-Qiang) Zhang, Ph.D. (Cambridge University, England)  
Associate Professor  
Programming languages, theory of computation, logic and topology in computer science, knowledge representation, information technology  
Adjunct Faculty

Active Emeritus Faculty  

Wen H. Ko, Ph.D. (Case Institute of Technology)  
Emeritus Professor  
Solid state electronics, Micro and nano sensors, biomedical instrumentation, implant telemetry  
Adjunct Faculty

Yoh-Han Pao, Ph.D. (Pennsylvania State University)  
George S. Dively Emeritus Professor  
Pattern recognition, signal and image processing, computational intelligence, intelligent systems  
Adjunct Faculty

Secondary Faculty Appointments  

Alexis Abramson, Ph.D. (University of California, Berkeley)  
Assistant Professor, Mechanical and Aerospace Engineering  

Robert V. Edwards, Ph.D. (Johns Hopkins University)  
Professor, Chemical Engineering  

Joseph Koonce, Ph.D. (University of Wisconsin, Madison)  
Professor, Biology  

Joseph Naddeo, Ph.D. (Boston University)  
James H. Jewel Professor of Genetics and Chair, Genetics  

Tomas Radioviesvitch, Ph.D. (Medical University of South Carolina)  
Assistant Professor, Epidemiology and Biostatistics  

Matthew J. Sobel, Ph.D. (Stanford University)  
Professor, Operations  

Qing-rong Jackie Wu, Ph.D. (Mayo Graduate School/Mayo Clinic)  
Assistant Professor, Radiation Oncology  

Adjunct Faculty Appointments  

Aaron Fleischman, Ph.D. (Case Western Reserve University)  
Assistant Professor  

Pat Howard, Ph.D. (Case Western Reserve University)  
Assistant Professor  

Peter Kinman, Ph.D. (University of Southern California)  
Assistant Professor  

Geoffrey Lockwood, Ph.D. (University of Toronto, Canada)  
Assistant Professor  

Shuvo Roy, Ph.D. (Case Western Reserve University)  
Assistant Professor  

William Schultz, Ph.D. (Case Western Reserve University)  
Associate Professor  

Marvin Schwartz, Ph.D. (Case Western Reserve University)  
Assistant Professor  

David A. Smith, Ph.D. (Massachusetts Institute of Technology)  
Assistant Professor  

Peter Tsivitse, Ph.D. (Case Western Reserve University)  
Assistant Professor  

RESEARCH ACTIVITIES  

The department’s over-arching research theme is exploring the intersections of “bio-micro/nano-info”. Within this theme, the divisions have delineated research thrusts. The Electrical and Computer Engineering research thrusts include: micro/nano systems; electronics and instrumentation; embedded systems; robotics and intelligent systems; and systems biology. The Computer Science research thrusts include: bioinformatics; data mining and visualization; and pervasive networks and distributed systems.  

EECS participates in a number of groundbreaking collaborative research and educational programs, including the Microelectromechanical Systems Research Program, the Center for Computational Genomics, Advanced Metrology And Nano-Device Applications, Dynamics of Adaptive Behavior Research Group, Neuromechanics - An Integrative Graduate Education and Research Training Program, and Global-Problematique Education Network Initiative.  

FACILITIES  

Computer Facilities  

The department computer facilities incorporate both Unix (primarily Solaris) and Microsoft Windows-based operating systems on high end computing workstations for education and research. A number of file, printing, database, and authentication servers support these workstations, as well as the administrative functions of the department. Labs are primarily located in the Olin and Glennan buildings, as well as Nord hall, and are networked via the Case Western Reserve University network.  

The Case network is a state-of-the-art, high-speed fiber-optic, campus computer network that interconnects laboratories, faculty and student offices, classrooms, and student residence halls. It is one of the largest fiber-to-desktop networks anywhere in the world. Every desktop has a 1 Gbps (gigabit per second) connection to a fault-tolerant 10 Gbps backbone.
To complement the wired network, over 1,200 wireless access points (WAPs) are also deployed allowing anyone with a laptop or wireless-enabled PDA to access resources from practically anywhere on campus.

Off-campus users, through the use of virtual private network (VPN) servers, can use their home dial-up or broadband connections to access many on-campus resources, as well as software, as if they were physically connected to the university network.

The department and the university also participate in the Internet2 project, which provides a high-speed, inter-university network infrastructure allowing for enhanced collaboration between institutions. The Internet2 infrastructure allows students, faculty and staff alike the ability to enjoy extremely high-performance connections to other Internet2 member institutions.

Aside from services provided through a commodity Internet connection, Case network users can take advantage of numerous on-line databases such as EUCLIDplus, the university libraries’ circulation and public access catalog, as well as Lexus-Nexus and various CD-ROM based dictionaries, thesauri, encyclopedias, and research databases. Many regional and national institutional library catalogs are accessible over the network, as well.

Microfabrication Facilities

The Microfabrication Laboratory (MFL) is a state-of-the-art clean room facility for the fabrication of microelectromechanical systems (MEMS) and microelectronic devices. The Class 100 facility supports the university’s strong interdisciplinary MEMS-microsystems research program by providing on-campus fabrication capabilities for a broad range of research projects by investigators from a number of departments within the university. It is also accessible by external organizations for prototype fabrication and research and development. The MFL offers a broad spectrum of micromachining processes, including bulk and surface micromachining, wafer bonding, and micro-molding. Nanofabrication capabilities are being planned and established in the MFL.

Additional Department Facilities

Jennings Computer Center Lab

Supported by an endowment from the Jennings Foundation, this lab provides our students with the educational resources necessary for their classwork and exploration of the art of computing. This lab has both PCs and Sun Unix workstations, and includes two high-speed laser printers.

ENGR 131 Freshman Computing Laboratory

This laboratory is used to support the freshman ENGR 131, Elementary Computer Programming, class. Twenty-two student workstations are available for hands-on instruction, and support the study of introductory C and C++ programming at the university.

Nord Computer Laboratory

General purpose computer facilities for undergraduate instruction are provided in this lab, which contains about 70 PCs, as well as Apple computers and Unix workstations.

Database Research Laboratory

Primarily funded by equipment grants from the National Science Foundation and Microsoft Research, this laboratory provides PCs running Windows and Linux, supporting research in database systems and bioinformatics.

Networks Laboratory

Supported through donations from both Cisco Systems and Microsoft Research, the networks lab has 15 stations complete with a PC, a Cisco switch and router, and IP telephony equipment, as well as network patches back to a central rack where devices at one workstation may be routed to other equipment in the lab. A “library” of related equipment is also available.

VLSI Design Laboratory

This lab has been supported by the Semiconductor Research Corporation, NSF, NASA, Synopsys and Sun Microsystems. This laboratory has a number of advanced Unix workstations that run commercial CAD software tools for VLSI design and currently is used to develop design and testing techniques for embedded system-on-chip.

Embedded Systems Laboratory

The Embedded Systems Laboratory is equipped with several Sun Blade Workstations running Solaris and Intel PCs running Linux. This lab recently has been equipped with advanced FPGA Virtex II prototype boards from Xilinx, including about 100 Xilinx Virtex II FPGAs and Xilinx CAD tools for development work. A grant-in-aid from Synopsys has provided the Synopsys commercial CAD tools for software development and simulation. This lab also is equipped with NIOS FPGA boards from Altera, including software tools.

Electronic Circuits Lab

This laboratory has been primarily supported by Hewlett-Packard, Agilent, and Keithley corporations. It is the central educational resource for students taking analog, digital, and mixed-signal electronics classes. All instrumentation in the lab is computer-interfaced. The analog workstations consist of Windows-based computers equipped with LabView software, as well as Hewlett-Packard 546xx oscilloscopes, 33120A Waveform Generators, 34401A Digital Multimeters, and E3631A power supplies.

The digital workstations are similarly configured and have additional hardware such as a Hewlett-Packard 4155B semiconductor parameter, Hewlett-Packard 54616TC mixed-signal test stations, Hewlett Packard logic analyzers, and Hewlett-Packard high-frequency oscilloscopes.

Mixed-Signal Integrated Circuit Laboratory

This research laboratory includes a cluster of Windows workstations with integrated
circuit design software (Cadence PSpice and Tanner L-Edit), as well as a variety of equipment used in the characterization of mixed-signal (analog and digital) integrated circuits, which are typically fabricated using the MOSIS foundry service. Test equipment includes an IC probe station, surface-mount soldering equipment, logic and network/spectrum analyzers, an assortment of digital oscilloscopes with sample rates up to 1 GHz, and a variety of function generators, multi-meters, and power supplies.

Wireless Microsystem Lab

This research laboratory focuses on developing key technologies, such as micromachined sensors, actuators, and low-power and low-noise integrated sensing and communication circuits, to implement advanced high-performance wireless microsystems for biomedical, communication, and general industrial applications. The laboratory is equipped with PCs, various computer simulation software (Hspice, 3D Maxwell, and Intellisense), high temperature annealing furnace, laser Doppler vibrometer, and various electronic measurement equipment, including high frequency spectrum analyzer, network analyzer, impedance analyzer, RF signal generator, multi-channel digital oscilloscopes, and probe station with microwave capabilities.

Microelectromechanical Systems (MEMS) Research Laboratory

The MEMS Research Laboratory is equipped for microfabrication processes that do not require a clean-room environment. These include chemical-mechanical polishing (two systems), bulk silicon etching, aqueous chemical release of free-standing micromechanical components, and supercritical point drying. In addition to the fabrication capabilities, the lab is also well equipped for testing and evaluation of MEMS components, as it houses wafer-scale probe stations, vacuum probe station, multipurpose vacuum chamber, and interferometric load-deflection station. Two large (8 x 4) vibration isolated air tables are available for custom testing setups. The laboratory has a wide variety of electronic testing instruments, including a complete IV-CV testing setup.

Advanced Metrology and Nano-Device Applications (AMANDA)

AMANDA is equipped with state-of-the-art atomic force microscopy (AFM) systems capable of imaging topography and electromagnetic properties of materials and devices at the nanometer scale. These nano-metrology tools are unique and enable imaging embedded nanostructures with unprecedented resolution over a wide range of frequencies, covering up to 100 GHz. In support of these imaging systems, AMANDA has microwave engineering tools, including automated network analyzers, sources and detectors, as well as microwave design simulation capabilities. Optical measurements and spectroscopy, as well as a whole gamut of DC and AC characterization systems enable the AMANDA group to measure device characteristics, including photoconductivity, S-parameters, magnetoresistivity, capacitance, conductance, and breakdown and leakage behavior as a function of temperature, field strength and frequency. Equipped with probe stations, and microscopes with on-line CCDs, AMANDA is capable of recording and imaging microfluidic, dielectrophoretic, osmotic processes and MEMS devices in real time and under different operating conditions. AMANDA is also equipped with a CVD reactor to grow carbon nano-tubes and solid-electrolytes on semiconductors, dielectrics and metals. A metal deposition and sputtering facility, and simple processing stations enable rapid prototyping of large-scale devices followed by their characterization in a very efficient manner.

Micro-Electronic Device Modeling and Characterization Lab

Affiliated with our Microfabrication Laboratory (MFL), this laboratory is equipped with DC measurement capabilities for evaluating semiconductor device performance. Device modeling is done on Sun and HP workstations.

Autonomous Robotics Laboratory

Primarily funded by ONR and other federal sources, this laboratory has a number of computer workstations and robots that are used to conduct research into robotics, autonomous agents, and biological simulation.

Lester J. Kern Computational Laboratory

This laboratory is used by students enrolled in “Electromechanical Energy Conversion,” as well as for research in robotics and mechatronics. Laboratory facilities include four lab stations for demonstrating machine characteristics and basic steady-state and dynamic system performance, four PC-based QNX workstations, and real-time data acquisition systems for interaction with lab experiments and control of machines.

Process Control Laboratory

This laboratory contains process control pilot plants, computerized hardware for process control, and demonstration and research facilities. This laboratory also has access to steam and compressed air for use in the pilot plants.

Timken Foundation Dynamics and Control Laboratory

This laboratory contains mechanical, pneumatic, and electrical laboratory experiments for teaching and research purposes. This includes PLCs, motors, and robotics systems.

Rockwell Automation Machinery Diagnostics and Control Laboratory

This laboratory is focused upon machinery diagnostics and failure prediction. Several test stands will provide instrumentation for machinery lifetime prediction and sensor development. Additional instrumentation will provide for remote operation of the test stands.

PLC Control and Automation Laboratory

This laboratory uses Allen-Bradley PLCs for data acquisition and real-time control of complex processes. Currently the PLCs
control a multi-train HO model system and a five-floor, two-car elevator system.

**Global Systems Laboratory**

This laboratory consists of various PC and Sun workstations containing databases from the United Nations, World Watch Institute, World Resources Institute, U.S. Government, etc., and policy and scenario analysis software.

**UNDERGRADUATE PROGRAMS**

The EECS department offers accredited programs leading to B.S. degrees in
(a) Electrical Engineering
(b) Systems and Control Engineering
(c) Computer Engineering
(d) Computer Science.

These programs give our students a strong background in the fundamentals of mathematics, science, and engineering. Our students can use their technical and open electives to pursue such concentrations as bioelectrical engineering, complex systems, controls, digital systems design, embedded systems, micro/nano systems, robotics and intelligent systems, signal processing and communications, and software engineering, computer networks and security, database systems and data mining, and bioinformatics. In addition to an excellent technical education, all students in the department are exposed to societal issues, ethics, and professionalism, and have the opportunity to develop leadership and creativity skills.

**ELECTRICAL ENGINEERING**

The Bachelor of Science program in electrical engineering provides our students with a broad foundation in electrical engineering through combined classroom and laboratory work, and prepares our students for entering the profession of electrical engineering, as well as for further study at the graduate level. Core courses provide our students with a strong background in signals and systems, computers, electronics (both analog and digital), and semiconductor devices. Students are required to develop depth in at least one of the following technical areas: electromagnetics, signals and systems, solid state, computer hardware, computer software, control, and circuits. Each electrical engineering student must complete the following requirements:

**Breadth Requirements:**
- ENGR 131: Elementary Computer Programming
- ENGR 210: Introduction to Circuits and Instrumentation
- EECS 281: Logic Design and Computer Organization
- EECS 245: Electronic Circuits
- EECS 246: Signals and Systems
- EECS 309: Electromagnetic Fields I
- STAT 332: Statistics of Signal Processing
- EECS 321: Semiconductor Electronic Devices
- EECS 398L: Senior Project in Electrical Engineering I
- EECS 399L: Senior Project in Electrical Engineering II

**Depth Requirement:**

Each student must show a depth of competence in one technical area by taking at least three courses from one of the following seven areas. This depth requirement may be met using a combination of the above core courses and a selection of open and technical electives.

**Area I: Electromagnetics**
- EECS 309: Electromagnetic Fields I
- EECS 310: Electromechanical Energy Conversion
- EECS 311: Electromagnetic Fields II
- EECS 412: Electromagnetic Fields III

**Area II: Signals and Systems**
- EECS 246: Signals and Systems
- EECS 313: Signal Processing
- EECS 347: Network Synthesis
- EECS 351: Communications and Signal Analysis
- EECS 354: Digital Communications
- EECS 381: Hybrid Systems

**Area III: Computer Software**
- EECS 233: Data Structures
- EECS 337: Systems Programming
- EECS 338: Operating Systems

**Area IV: Solid State**
- EECS 321: Semiconductor Electronic Devices
- EMSE 314: Electrical, Optical and Magnetic Properties of Matter
- EECS 322: Integrated Circuits and Electronic Devices

**Area V: Control**
- EECS 304: Control Engineering I
- EECS 310: Electromechanical Energy Conversion
- EECS 383: Microprocessor Applications to Control
- EECS 346: Engineering Optimization
- EECS 381: Hybrid Systems

**Area VI: Circuits**
- EECS 245: Electronic Circuits
- EBME 310: Biomedical Instrumentation
- EECS 344: Electronic Circuit Design
- EECS 382: Microprocessor Based Design
- EBME 418: Biomedical Electronics
- EECS 426: MOS Integrated Circuit Design

**Area VII: Computer Hardware**
- EECS 281: Computer Organization
- EECS 382: Microprocessor Based Design
- EECS 301: Computer Design Lab
- EECS 314: Computer Architecture
- EECS 315: Digital Systems Design

**Statistics Requirement:**
- STAT 332: Statistics of Signal Processing (STAT 333 may be substituted for STAT 332 with approval of advisor)
- Applied Statistics Elective (Class which uses statistics in some aspect of electrical engineering. Student may choose from EECS 351, EECS 354, EECS 355 or another class approved by advisor.)

**Design Requirement:**
- EECS 398L: Senior Project in Electrical Engineering I
- EECS 399L: Senior Project in Electrical Engineering II

In consultation with a faculty advisor, a student completes the program by selecting technical and open elective courses that provide in-depth training in one or more of a spectrum of specialties such as digital and microprocessor-based control, communications and electronics, solid state electronics, and integrated circuit design and fabrication. With the approval of the advisor, a students may empha-
Major in Electrical Engineering

**Freshman Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 111 Chemistry I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 121 Calculus I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td>PHED 101 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td>Total</td>
<td>(17-3-17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 Physics I: Mechanics</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 122 Calculus II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td>Total</td>
<td>(15-3-15)</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 122 Physics II Electricity &amp; Magnetism</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 223 Calculus III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 210 Circuits and Instrumentation</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>EECS 281 Computer Organization, Logic Design</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>Total</td>
<td>(13-4-15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 225 Thermodynamics, Transport</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 224 Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 245 Electronic Circuits</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>EECS 309 Electromagnetic Fields I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(16-2-17)</td>
</tr>
</tbody>
</table>

d. Technical electives will be chosen to fulfill the depth requirement and otherwise increase the student’s understanding of electrical engineering. Courses used to satisfy the depth requirement must come from the department’s list of depth areas and related courses. Technical electives not used to satisfy the depth requirement are more generally defined as any course related to the principles and practice of electrical engineering. This includes all EECS courses at the 200 level and above, and can include courses from other programs. All non-EECS technical electives must be approved by the student’s advisor.

c. Although not required students may elect to take ENGR 101 Freshman Engineering Field Service Project as their open elective in the freshman year.

**Junior Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 200 Statics and Strength of Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 246 Signals and Systems</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>STAT 332 Statistics of Signal Processing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved Tech. Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(15-2-16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 321 Semiconductor Elect. Devices</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>Applied Statistics Req.</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(15-2-16)</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECS 398L Senior Project Lab I</td>
<td>(0-8-4)</td>
</tr>
<tr>
<td>ENGL 398N Professional Communications</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(12-8-16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 399L Senior Project Lab II</td>
<td>(0-8-4)</td>
</tr>
<tr>
<td>Open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(12-8-16)</td>
</tr>
</tbody>
</table>

**Graduation Requirement: 128 hours total**

c. This applied statistics requirement must utilize statistics in electrical engineering applications and is typically selected from EECS 351 Communications and Signal Analysis, EECS 354 Digital Communications or EECS 355 RF Communications. Other courses are possible with approval of the student’s advisor.

d. Co-op students may obtain design credit for one semester of Senior Project Lab if their co-op assignment included significant design responsibility; however, the student is still responsible for such course obligations as reports, presentations, and ethics assignments. Design credit and fulfillment of remaining course responsibilities are arranged through the senior project instructor.

g. B.S./M.S. students may also utilize EECS 398L/399L to fulfill eight credits of M.S. thesis provided their thesis has adequate design content to meet the requirements of EECS 398L/399L. B.S./M.S. students should see their M.S. thesis advisor for details.
## Major in Systems and Control Engineering

### Freshman Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 111 Chemistry I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 121 Calculus I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(17-3-17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 Physics I: Mechanics</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 122 Calculus II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-3-15)</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 122 Physics II: Electricity &amp; Magnetism</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 223 Calculus III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 210 Circuits and Instrumentation</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>EECS 281 Computer Organization</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(13-4-15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 225 Fluid and Thermodynamics</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 224 Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>STAT xxx Statistical Methods Course</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 200 Statics &amp; Strength of Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(16-0-16)</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 246 Signals and Systems</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>EECS 342 Introduction to Global Systems</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 324 Simulation Methods</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 304 Control Engineering I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 305 Control Lab I</td>
<td>(0-2-1)</td>
</tr>
<tr>
<td>EECS 346 Engineering Optimization</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 398N Senior Project Lab</td>
<td>(0-8-4)</td>
</tr>
<tr>
<td>ENGL 398N Professional Communications</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 352 Eng. Econ. &amp; Dec. Analysis</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12-8-16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 399N Engineering Projects Lab II</td>
<td>(0-8-4)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(12-8-16)</td>
</tr>
</tbody>
</table>

### Graduation Requirement: 127 hours total

---

a. Although not required, students may elect to take ENGR 101, Freshman Engineering Service Project, as their open elective during the freshman year.
b. Selected students may be invited to take PHYS 123 and PHYS 124 in place of PHYS 121 and 122.
c. Choose from STAT 312, STAT 332, or STAT 333.
d. Co-op students may obtain design credit for one semester of Senior Project Lab if their co-op assignment included significant design responsibility; however, the student is still responsible for such course obligations as reports, presentations, and ethics assignments. Design credit and fulfillment of remaining course responsibilities are arranged through the senior project instructor.
e. Signal Processing or Communication Systems technical elective to be taken in any semester after EECS 246. This elective should be chosen from EECS 313, EECS 351, or EECS 354.
f. Three of the five technical electives must be taken from one of the five systems and control engineering elective sequences. The remaining two should be chosen from any of the remaining elective sequences.
BACHELOR OF SCIENCE IN ENGINEERING DEGREE  
Major in Computer Engineering

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Open elective or HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 111 Chemistry I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 121 Calculus I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(17-3-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS elective or open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 Physics I: Mechanics</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 122 Calculus II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-3-15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 122 Physics II: Electricity and Magnetism</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 223 Calculus III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 200 Statics and Strength of Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 233 Introduction to Data Structures</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(16-2-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 224 Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 210 Circuits and Instrumentation</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 281 Comp. Organization Logic Design</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-4-17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 304 Discrete Mathematics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 337 Systems Programming</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>ENGR 225 Thermodynamics, Fluids, Transport</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>Technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(16-2-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>ENGL 398N Prof. Communications</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 301 Digital Laboratory</td>
<td>(0-4-2)</td>
</tr>
<tr>
<td>EECS 314 Computer Architecture</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 315 Digital Systems Design</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>EECS 338 Intro to Operating Systems</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>or Technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(12-8-16) or (12-6-15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 318 VLSI/CAD</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>or Technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16) or (15-0-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 399M Comp. Eng. Design Project</td>
<td>(0-8-4)</td>
</tr>
<tr>
<td>Technical elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(12-6-15)</td>
</tr>
</tbody>
</table>

**Graduation Requirement: 129 hours total**

a. One of these must be a humanities/social science course

b. Technical electives are more generally defined as any course related to the principles and practice of computer engineering. This includes all EECS courses at the 200 level and above, and can include courses from other programs. All non-EECS technical electives must be approved by the student’s advisor.

c. The student must take either EECS 318 VLSI/CAD (Fall Semester) or EECS 338 Introduction to Operating Systems (Spring Semester), and a three credit hour technical elective.

### BACHELOR OF SCIENCE DEGREE

**Major in Computer Science**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Open elective or HM/SS elective&lt;sup&gt;a&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 111 Chemistry I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 121 Calculus I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS elective or open elective&lt;sup&gt;a&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 Physics I: Mechanics</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 122 Calculus II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-3-15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 222 Physics II Electricity and Magnetism</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 223 Calculus III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Technical elective&lt;sup&gt;b&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ECES 281 Comp. Organization Logic Design</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(16-2-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 224 Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Technical elective&lt;sup&gt;c&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 304 Discrete Mathematics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ECES 233 Intro Data Structures</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 340 Algorithms and Data Structures</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 337 Systems Programming</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>EECS 345 Programming Language Concepts</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Statistics elective&lt;sup&gt;d&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>ENGL 398N Professional Communication</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 343 Theoretical Computer Science</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 314 Computer Architecture</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 338 Intro to Operating Systems</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>Technical elective&lt;sup&gt;e&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>PHIL 304 Science and Engr. Ethics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 398M Software Engineering</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Technical elective&lt;sup&gt;f&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective&lt;sup&gt;g&lt;/sup&gt;</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-0-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>HM/SS elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 341 Intro. to Database Systems</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EECS 391 Intro. to Artificial Intelligence</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Technical elective&lt;sup&gt;h&lt;/sup&gt;</td>
<td>(2-0-2)</td>
</tr>
<tr>
<td>Open elective</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-0-15)</td>
</tr>
</tbody>
</table>

**Graduation Requirement: 127 hours total**

a. One of these must be a humanities/social science course.

b. ENGR 210 is recommended because it provides flexibility in choice of major and advanced EECS courses.


d. Course other than mathematics or computer science.

e. Technical electives must come from an approved list of courses available from the department.
size other specialties by selecting elective courses from other programs or departments.

Many courses have integral or associated laboratories in which students gain hands-on experience with electrical engineering principles and instrumentation. Students have ready access to the teaching laboratory facilities and are encouraged to use them during nonscheduled hours in addition to the regularly scheduled laboratory sessions. Opportunities also exist for undergraduate student participation in the wide spectrum of research projects being conducted in the department.

**Minor in Electrical Engineering**

Students enrolled in degree programs in other engineering departments can have a minor specialization by completing the following courses:
- EECS 245: Electronic Circuits I (4)
- EECS 246: Signals and Systems (4)
- EECS 281: Logic Design and Computer Organization (4)
- EECS 309: Electromagnetic Fields I (3)
- Approved Technical Elective (3)

**Minor in Electronics**

The department also offers a minor in electronics for students in the College of Arts and Science. This program requires the completion of 29 credit hours, of which 10 credit hours may be used to satisfy portions of the student's skills and distribution requirements. The following courses are required for the electronics minor:
- MATH 125: Mathematics I (4)
- MATH 126: Mathematics II (4)
- PHYS 115: Introductory Physics I (4)
- PHYS 116: Introductory Physics II (4)

### BACHELOR OF ARTS DEGREE

#### Computer Science

#### Freshman Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>MATH 125 Mathematics I</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
</tr>
<tr>
<td>GER course</td>
</tr>
<tr>
<td>GER course</td>
</tr>
<tr>
<td>PHED 101 Physical Education</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 150 Expository Writing</td>
</tr>
<tr>
<td>MATH 126 Mathematics II</td>
</tr>
<tr>
<td>GER course</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>PHED 102 Physical Education</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>EECS 281 Comp. Organization Logic Design</td>
</tr>
<tr>
<td>GER course</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER course</td>
</tr>
<tr>
<td>MATH 304 Discrete Mathematics</td>
</tr>
<tr>
<td>EECS 233 Intro Data Structures</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

#### Junior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>EECS 337 Systems Programming</td>
</tr>
<tr>
<td>GER course</td>
</tr>
<tr>
<td>Technical Elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>EECS 338 Intro to Operating Systems</td>
</tr>
<tr>
<td>EECS 341 Intro to Database Systems</td>
</tr>
<tr>
<td>EECS 314 Computer Architecture</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

#### Senior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>EECS 340 Algorithms and Data Structures</td>
</tr>
<tr>
<td>Technical Elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

**Graduation Requirement: 120 hours total**

a. One technical elective must be a computer science course. The other two technical electives may be computer science, MATH or STAT courses.
Cooperative Education Program

There are many excellent cooperative education (co-op) opportunities for electrical engineering majors. A co-op student does two co-op assignments in industry or government. The length of each assignment is a semester plus a summer, which is enough time for a student to complete a significant engineering project. The co-op program takes five years to complete because the student is typically away from campus for two semesters.

B.S./M.S. Program

The department encourages highly motivated and qualified students to apply for admission to the five-year B.S./M.S. program in the junior year. This integrated program, which permits substitution of M.S. thesis work for the senior design project, provides a high level of fundamental training and in-depth advanced training in the student's selected specialty. It also offers the opportunity to complete both the Bachelor of Science in Engineering and Master of Science degrees within five years.

SYSTEMS AND CONTROL ENGINEERING

The Bachelor of Science program in systems and control engineering provides our students with the basic concepts, analytical tools, and engineering methods which are needed in analyzing and designing complex technological and non-technological systems. Problems relating to modeling, decision-making, control, and optimization are studied. Some examples of systems problems that are studied include: modeling and analysis of complex biological systems, computer control of industrial plants, developing world models for studying environmental policies, and optimal planning and management in large-scale systems. In each case, the relationship and interaction among the various components of a given system must be modeled. This information is used to determine the best way of coordinating and regulating these individual contributions to achieve the overall goal of the system.

There are five elective sequences available within the B.S. program in systems and control engineering curriculum that represent the breadth of the discipline:

AREA 1: Dynamic Systems and Control
MATH 201: Linear Algebra
EECS 306: Control Engineering II
EECS 310: Electromechanical Energy Conversion
EECS 382: Microprocessor-Based Design
EECS 381: Hybrid Systems
EECS 408: Intro. To Linear Systems
EECS 418: Systems Identification and Adaptive Control
EECS 421: Optimization of Dynamic Systems
EECS 483: Data Acquisition and Control
EECS 489: Robotics I

AREA 2: Complex Systems Analysis
MATH 201: Linear Algebra
EECS 381: Hybrid Systems
EECS 408: Intro. To Linear Systems
EECS 414: Complex Systems Modeling and Analysis
EECS 416: Engineering Optimization
EECS 429: Risk and Decision Analysis
EECS 356: Economics of Energy
EECS 365: Environmental Economics
EECS 452: Random Signals
EECS 482: Computational Intelligence I
EECS 491: Intelligent Systems I

AREA 3: Signal Processing and Communication
MATH 201: Linear Algebra
EECS 351: Communications and Signal Analysis
EECS 354: Digital Communications
EECS 355: RF Communications
EECS 401: Digital Signal Processing
EECS 452: Random Signals
EECS 491: Intelligent Systems I

AREA 4: Manufacturing, Industrial Automation and Operational Systems
EECS 350/450: Production and Operational Systems

EECS 360/460: Manufacturing and Integrated Systems
EECS 416: Engineering Optimization
EECS 429: Risk and Decision Analysis
EECS 489: Robotics I
OPMT 351: Logistical Systems
OPMT 353: Quality Control and Management
OPRE 424: Scheduling
OPRE 426: Stochastic Processes in Operations Research

AREA 5: Information Systems
EECS 233: Intro. Data Structures
EECS 329: Design of Object-Oriented Systems
EECS 337: Systems Programming
EECS 340: Algorithms and Data Structures
EECS 341: Intro. To Database Systems
MATH 304: Discrete Mathematics
MATH 307: Intro. To Abstract Algebra I
EECS 425: Computer Communications Networks

MINOR PROGRAM IN SYSTEMS AND CONTROL ENGINEERING

A total of five courses (15 credit hours) are required to obtain a minor in systems and control engineering. At least nine credit hours must be selected from:

- EECS 212: Signals, Systems and Control (3)
- EECS 214: Signals, Systems and Control Lab (1)
- EECS 304: Control Engineering I (3)
- EECS 346: Engineering Optimization (3)
- EECS 352: Engineering Economics and Decision Analysis (3)

The remaining credit hours can be chosen from EECS courses with the written approval of the faculty member (see the EECS Web page for the current responsible faculty member) in charge of the minor program in the Systems and Control Program. A list of suggested EECS courses to complete the minor is:

- EECS 324: Simulation Methods in Engineering
- EECS 313: Signal Processing
COMPUTER SCIENCE

The Bachelor of Science program in computer science is designed to give students a strong background in the fundamentals of mathematics and computer science. A graduate of this program will have the knowledge and skills to use these fundamentals to analyze and evaluate software systems and the underlying abstractions upon which they are based. A CS graduate will also be able to design and implement software systems which are state-of-the-art solutions to a variety of computing problems; this includes problems which are sufficiently complex to require the evaluation of design alternatives and engineering trade-offs.

The Bachelor of Arts program in computer science is a combination of a liberal arts program and a computing major. It is a professional program in the sense that graduates can be employed as computer professionals, but it is less technical than the Bachelor of Science program in computer science. This degree is particularly suitable for students with a wide range of interests. For example, students can major in another discipline in addition to computer science and routinely complete all of the requirements for the double major in a four-year period. This is possible because over a third of the courses in the program are open electives. Furthermore, if a student is majoring in computer science and a second technical field such as mathematics or physics, many of the technical electives will be accepted for both majors. Another example of the utility of this program is that it routinely allows students to major in computer science and take all of the pre-med courses in a four-year period.

Minor in Computer Science (B.S. or B.S.E.)

For students pursuing a B.S. or B.S.E. degree, the following three courses are required for a minor in computer science:

- EECS 233: Introduction to Data Structures
- EECS 338: Introduction to Operating Systems
- EECS 340: Algorithms and Data Structures

MINOR IN COMPUTER ENGINEERING

The minor has a required two-course sequence followed by a two course sequence in either hardware or software aspects of computer engineering. The following two courses are required for any minor in computer engineering:

- EECS 281: Logic Design and Computer Organization (or equivalent)
- EECS 233: Introduction to Data Structures

The two-course hardware sequence is:

- EECS 314: Computer Architecture
- EECS 315: Digital Systems Design

The corresponding two-course software sequence is:

- EECS 337: Systems Programming
- EECS 338: Introduction to Operating Systems

In addition to these two standard sequences, a student may design his or her own with the approval of the minor advisor. A student cannot have a major and a minor, or two minors, in both computer engineering and computer science because of the significant overlap between these subjects.

COMPUTER ENGINEERING

The Bachelor of Science program in computer engineering is designed to give a student a strong background in the fundamentals of computer engineering. A graduate of this program will be able to use these fundamentals to analyze and evaluate computer systems, both hardware and software. A computer engineering graduate would also be able to design and implement computer systems, both hardware and software, which are state-of-the-art solutions to a variety of computing problems. This includes systems which have both a hardware and a software component, whose design requires a well-defined interface between the two, and the evaluation of the associated trade-offs.

Cooperative Education Program

There are many excellent cooperative education (co-op) opportunities for systems and control engineering majors. A co-op student does two co-op assignments in industry or government. The length of each assignment is a semester plus a summer, which is enough time for the student to complete a significant engineering project. The co-op program takes five years to complete because the student is typically away from campus for two semesters.

B.S./M.S. Program

The department encourages highly motivated and qualified students to apply for admission to the five-year B.S./M.S. program in the junior year. This integrated program, which permits substitution of M.S. thesis work for the senior design project, provides a high level of fundamental training and in-depth advanced training in the student’s selected specialty. It also offers the opportunity to complete both the Bachelor of Science in Engineering and Master of Science degrees within five years.

COMPUTER ENGINEERING

The Bachelor of Science program in computer engineering is designed to give a student a strong background in the fundamentals of computer engineering. A graduate of this program will be able to use these fundamentals to analyze and evaluate computer systems, both hardware and software. A computer engineering graduate would also be able to design and implement computer systems, both hardware and software, which are state-of-the-art solutions to a variety of computing problems. This includes systems which have both a hardware and a software component, whose design requires a well-defined interface between the two, and the evaluation of the associated trade-offs.
A student must take an additional four credit hours of computing courses with the exclusion of ENGR 131. MATH 304 (Discrete Mathematics) may be used in place of three of these credit hours because it is a prerequisite for EECS 340.

Minor in Computer Science (B.A.)

For students pursuing B.A. degrees, the following courses are required for a minor in computer science:
• ENGR 131: Elementary Computer Programming
• EECS 233: Introduction to Data Structures
• MATH 125: Mathematics I

Two additional computing courses are also required for this minor.

Cooperative Education Program

There are many excellent cooperative education (co-op) opportunities for systems and control engineering majors. A co-op student does two co-op assignments in industry or government. The length of each assignment is a semester plus a summer, which is enough time for the student to complete a significant engineering project. The co-op program takes five years to complete because the student is typically away from campus for two semesters.

B.S./M.S. Program

Students with a grade point average of 3.2 or higher are encouraged to apply to the B.S./M.S. Program which will allow them to get both degrees in five years. The B.S. can be in Computer Science or a related discipline, such as mathematics or electrical engineering. Integrating graduate study in computer science with the undergraduate program allows a student to satisfy all requirements for both degrees in five years.

GRADUATE PROGRAMS

The EECS department offers graduate study leading to the Master of Science and Doctor of Philosophy degrees in electrical engineering, systems and control engineering, computer engineering, and computer science. These graduate programs provide a balance of breadth and depth appropriate for each degree and support the department’s research thrust areas by emphasizing:

**ELECTRICAL ENGINEERING** – Research in computational intelligence, robotic control, solid-state devices, microelectromechanical systems (MEMS), micro/nano sensors, micro/nano scale imaging, wireless implantable biosensors, surgical robotics and simulation, and CMOS and mixed-signal integrated circuit design.

**SYSTEMS AND CONTROL ENGINEERING** – Research in non-linear control, optimization, signal processing, global modeling, and systems biology.

**COMPUTER ENGINEERING** – Research in VLSI design, programmable logic, computer architectures, embedded systems, design for testability, and reconfigurable processors.

**COMPUTER SCIENCE** – Research in bioinformatics, computational neuroscience, databases, software engineering, data mining and visualization, and pervasive networks and distributed systems.

Incoming graduate students are encouraged to apply for Case Prime Fellowships which provide, on a competitive basis, for full tuition and support of qualified students. In addition, research funds are used to provide assistantships that support the thesis research of graduate students. A limited number of fellowships providing partial support are also available for students enrolled in the B.S./M.S. program.

The department believes that the success of its graduates at all levels is due to emphasis on project- and problem-oriented course material coupled with the broad-based curricular requirements.

M.S. students may select either Plan A which requires a research thesis or Plan B which does not require a thesis. Doctoral dissertations in all programs must be original contributions to the existing body of knowledge in engineering and science. Academic requirements for graduate degrees in engineering are as specified by the Case School of Engineering in this bulletin. A more detailed set of rules and regulations for each degree program contained here is available from the department, and may also be found on the department Web page.

COMPUTER ENGINEERING AND SCIENCE (EECS)

Undergraduate Courses
EECS 120. Introduction to Electrical, Systems, and Computer Engineering (3)
This course is an introduction to the fields of Electrical, Systems, and Computer Engineering through exposure to selected applications such as the digital generation of music, the processing of digital images, coding of information, digital communication, and computer networks. Discussions of each field (Electrical, Systems, and Computer Engineering) using guest speakers as well as such topics as ethics and professionalism (as examined in the context of the course projects) will also be included. The course is intended to be taken as an open elective by freshmen who are interested in applying of fundamental mathematical and science concepts to the solution of interesting engineering problems. Students who are considering choosing a major in Electrical, Systems, or Computer Engineering (among other fields) can use this course to help in their decision making. Prereq: Freshman standing.

EECS 212. Signals, Systems, and Control (3)

EECS 214. Signals, Systems, and Control Laboratory (1)
A laboratory course based on the material in EECS 212. Analysis and simulation using MATLAB/Simulink. Laboratory experiments involving signal processing and control. Coreq: EECS 212.

EECS 216. Fundamental System Concepts (3)
Develops framework for addressing problems in science and engineering that require an integrated, interdisciplinary approach, including the effective management of complexity and uncertainty. Introduces fundamental system concepts in an integrated framework. Properties and behavior of phenomena regardless of the physical implementation through a focus on the structure and logic of information flow. Systematic problem solving methodology using systems concepts. Prereq: MATH 224.

EECS 233. Introduction to Data Structures (4)
The programming language C++: pointers, files, variant records, and recursion. Representation and manipulation of data: one-way and circular linked lists, doubly linked lists; the available space list. Different representations of stacks and queues. Representation of binary trees, trees and graphs. Hashing; searching and sorting. Laboratory. Prereq: ENGR 131.

EECS 245. Electronic Circuits (4)
Analysis of time-dependent electrical circuits. Dynamic waveforms and elements: inductors, capacitors, and transformers. First- and second-order circuits, passive and active. Analysis of sinusoidal steady state response using phasors. Laplace transforms and pole-zero dia-

EECS 246. Signals and Systems (4)

EECS 251. Numerical Methods (3)
Introduction to basic concepts and algorithms used in the numerical solution of common problems including solving non-linear equations, solving systems of linear equations, interpolation, fitting curves to data, integration and solving ordinary differential equations. Computational error and the efficiency of various numerical methods are discussed in some detail. Most homework requires the implementation of numerical methods on a computer. Prereq: ENGR 131 and MATH 122.

EECS 285. Engineering in Community Service II (3)
Project-oriented course; students work on “real” engineering projects of benefit to the community and in partnership with community “customers.” Project teams consist of a mix of sophomores, juniors, and seniors. Students perform engineering design tasks as appropriate to their technical background. Emphasis on teamwork, communication skills, customer awareness, and professional responsibility. Prereq: Sophomore standing in EECS.

EECS 290. Special Topics (1-18)
Limited to sophomores and juniors. Prereq: Consent of instructor.

EECS 301. Digital Logic Laboratory (2)
This course is an introductory experimental laboratory for digital networks. The course introduces students to the process of design, analysis, synthesis and implementation of digital networks. The course covers the design of combinational circuits, sequential networks, registers, counters, synchronous/asynchronous Finite State Machine, register based design, and arithmetic computational block. Prereq: EECS 281.

EECS 304. Control Engineering I with Laboratory (3)

EECS 305. Control Engineering I Laboratory (1)
A laboratory course based on the material in EECS 304. Modeling, simulation, and analysis using MATLAB. Physical experiments involving control of mechanical systems, process control systems, and design of PID controllers. Prereq: EECS 212 or equivalent. Coreq: EECS 304.

EECS 306. Control Engineering II with Laboratory (3)
Advanced techniques for control of dynamic systems. State-space modeling, analysis, and controller synthesis; introduction to nonlinear control systems: phase plane methods, bang-bang control, time-optimal control; describing functions analysis and design techniques; discrete time systems and controllers. Advanced control design methods implementation. Prereq: EECS 304.

EECS 309. Electromagnetic Fields I (3)
Maxwell’s integral and differential equations, boundary conditions, constitutive relations, energy conservation and Pointing vector, wave equation, plane waves, propagating waves and transmission lines, characteristic impedance, reflection coefficient and standing wave ratio, in-depth analysis of coaxial and strip lines, electro- and magneto-quasistatics, simple boundary value problems, correspondence between fields and circuit concepts, energy and forces. Prereq: MATH 223 and PHYS 122. Coreq: MATH 224.

EECS 310. Electromechanical Energy Conversion (4)
Electromechanical dynamics, modeling and control. Forces in quasistatic magnetic systems. Energy conversion properties of rotating machines. Analysis and control of DC servomotors, AC servomotors, reluctance machines, inductance machines, and magnetic bearing. Analysis of electromagnetic sensors. Electronic communication, torque linearization through computer controls and flux-vector control. Electromechanical properties are measured in the lab and high-performance controls are constructed and tested. Prereq: EECS 309.

EECS 311. Electromagnetic Fields II (3)
Boundary value problems, guided electromagnetic waves, rectangular and circular waveguides, strip lines, losses in waveguiding structures, scattering, wave optics and wave propagation in anisotropic media, ferrites and plasmas, resonant systems, cavities, microwave networks, multiport networks, scattering matrix formulation, radiation and antennas, radiation from dipoles, apertures and simple arrays. Prereq: EECS 309.

EECS 313. Signal Processing (3)

EECS 314. Computer Architecture (3)
This course provides students the opportunity to study and evaluate a modern computer architecture design. The course covers topics in fundamentals of computer design, performance, cost, instruction set design, processor implementation, control unit, pipelining, communication and network, memory hierarchy, computer arithmetic, input-output, and an introduction to RISC and super-scalar processors. Prereq: EECS 281.

EECS 315. Digital Systems Design (4)
This course gives students the ability to design modern digital circuits. The course covers topics in logic level analysis and synthesis, digital electronics: transistors, CMOS logic gates, CMOS lay-out, design metrics space, power, delay. Programmable logic (partitioning, routing), state machine analysis and synthesis, register transfer level design, datapath, controllers, ASM charts, microsequencers, emulation and rapid prototyping, and switch/logic-level simulation. Prereq: EECS 281.

EECS 316. Computer Design (3)
Methodologies for systematic design of digital systems with emphasis on programmable logic implementation and prototyping. Laboratory which uses modern design techniques based on hardware description languages such as VHDL, CAD tools, and Field Programmable Gate Arrays (FPGAs). Prereq: EECS 281; EECS 315 or consent of instructor.

EECS 317. Computer Design Laboratory (2)
Sequence of laboratory projects provide practical experience in computer-aided design techniques for computer and digital system design. Hardware system modeled and simulated at register transfer and switching transistor level.

EECS 318. VLSI/CAD (4)
With Very Large Scale Integration (VLSI) technology there is an increased need for Computer-Aided Design (CAD) techniques and tools to help in the design of large digital systems that deliver both performance and functionality. Such high performance tools are of great importance in the VLSI design process, both to perform functional, logical, and behavioral modeling and verification to aid the testing process. This course discusses the fundamentals in behavioral languages, both VHDL and Verilog, with hands-on experience. Prereq: EECS 281, EECS 315.

EECS 321. Semiconductor Electronic Devices (4)
Energy bands and charge carriers in semiconductors and their experimental verifications. Excess carriers in semiconductors. Principles of operation of semiconductor devices that rely on the electrical properties of semiconductor surfaces and junctions. Development of equivalent circuit models and performance limitations of these devices. Devices covered include: junctions, bipolar transistors, Schottky junctions, MOS capacitors, junction gate and MOS field effect transistors, optical devices such as photodetectors, light-emitting diodes, solar cells and lasers. Laboratory experiments to characterize some of the above devices. Prereq: EECS 309.

EECS 322. Integrated Circuits and Electronic Devices (3)
Technology of monolithic integrated circuits and devices, including crystal growth and doping, photolithography, vacuum technology, metalization, wet etching, thin film basics, oxidation, diffusion, ion implantation, epitaxy, chemical vapor deposition, plasma processing, and micromachining. Basics of semiconductor devices including junction diodes, bipolar junction transistors, and field effect transistors. Prereq: EECS 321.

EECS 324. Simulation Techniques in Engineering (3)
Discrete event systems and simulation concepts. Discrete event simulation with batch and interactive languages. Coreq: ENGL 398.

EECS 329. Design of Object-Oriented Systems (3)
This course provides an opportunity to gain an understanding of the concepts and technology of object-oriented systems and learn system design techniques that take full advantage of this technology. Students also develop competence in programming with the object-oriented features of C++. Prereq: EECS 253.
EECS 337. Systems Programming (4)  
Lexical analyzers; symbol tables and their searching; assemblers, one-pass and two-pass, conditional assembly, and macros; linkers and loaders; interpreters, pscodes, threaded codes; introduction to compilation, grammar, parsing, and code generation; preprocessors; text editors, line-oriented and screen-oriented; bootstrap loaders, ROM monitors, interrupts, and device drivers. Laboratory. Prereq: EECS 233 and EECS 281.

EECS 338. Introduction to Operating Systems (4)  
CPU scheduling, memory management, concurrent processes, semaphores, monitors, deadlocks, secondary storage management, file systems, protection, UNIX operating system, fork, exec, wait, UNIX System V IPCs, sockets, remote procedure calls, threads. Must be proficient in “C” programming language. Prereq: EECS 337.

EECS 340. Algorithms and Data Structures (3)  
Efficient sorting algorithms, external sorting methods, internal and external searching, efficient string processing algorithms, geometric and graph algorithms. Prereq: EECS 233 and MATH 304.

EECS 341. Introduction to Database Systems (3)  
Relational model, ER model, relational algebra and calculus, SQL, OBE, security, views, files and physical database structures, query processing and query optimization, normalization theory, concurrency control, object relational systems, multimedia databases, Oracle SQL server, Microsoft SQL server. Prereq: EECS 233.

EECS 342. Introduction to Global Issues (3)  
This systems course is based on the paradigm of the world as a complex system. Global issues such as population, world trade and financial markets, resources (energy, water, land), global climate change, and others are considered with particular emphasis put on their mutual interdependence. A reasoning support computer system which contains extensive data and a family of models is used for future assessment. Students are engaged in individual, custom-tailored, projects of creating conditions for a desirable or sustainable future based on data and scientific knowledge available. Students at Case will interact with students from fifteen universities that have been strategically selected in order to give global coverage to UNESCO’S Global-qualitative Education Network Initiative (GENE) in joint, participatory scenario analysis via the internet.

EECS 343. Theoretical Computer Science (3)  
Introduction to mathematical logic, different classes of automata and their correspondence to different classes of formal languages, recursive functions and computability, assertions and program verification, denotational semantics. Prereq: MATH 304. Cross-listed as MATH 343.

EECS 344. Electronic Analysis and Design (3)  
The design and analysis of real-world circuits. Topics include: junction diodes, non-ideal op-amp models, characteristics and models for large and small signal operation of bipolar junction transistors (BJTs) and field effect transistors (FETs), selection of operating point and biasing for BJT and FET amplifiers. Hybrid-pi model and other advanced circuit models, cascaded amplifiers, negative feedback, differential amplifiers, oscillators, tuned circuits, and phase-locked loops. Computers will be extensively used to model circuits. Selected experiments and/or laboratory projects. Prereq: EECS 245.

EECS 345. Programming Language Concepts (3)  
This course studies important concepts underlying the design, implementation, and use of modern programming languages including syntax, semantics, names/scopes, types, expression, assignment, subprograms, data abstraction, and inheritance. Imperative, object-oriented, concurrent, functional, and logic programming paradigms are discussed. Illustrative examples are drawn from a variety of popular languages, such as C++, Java, Ada, Lisp, and Prolog. Prereq: EECS 233, EECS 337.

EECS 346. Engineering Optimization (3)  
Optimization techniques including linear programing and extensions; transportation and assignment problems; network flow optimization; quadratic, integer, and separable programing; geometric programing; and dynamic programing. Nonlinear optimization topics: optimality criteria, gradient and other practical unconstrained and constrained methods. Computer applications using engineering and business case studies. Prereq: MATH 201.

EECS 347. Network Synthesis (3)  
Design techniques for the construction of filters, delayers, predictors, analog computer networks, and necessary and sufficient requirements for the realization of practical networks. Prereq: EECS 246 or equivalent.

EECS 348. Communication Electronic Cir (4)  
EECS 350. Industrial and Production Systems Engineering (3)  
Time and motion study, human factors and safety engineering in man-machine systems, quality control and reliability, project management, scheduling, sequencing, inspection and maintenance of industrial processes.

EECS 351. Communications and Signal Analysis (3)  
Fourier transform analysis and sampling of signals. AM, FM and SSB modulation and other modulation methods such as pulse code, delta, pulse position, PSK and FSK. Detection, multiplexing, performance evaluation in terms of signal-to-noise ratio and bandwidth requirements. Prereq: EECS 246 or equivalent.

EECS 352. Engineering Economics and Decision Analysis (3)  

EECS 354. Digital Communications (3)  

EECS 355. RF Communications (3)  
Coverage of modern communications circuits and systems with a particular emphasis upon mobile communications. Cellular communications, modulation methods, user access schemes. Individual system components: tuned small signal amplifiers and power amplifiers, mixers, detectors, and frequency synthesizers. Low-power design considerations. Prereq: EECS 351.

EECS 356. Microwave Engineering (3)  
Transmission lines and circuit analysis, waveguides, modes of propagation, impedance matching techni-
EECS 382. Microprocessor-Based Design (3)
Microprocessor architectures, memory design, timing, pulled and interrupted device I/O, microprocessor support devices, microcontrollers, integrated hardware/software design considerations. Prereq: ENGR 210 and EEC 281.

EECS 383. Microprocessor Applications to Controls (3)
Digital control and its implementation using microprocessors. Z-transforms. Time response characteristics, steady-state error, mapping from the s-plane to the z-plane. Digital controller design-stability testing methods, gain and phase margins, PID controllers, digital filter structures. Prereq: EEC 246 or equivalent.

EECS 385. Engineering in Community Service IV (3)
Project-oriented course; students work on “real” engineering projects of benefit to the community and in partnership with community “customers.” Project teams consist of a mix of sophomores, juniors, and seniors. Students perform engineering design, project specification, and technical research as appropriate to their technical background. Emphasis on project planning and organization, teamwork, project management, communication skills, customer awareness, and professional responsibility. Prereq: Junior or Senior standing in EEC.

EECS 391. Introduction to Artificial Intelligence (3)
Overview of artificial intelligence, knowledge representation, search, game-playing, rule-base systems, AI programming languages, learning, neural networks, evolutionary algorithms, natural language understanding, planning, robotics. Prereq: ENGR 131.

EECS 396LM. Special Topics - Computer Science (1-6)
(Credit as arranged.) Limited to juniors and seniors.

EECS 396M. Special Topics - Computer Science (1-9)

EECS 396N. Special Topics (1-18)

EECS 397LM. Special Topics in Electrical Engineering (1-6)
(Credit as arranged.) Limited to juniors and seniors. Prereq: Consent of instructor.

EECS 398L. Senior Project in Electrical Engineering (1-4)

EECS 398M. Software Engineering (3)
Issues in the development of complex software systems. Software lifecycle models. Software engineering methodology, requirements, analysis and specification design implementation, validation, and maintenance. Team development of a significant applications program. Prereq: EEC 337.

EECS 398N. Engineering Projects I (4)
Project experience in the application of course material to practical systems engineering problems. Identification of project, literature review, and proposal preparation for EEC 399. Prereq: Senior standing.

EECS 399L. Senior Project in Electrical Engineering II (4)
Prereq: EECS 398L (or concur).

EECS 399M. Computer Engineering Design Project (4)
Capstone course for computer engineering seniors. Material from previous and concurrent courses used to solve hardware and/or software design problems. Formal presentations of the projects scheduled during last week of classes. Prereq: Senior standing.

EECS 399N. Engineering Projects II (4)
Elective projects with emphasis on engineering design. Capstone engineering project. Prereq: Senior standing.

Graduate Courses

EECS 400T. Graduate Teaching I (0)
This course will provide the Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to involve direct student contact but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams, having office hours for students, tutoring students. Prereq: Ph.D. student in EEC department.

EECS 401. Digital Signal Processing (3)

EECS 405. Data Structures and File Management (3)
Fundamental concepts: sequential allocation, linked allocation, lists, trees, graphs, internal sorting, external sorting, sequential, binary, interpolation search, hashing file, indexed files, multiple level index structures, btrees, hashed files. Multiple attribute retrieval; inverted files, multi lists, multiple-key hashing, htd trees. Introduction to data bases. Data models. Prereq: EEC 233 and MATH 304.

EECS 408. Introduction to Linear Systems (3)

EECS 409. Discrete Event Systems (3)
A broad range of system behavior can be described using a discrete event framework. These systems are playing an increasingly important role in modeling, analyzing, and designing manufacturing systems. Simulation, automata, and queueing theory have been the primary tools for studying the behavior of these logically complex systems; however, new methods and techniques as well as new modeling frameworks have been developed to represent and to explore discrete event system behavior. The class will begin by studying simulation, the theory of languages, and finite state automata and queueing theory approaches and then progress to examining selected additional frameworks for modeling and analyzing these systems and including Petri nets, perturbation analysis, and Min-Max algebra.

EECS 411. Introduction to Logic Programming (3)

EECS 412. Electromagnetic Fields III (3)
Maxwell’s equations, macroscopic versus microscopic fields, field interaction with materials in terms of polarization vectors P and M. Laplace’s and Poisson’s equations and solutions, scalar and vector potentials. Wave propagation in various types of media such as anisotropic and gyrotropic media. Phase and group velocities, signal velocity and dispersion. Boundary value problems associated with wave-guide and cavities. Wave solutions in cylindrical and spherical coordinates. Radiation and antennas.

EECS 413. Nonlinear Systems I (3)
This course will provide an introduction to techniques used for the analysis of nonlinear dynamic systems. Topics will include existence and uniqueness of solutions, phase plane analysis of two dimensional systems including Poincare-Bendixson, describing functions for single-input single-output systems, averaging methods, bifurcation theory, stability, and an introduction to the study of chaotic dynamics and chaos. Coreq: EEC 408.

EECS 414. Complex Systems Modeling and Analysis (3)
The concept of a complex system as a relationship of identifiable subsystems. Modeling of large-scale systems by aggregation, perturbation, via system identification and by the use of fuzzy logic. The structural properties of large-scale systems. A hierarchical, multi-level approach to large-scale systems analysis and synthesis. Coordination by the interaction balance and by interaction prediction principles. Decentralized decision making and control of large-scale systems. Near optimum system design. Structure and stability of fuzzy control systems.

EECS 415. Integrated Circuit Technology I (3)

EECS 416. Optimization Theory and Techniques (3)

EECS 417. Introduction to Stochastic Control (3)
Analysis and design of controllers for discrete-time stochastic systems. Review of probability theory and stochastic properties, input-output analysis of linear stochastic systems, spectral factorization and Weiner filtering, minimum variance control, state-space models of stochastic systems, optimal control and dynamic programming, statistical estimation and filtering, the Kalman-Bucy theory, the linear quadratic Gaussian problem, and the separation theorem. Prereq: EEC 408.

EECS 490. Seminar and Study (1-9)
(Credit as arranged.) Limited to juniors and seniors. Teaching experience will be conducted under the supervision of the faculty member who is responsible for the course. The academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams, having office hours for students, tutoring students. Prereq: Ph.D. student in EEC department.

EECS 491. Informatics Project (1-9)
(Independent study.) Limited to seniors. Prereq: Consent of instructor.

EECS 493. Advanced Programming (1-9)
(Independent study.) Limited to juniors and seniors. Prereq: Consent of instructor.

EECS 495. Senior Seminar (1-9)
Seminar in a special area of programming. Prereq: Consent of instructor.

EECS 498. Independent Study (1-9)
Independent study of programming topics. Prereq: Consent of instructor.

EECS 499. Independent Study (1-9)
Independent study of programming topics. Prereq: Consent of instructor.

EECS 500. Seminar (1-9)
Seminar in a special area of programming. Prereq: Consent of instructor.

EECS 502. Seminar and Study (1-9)
(Credit as arranged.) Limited to juniors and seniors. Teaching experience will be conducted under the supervision of the faculty member who is responsible for the course. The academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams, having office hours for students, tutoring students. Prereq: Ph.D. student in EEC department.

EECS 552. Work Experience (1-9)
Work experience will be conducted under the supervision of the faculty member who is responsible for the course. The academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams, having office hours for students, tutoring students. Prereq: Ph.D. student in EEC department.

EECS 590. Seminar (1-9)
Seminar in a special area of programming. Prereq: Consent of instructor.

EECS 598. Independent Study (1-9)
Independent study of programming topics. Prereq: Consent of instructor.

EECS 600. Seminar (1-9)
Seminar in a special area of programming. Prereq: Consent of instructor.
EECS 418. System Identification and Adaptive Control (3)

EECS 419. Computer System Architecture (3)

EECS 420. Solid State Electronics I (3)

EECS 421. Optimization of Dynamic Systems (3)

EECS 422. Solid State Electronics II (3)

EECS 423. Distributed Systems (3)
Introduction to distributed systems; system models; network architecture and protocols; interprocess communication; client-server model; group communication; TCP sockets; remote procedure calls; distributed objects and remote invocation; distributed file systems; file service architecture; name services; directory and discovery services; distributed synchronization and coordination; transactions and concurrency control; security; cryptography; replication; distributed multimedia systems. Prereq: EECS 338.

EECS 424. Introduction to Nanotechnology (3)
(See EMAE 424.) Cross-listed as EMAE 424.

EECS 425. Computer Communications Networks (3)
Covers computer network architecture. Topics include: network architecture and protocols; interprocess communication; client-server model; group communication; TCP sockets; remote procedure calls; distributed objects and remote invocation; distributed file systems; file service architecture; name services; directory and discovery services; distributed synchronization and coordination; transactions and concurrency control; security; cryptography; replication; distributed multimedia systems. Prereq: EECS 338.

EECS 426. MOS Integrated Circuit Design (3)

EECS 427. MEMS for Sensing and Communications (3)
This course covers basic MEMS fabrication technologies and device operating principles of MEMS resonators and inertial sensors such as accelerometers and gyroscopes. Critical issues regarding sensing resolution and low noise interface electronics design will be discussed. MEMS applications such as low noise oscillators, filters, switches, etc. for wireless communications will also be covered.

EECS 428. Computer Communications Networks II (3)
Introduction to topics and methodology in computer networks and middleware research. Traffic characterization, stochastic models, and self-similarity. Congestion control ( Tahoe, Reno, Sack). Active Queue Management (RED, AQM) and Explicit QoS. The Web: overview and components, HTTP, its interaction with TCP, caching. Overlay networks and CDN. Expected work includes a course-long project on network simulation, a final project, a paper presentation, midterm, and final test. Prereq: EECS 425 or permission of instructor.

EECS 430. Object-Oriented Software Development (3)
Covers advanced methodology for the design of large software systems. Topics include: object-oriented analysis and design; encapsulation; inheritance; subtype and parametric polymorphism; object-oriented programming languages; design patterns; application frameworks; software architecture; user-interfaces; concurrent and distributed objects. Prereq: EECS 337 or consent of instructor.

EECS 431. Software Engineering (3)
Design of software systems working from specifications: top-down decomposition using stepwise refinement; object-oriented methods; prototyping. Software metrics and testing; software quality and reliability; maintenance; human factors. Homework involves working in teams on large software projects. Prereq: EECS 337.

EECS 432. Compiler Construction (3)
Top-down and bottom-up recognizers for context-free grammars; LL(k) parsers, error recovery, semantic analysis, storage allocation for block structured languages, optimization, code generation. Homework involves writing a compiler for a block structured language. Prereq: EECS 337.

EECS 433. Database Systems (3)

EECS 434. Microfabricated Silicon Electromechanical Systems (3)

EECS 435. Data Mining (3)
Data Mining is the process of discovering interesting knowledge from large amounts of data stored either in databases, data warehouses, or other information repositories. Topics to be covered includes: Data Warehouse and OLAP technology for data mining, Data Preprocessing, Data Mining Fundamentals, Languages, and System Architectures, Mining Association Rules from Large Databases, Classification and Prediction, Cluster Analysis, Mining Complex Types of Data, and Applications and Trends in Data Mining. Prereq: EECS 341 or equivalent.

EECS 436. Advances in Databases (3)
Advanced topics in databases will be covered in this course. Query optimization in object-oriented databases, temporal databases, issues in multimedia databases, databases and Web, graphical query interfaces. Basic knowledge in databases is required. Prereq: EECS 433. EECS 438. Biomedical Microdevices (3)

EECS 440. Automata and Formal Languages (3)
Finite automata, Turing and Post machines, and push-down automata. The languages generated, accepted, and decided by these machines. Closure properties. Decidability and undecidability. Regular expressions. Right linear, unrestricted, and context-free grammars. MATH 410 and MATH/EECS 343 cannot both be taken for credit. Prereq: MATH 304. Cross-listed as MATH 410.

EECS 444. Computer Security (3)
General types of security attacks; approaches to prevention; secret key and public key cryptography; message authentication and hash functions; digital signatures and authentication protocols; information gathering; password cracking; spoofing; session hijacking; denial of service attacks; buffer overruns; viruses, worms, etc., principles of secure software design, threat modeling; access control; least privilege; storing secrets; socket security; RPC security; security testing; secure software installation; operating system security; database security; web security; email security; firewalls; intrusions. Prereq: EECS 337.

EECS 445. Formal Verification (3)
Introduction and survey of principles and methodologies in formal specification and verification of systems (hardware, software, hybrid). Prereq: EECS 345 or graduate standing.

EECS 450. Production and Operations Systems (3)
Fundamental theories and techniques, decision making, and artificial intelligence for solving production/manufacturing problems. Formulation, modeling, planning, and control of production problems at three levels: strategic, tactical, and operational (long term, medium, and short term). Specific problems include aggregate planning, project planning, scheduling, line balancing, sequencing, and machine set-up. Special emphasis will be given on decomposition and control of computer integrated systems, on-line and off-line supervisory planning, and man/machine systems.

EECS 452. Random Signals (3)
EECS 454. Analysis of Algorithms (3)
This course presents and analyzes a number of efficient algorithms. Problems are selected from such problem domains as sorting, searching, set manipulation, graph algorithms, matrix operations, polynomial manipulation, and fast Fourier transforms. Through specific examples and general techniques, the course covers the design of efficient algorithms as well as the analysis of the efficiency of particular algorithms. Certain important problems for which no efficient algorithms are known (NP-complete problems) are discussed in order to illustrate the intrinsic difficulty which can sometimes preclude efficient algorithmic solutions. Prereq: MATH 304 and (EECS 340 or EECS 405). Cross-listed as OPRE 454.

EECS 455. Wireless Communications (3)
Cellular telephone systems, wireless networks, receiver architectures, noise characterization, error-correction coding, digital modulation, multiple-access technologies, multipath fading. Prereq: STAT 332 and EECS 351 or consent of instructor.

EECS 456. Microwave Engineering (3)

EECS 458. Introduction to Bioinformatics (3)
Fundamental algorithmic methods in computational molecular biology and bioinformatics discussed. Sequence analysis, pairwise and multiple alignment, probabilistic models, phylogenetic analysis, folding and structure prediction emphasized. Prereq: EECS 340, EECS 233.

EECS 459X. Domain Theoretic Methods for Artificial Intelligence (3)
(See EECS 358.) Cross-listed as MATH 450.

EECS 460. Manufacturing, Design, and Automated Systems (3)
The course is designed primarily for graduate engineering students who wish to know about the fundamentals and modern practice of production/automation/machine automation systems. The course provides a survey of various topics in production automation and computer-aided and integrated manufacturing with emphases on decision making, optimization, and modeling. Topics include computerized process planning, on-line and off-line supervisory computer control, computerized discrete production systems, numerical control, monitoring and planning, flexible manufacturing systems, group technology, materials handling systems, man/machine systems and requirements, design and analysis of assembly systems, and computerized facility layout design problems. The course presents a step-by-step and cohesive account of concepts, theories, and procedures for solving modern manufacturing and production problems with emphasis on computer applications. Prereq: Consent of instructor.

EECS 466. Computer Graphics (3)
Theory and practice of computer graphics: object and environment representation including coordinate transformations image extraction including perspective, hidden surface, and shading algorithms; and interaction. Covers a wide range of graphic display devices and systems with emphasis in interactive shaded graphics. Laboratory. Prereq: EECS 235.

EECS 473. Multimedia and Web Computing (3)
Multimedia is an important application area that will be at the center for next-generation computer systems and software design. It is a fast-changing technology, and, already, in the industry, there is a significant demand for computer scientists/engineers with multimedia system design knowledge. The objective of EECS 473 is to present design issues for multimedia systems from specification to software implementation and testing. This will include multimedia basics, data capture/models/compression, synchronization models, multimedia servers, OS support for multimedia, multimedia communication systems, and multimedia user interfaces. There will be a project about designing and implementing a multimedia system. Students are expected to know Unix systems programming (System V IPCs, fork, exec, etc.), RPC, thread and socket programming. Prereq: ENGR 151, EECS 233, and EECS 338.

EECS 475. Autonomous Robotics (3)
Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechanical construction with LEGO, characteristics of sensors, motors and batteries, and control strategies for autonomous robots. In the second half of the course, students design, build and program their own complete robots that participate in a public competition. All work is performed in groups. Biologically-inspired approaches to the design and control of autonomous robots are emphasized throughout. Prereq: Consent of instructor. Cross-listed as BIOL 475.

EECS 477. The Dynamics of Adaptive Behavior (3)
Introduction to embodied, situated, and dynamical approaches to design and analysis of autonomous agents and animals. Topics include recurrent neural networks, coupled neural/body/environment systems, and evolution and analysis of neural circuits. Behavior studied include examples from motor control, perception, learning, and cognition. Prereq: ENGR 131 and MATH 224. Cross-listed as BIOL 477.

EECS 478. Computational Neuroscience (3)
Computer simulation of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course helps students to understand dynamical systems theory for the analysis of neurons and neural circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as BIOL 478, EMBE 478, and NEUR 478.

EECS 479. Seminar in Computational Neuroscience (3)
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Cross-listed as BIOL 479.

EECS 483. Data Acquisition and Control (3)
Data acquisition (telemetry) and digital control of sampled data systems, stability tests, system simulation digital filter structure, finite word length effects, limit cycles, state-variable feedback and state estimation. Laboratory includes control algorithm programming done in assembly language.

EECS 484. Computational Intelligence I: Basic Principles (3)
This course is concerned with learning the fundamentals of a number of computational methodologies which are used in adaptive parallel distributed information processing. Such methodologies include neural net computing, evolutionary programming, genetic algorithms, fuzzy set theory, and “artiﬁcial life.” These computational paradigms complement and supplement the traditional practices of pattern recognition and artiﬁcial intelligence. Functionality covered include self-organization, learning a model or supervised learning, optimization, and memorization.

EECS 485. VLSI Systems (3)
Basic MOSFET models, inverters, steering logic, the silicon gate, NMOS process, design rules, basic design structures (e.g., NAND and NOR gates, PLA, ROM, RAM), design methodology and tools (spice, Synopsys, Cadence, Molspace, mklab), VLSI technology and system architecture. Requires project and student presentation, laboratory.

EECS 486. Research in VLSI Design Automation (3)
Research topics related to VLSI design automation such as hardware description languages, computer-aided design tools, algorithms and methodologies for VLSI design for a wide range of levels of design abstraction, design validation and test. Requires term project and class presentation.

EECS 488. Embedded Systems Design (3)
Objective: to introduce and expose the student to methodologies for systematic design of embedded system. The topics include, but are not limited to, system specification, architecture modeling, component partitioning, estimation metrics, hardware software co-design, diagnostics.

EECS 489. Robotics I (3)

EECS 490. Computer Processing of Images (3)
Introduction of computer vision methodologies. Includes the images systems: optics and detectors and geometric relationships between scene and image, 3-D scene scanning and imaging techniques including stereovision and laser range finders. Digital signal processing in 2-D and optical preprocessing of images. Real-time digital signal transmission of dynamic images and HDTV. Hardware issues in processing of vision information. Prereq: EECS 322, EMBE 310, EMAE 325 or equivalent or consent of instructor.

EECS 491. Intelligent Systems I (3)
Artificial intelligence and programming techniques used in design and implementation of intelligent systems. Problem solving and game playing by computer, different representation of problems and games, and their associated solution methods. Knowledge representation: logic, semantic networks frames. Programming in Lisp and Prolog.

EECS 500. EECS Colloquium (0)
Seminars on current topics in Electrical Engineering and Computer Science.

EECS 500T. Graduate Teaching II (0)
This course will provide the Ph.D. candidate with experience in teaching undergraduate or graduate...
students. The experience is expected to involve direct student contact but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams, having office hours for students, running recitation sessions, providing laboratory assistance. Prereq: Ph.D. student in EECS department.

EECS 516. Large Scale Optimization (3)

Concepts and techniques for dealing with large optimization problems encountered in designing large engineering structure, control of interconnected systems, pattern recognition, and planning and operations of complex systems; partitioning, relaxation, restriction, decomposition, approximation, and other problem simplification devices; specific algorithms; potential use of parallel and symbolic computation; student seminars and projects. Prereq: EECS 416.

EECS 518. Nonlinear Systems: Analysis and Control (3)


EECS 519. Differential Geometric Nonlinear Control (3)

This advanced course focuses on the analysis and design of nonlinear control systems, with special emphasis on the differential geometric approach. Differential geometry has proved to be an extremely powerful tool for the analysis and design of nonlinear systems, similar to the roles of the Laplace transformation and linear algebra in linear systems. The objective of the course is to present the major methods and results of nonlinear systems and provide a mathematical foundation, which will enable students to follow the recent developments in these constantly expanding literature. This course will also benefit those students from Electrical, Mechanical, Chemical and Biomedical Engineering, who are doing research in the fields that involve nonlinear control problems. Prereq: EECS 408 or equivalent.

EECS 526. Integrated Mixed-Signal Systems (3)

Mixed-signal (analog/digital) integrated circuit design. D-to-A and A-to-D conversion, applications in mixed-signal VLSI, low-noise and low-power techniques, and communication sub-circuits. System simulation at the transistor and behavioral levels using SPICE. Class will design a mixed-signal CMOS IC for fabrication by MOSIS. Prereq: EECS 426.

EECS 527. Advanced Sensors: Theory and Techniques (3)

Sensor technology with a primary focus on semiconductor-based devices. Physical principles of energy conversion devices (sensors) with a review of relevant fundamentals: elasticity theory, fluid mechanics, silicon fabrication and micromachining technology, semiconductor device physics. Classification and terminology of sensors, defining and measuring sensor characteristics and performance, effect of the environment on sensors, predicting and controlling sensor error.

Mechanical, acoustic, magnetic, thermal, radiation, chemical and biological sensors will be examined. Sensor packaging and sensor interface circuitry. Prereq: EECS 322 or EECS 415 and EECS 434.

EECS 531. Computer Vision (3)

Geometric optics, ray matrices, calibration of monocular and stereo imaging systems. Adaptive camera thresholding and image segmentation, morphological and convolutional image processing. Selected topics including edge estimation and industrial inspection, optimal filtering, model matching, CAD-based vision and range image processing. Neural-net image processing. Model-based computer vision for scene interpretation and autonomous systems. Prereq: EECS 490 or equivalent.

EECS 550. Neuromechanics Seminar (0)

Current research in neuromechanical systems, including movement control in natural organisms, biologically inspired robots, and hybrid (artificial/natural) neural prosthetic systems. Presentations by students, faculty, and visiting scholars. Cross-listed as EBME 550.

EECS 589. Robotics II (3)

Survey of research issues in robotics. Force control, visual servoing, robot autonomy, on-line planning, high-speed control, man/machine interfaces, robot learning, sensory processing for real-time control. Primarily a project-based lab course in which students design real-time software executing on multi-processors to control an industrial robot. Prereq: EECS 489.

EECS 591. Intelligent Systems II (3)

EECS 600T. Graduate Teaching III (0)

This course will provide Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to involve direct student contact but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities running recitation sessions, providing laboratory assistance, developing teaching or lecture materials presenting lectures. Prereq: Ph.D. student in EECS department.

EECS 601. Independent Study (1-18)

EECS 602. Advanced Projects Laboratory (1-18)

EECS 620. Special Topics (1-18)

EECS 621. Special Projects (1-18)

EECS 649. Project M.S. (1-9)

EECS 651. Thesis M.S. (1-18)

EECS 701. Dissertation Ph.D. (1-18)

EECS 703. Dissertation Fellowship (1-8)

**Degree Program in Engineering, Undesignated**

304 Nord Building (7220)  
Phone 216-368-6482; Fax 216-368-0327  
James D. McGuffin-Cawley, Associate Dean  
e-mail cawley@case.edu

The Undesignated Engineering program prepares students who seek a technological background but do not wish to pursue a pure engineering career. For example, some needs in the public sector, such as pollution remediation, transportation, low-cost housing, elective medical care, and crime control could benefit from engineering expertise. To prepare for careers in fields that address such problems, the Undesignated Engineering program allows students to acquire some engineering background, and combine it with a minor in such programs as management, history of technology and science, or economics. The undesignated degree is not an ABET-accredited degree.

**UNDERGRADUATE PROGRAM**

A student electing an undesignated degree must submit a clear statement of career goals supported by a proposed course schedule with written justification for the selections. These documents are to be submitted to the office of the associate dean for undergraduate programs of the Case School of Engineering. The program must be approved by the dean of engineering or designate in consultation with representatives of the major and minor departments. A total of at least 128 semester credits are required for graduation.

Since each student's program is unique, no typical curriculum can be shown. Every program must fulfill the requirements described below.

1. **Engineering Core**

2. A minimum of two engineering electives courses selected from two of the following four groups

   a. Thermodynamics or Physical Chemistry (EMAE 150, EMAC 171 and 172, CHEM 301 and 302, or ECHE 363)

   b. Signals, Systems or Control (EECS 212, EECS 304, ECHE 367)

   c. Materials Science (EMSE 201, EMAC 270, EMSE 314, EBME 306, or EECS 321)

   d. Economics, Production Systems or Decision Theory (EECS 350, EECS 352, OPRE 345)
The major must contain a minimum of 24 semester credit hours of work in one of the following engineering fields:
- Biomedical engineering
- Chemical engineering
- Civil engineering
- Computer engineering
- Electrical engineering
- Fluid and thermal engineering sciences
- Materials science and engineering
- Polymer science and engineering
- Systems and control engineering

This work includes a senior projects laboratory (3 credits) and usually a course with a physical measurements laboratory.

Minor

The minor program requires a minimum of 15 semester credit hours. Suggested minors for students pursuing the undesignated degree program in engineering are the following. Other minors are available with approval of the Office of Undergraduate Studies.

Engineering

A minor program may be chosen in any engineering field that differs from the major and that, when combined with the major, fulfills a specific purpose or career plan. The purpose of a minor program is to allow more breadth, with less depth in any one engineering area. For example, such a program may appeal to the student

### BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Engineering (Undesignated)

#### Freshman Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
<th>Fall</th>
<th></th>
<th>Class-Lab-Credit Hours</th>
<th>Junior Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Humanities/Social Science or open elective</td>
<td>(3-0-3)</td>
<td></td>
<td>Humanities or Social Science Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>CHEM 111 Principles of Chemistry for Engineers</td>
<td>(4-0-4)</td>
<td>Major Concentration Course</td>
<td>(3-0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(2-2-3)</td>
<td>Major Concentration Course</td>
<td>(3-0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR 150 Expository Writing</td>
<td>(3-0-3)</td>
<td>Minor Concentration Course</td>
<td>(3-0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 121 Calculus for Science and Engineering I</td>
<td>(4-0-4)</td>
<td>Engineering elective</td>
<td>(3-0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHED 101 Physical Education Activities</td>
<td>(0-3-0)</td>
<td>Open elective</td>
<td>(3-0-3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(16-5-17)</td>
<td>Total</td>
<td>(18-0-18)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Humanities/Social Science or open elective</td>
<td>(3-0-3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 122 Calculus for Science and Engineering II</td>
<td>(4-0-4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHED 102 Physical Education Activities</td>
<td>(0-3-0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHYS 121 General Physics I</td>
<td>(4-0-4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(15-3-15)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
<th>Fall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Humanities or Social Science Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>ENGR 200 Statics and Strength of Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>MATH 223 Calculus for Science and Engineering III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>ECES 251 Numerical Methods</td>
<td>(2-2-3)</td>
</tr>
<tr>
<td></td>
<td>PHYS 122 General Physics II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(15-2-16)</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Humanities or Social Science Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>ENGR 225 Thermodynamics, Fluid Mechanics, Heat and Mass Transfer</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td></td>
<td>ENGR 210 Introduction to Circuits and Instrumentation</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td></td>
<td>MATH 224 Elementary Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>PHYS 221 General Physics III, Modern Physics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(16-2-17)</td>
</tr>
</tbody>
</table>

#### Senior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
<th>Fall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Humanities or Social Science elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Exxx 398 Engineering Senior Project</td>
<td>(0-6-3)</td>
</tr>
<tr>
<td></td>
<td>Major Concentration Course</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Minor Concentration Course</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Minor Concentration Course</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>(12-6-15)</td>
</tr>
</tbody>
</table>

#### Hours required for graduation: 128

a. One of these courses must be a humanities/social science course.
who prefers a broad design-oriented background or the student who wishes to couple knowledge in systems and control engineering with knowledge in a field such as civil engineering, chemical processing, or computer engineering. Other major and minor combinations that may be of interest are the coupling of a civil engineering major with a metallurgy or materials minor or a combination of electrical and materials science and engineering.

Science

A minor field may be chosen in any field of science wherein the major-minor combination fulfills a unique purpose. Many engineering majors and science minors can be successfully combined. For example, a major in civil engineering coupled with a minor in geology leads to a program aimed at geophysical sciences or oceanography. The student with electrical engineering interests in lasers, optics, solid state, plasmas, and the like may profit by coupling an electrical engineering major with a physics minor. Many other combinations are possible.

Management

Many students enter the engineering program at Case Western Reserve University in preparation for industrial management careers. Generally, their plan is to work in an engineering capacity and gradually assume management responsibilities. Some of these students plan to take a graduate program in management, such as the Master of Business Administration degree or the Master of Engineering and Management (MEM) degree offered through the Institute for Management and Engineering (TIME). However, others rely on a combination of undergraduate elective courses, job experience, and industrial training programs for this career preparation.

To serve engineering students whose career goals involve management, a minor program has been developed in cooperation with the Weatherhead School of Management. This program gives the student the options of direct entry into industry in either an engineering or management tracking program or entry into graduate school to earn the Master of Science degree in engineering or the Master of Business Administration degree.

A management minor requires the following courses:
- ACCT 303: Survey of Accountancy (3)
- BAFI 355: Corporation Finance (3)
- OPMT 350: Operations Management (3)

plus any two of the following:
- LHRP 251: Industrial Relations and Administrative Practices (or LHRP 311: Labor Problems (3))
- MIDS 308: Management Information Systems I (3)
- MKMR 301: Marketing Management (3)
- OPRE 201: Introduction to Operations Research I (3)
- ORBH 250: Introduction to Organizational Behavior and Management (3)

History of Technology and Science

The purpose of coupling an engineering major with a minor in the history of technology and science is primarily to prepare for entry into the field of history of technology. Beyond this, however, knowledge of the history of technology may be invaluable to engineers who take decision-making roles during their careers. This minor provides a much needed emphasis on the consequences of technological decisions on society and the importance of historical insight in such decisions.

The minor program can be tailored to individual interests, based on the following offerings:
- HSTY 266: The Engineer in America (3)
- HSTY 306: Engineering in History (3)
- HSTY 307: Development of Chemistry and Chemical Engineering (3)
- HSTY 366: Science: Technology, and Government (3)
- HSTY 377: Nuclear Weapons and Arms Control (3)

Economics

The field of economics is moving rapidly toward a more quantitative approach and is an important field for engineers. The economics minor requires the following courses:
- ECON 103: Principles of Macroeconomics (3)
- ECON 102: Principles of Microeconomics (3)

The following electives in economics are suggested:
- ECON 341: Money and Banking (3)
- ECON 326: Econometrics (3)
- ECON 342: Public Finance (3)
- ECON 369: Economics of Industrial Production and Technology (3)
- ECON 386: Urban Economics (3)
- ECON 361: Managerial Economics (3)

Engineering Physics

Rockefeller Building (7079)
Phone 216-368-4017; Fax 216-368-4671
Kenneth D. Singer
e-mail kds4@case.edu

The engineering physics minor allows students with strong interests in both physics and engineering to concentrate their studies in the common areas of these disciplines. The engineering physics major prepares students to pursue careers in industry, either directly after undergraduate studies, or following graduate study in engineering or physics. Many employers value the unique problem-solving approach of physics, especially in industrial research and development.
Students majoring in engineering physics complete the Engineering Core as well as a rigorous course of study in physics. Students select a concentration area from an engineering discipline, and must complete a sequence of at least four courses in this discipline. In addition, a senior research project under the guidance of a faculty member in the concentration discipline is required. The project includes a written report and participation in the senior symposium.

Details of the engineering physics program can be found under the Department of Physics in the College of Arts and Sciences section.

**BACHELOR OF SCIENCE IN ENGINEERING DEGREE**

Major in Engineering Physics

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 111 Principles of Chemistry for Engineers</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry Laboratory</td>
<td>(1-3-2)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 General Physics I: Mechanics</td>
<td>(4-3-4)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(16-9-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engineering II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 122 General Physics II: Electricity and Magnetism</td>
<td>(4-3-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(2-2-3)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(14-8-15)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 221 General Physics III – Modern Physics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 200 Statics and Strength of Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 210 Circuits and Instrumentation</td>
<td>(3-2-4)</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-2-16)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 224 Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 208 Instrumentation and Signal Analysis Lab</td>
<td>(2-4-4)</td>
</tr>
<tr>
<td>PHYS 250 Mathematics, Physics and Computing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 310 Classical Mechanics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 225 Thermodynamics, Fluids, Heat and Mass Transfer</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(15-4-17)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>PHYS 313 Thermodynamics and Statistical Mechanics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 317 Engineering Physics Lab I</td>
<td>(2-4-4)</td>
</tr>
<tr>
<td>PHYS 331 Introduction to Quantum Mechanics I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Engineering Concentration</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(14-4-16)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>PHYS 318 Engineering Physics Lab II</td>
<td>(2-4-4)</td>
</tr>
<tr>
<td>PHYS 324 Electricity and Magnetism I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 398N Professional Communications</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Engineering Concentration</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(14-4-16)</td>
</tr>
<tr>
<td><strong>Senior Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>PHYS 315 Introduction to Solid State Physics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 325 Electricity and Magnetism II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 353 Senior Engineering Physics Project</td>
<td>(0-6-3)</td>
</tr>
<tr>
<td>Engineering Concentration</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(12-6-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>PHYS 353 Senior Engineering Physics Project</td>
<td>(0-6-3)</td>
</tr>
<tr>
<td>Applied Quantum Mechanics</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Engineering Concentration</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>(12-6-15)</td>
</tr>
<tr>
<td><strong>Hours required for graduation</strong></td>
<td>127</td>
</tr>
</tbody>
</table>

**a.** Selected students may be invited to take MATH 123, 124, 227, and 228 in place of MATH 121, 122, 223, and 224.

**b.** Selected students may be invited to take PHYS 123, 124 Physics and Frontiers I, II Honors in place of PHYS 121, 122.

**c.** Engineering Physics Concentration courses are flexible, but must be in a specific engineering discipline or study area and be approved by an advisor. Possible concentration areas include: Aerospace engineering, Biomedical engineering “hardware,” Biomedical engineering “software,” Chemical engineering, Civil engineering (solid mechanics, structural and geotechnical, environmental), Computer science, Computer systems hardware, Computer systems software, Control systems and automation, Electrical engineering, Macromolecular science, Materials science and engineering, Mechanical engineering, Signal processing, Systems analysis and decision making.

**d.** PHYS 322, PHYS 327/427, EEAP 321, EEAP 420, EMSE 314, or EMSE
Macromolecular science and engineering is the study of the synthesis, structure, processing, and properties of polymers. These giant molecules are the basis of synthetic materials including plastics, fibers, rubber, films, paints, membranes, and adhesives. Research is constantly expanding these applications through the development of new high-performance polymers, e.g., for engineering composites, electronic, optical, and biomedical uses.

In addition, most biological systems are composed of macromolecules: Proteins (e.g., silk, wool, tendon), carbohydrates (e.g., cellulose) and nucleic acids (RNA and DNA) can all be classified as polymers and are studied by the same methods that are applied to synthetic polymers.

Production of polymers and their components is central to the chemical industry, and statistics show that more than 75 percent of all chemists and chemical engineers in industry are involved with some aspect of polymers. Despite this, formal education in this area is offered by only a few universities in the country, resulting in a continued strong demand for our graduates upon completion of their B.S., M.S., or Ph.D. degrees.

**FACULTY**

Alexander M. Jamieson, D. Phil. (Oxford University, England)

*Professor and Chair*

Laser light scattering; rheology and transport of macromolecules in and biopolymers solution and bulk; positron annihilation lifetime studies of free volume in polymers; electro rheological fluids; drag reduction of polymer solutions; polymer-surfactant interactions.

Eric Baer, D. Eng. (Johns Hopkins University)

*Herbert Henry Dow Professor of Science and Engineering*

Irreversible microdeformation mechanisms; pressure effects on morphology and mechanical properties; relationships between hierarchical structure and mechanical function; mechanical properties of soft connective tissue; polymer composites and blends; polymerization and crystallization on crystalline surfaces; viscoelastic properties of polymer melts; damage and fracture analysis of polymers and their composites; Structure-property relationships in biological systems.

John Blackwell, Ph.D. (University of Leeds, England)

*Leonard Case Jr. Professor*

Determination of the solid state structure and morphology of polymers; X-ray analysis of the structure of thermotropic copolymers, copolymids, polytetrafluoroethylene, polyacrylates; supramolecular assemblies, fluoropolymers; molecular modeling of semi-crystalline and liquid crystalline polymers; rheological properties of polysaccharides and glycoproteins.

Elena Dormidontova, Ph.D. (Moscow State University)

*Assistant Professor*

Statistical physics of macromolecules; phase behavior (phase stability and thermodynamic ordering) and properties of complex polymer and biopolymer systems: biocompatible and water-soluble polymers (their properties and applications for biomimetics and drug delivery), hydrogen bonded and associating polymers (reversibly associated living polymers), polymer/surfactant systems, polymer micelles (at thermodynamic equilibrium and micellization kinetics), polyelectrolytes and block copolymers.

Anne Hiltner, Ph.D. (Oregon State University)

*Professor*

Structure-property relationships; irreversible deformation, crack propagation and fracture of polymers, blends and composites; micro layer processing of polymers; structure-function relationships in collagenous tissues; biostability of biomaterials.

Hatsuo Ishida, Ph.D. (Case Western Reserve University)

*Professor*

Processing of polymers and composite materials; structural analysis of surfaces and interfaces; molecular spectroscopy of synthetic polymers.

Jack L. Koenig, Ph.D. (University of Nebraska, Lincoln)

*The Donnell Institute Professor*

Polymer structure-property relationships using infrared, Raman, NMR spectroscopy and spectroscopic imaging techniques.

Jerome B. Lando, Ph.D. (Polytechnic Institute of Brooklyn)

*Professor*

Solid state polymerization; X-ray crystallography of polymers; electrical properties of polymers; ultra-thin polymer films.

Morton Litt, Ph.D. (Polytechnic Institute of Brooklyn)

*Professor*

Kinetics and mechanisms of free radical and ionic polymerization; mechanical properties of polymers; fluorocarbon chemistry; synthesis of novel monomers and polymers; polymer electrical properties; cross-linked liquid crystal polymers.

Ica Manas-Zloczower, D.Sc. (Israel Institute of Technology)

*Professor*

Structure and micromechanics of fine particle clusters; interfacial engineering strategies for advanced materials processing; dispersive mixing mechanisms and modeling; design and mixing optimization studies for polymer processing equipment through flow simulations.

Stuart Rowan, Ph.D. (University of Glasgow, UK)

*Assistant Professor*

Organic chemistry, synthesis, supramolecular chemistry, conducting polymers, interlocked macromolecules (polyrotaxanes and polycatenanes), peptide nucleic acids, supramolecular polymerization, reversible ‘dynamic’ chemistry and combinatorial libraries.

David Schiraldi, Ph.D. (University of Oregon)

*Associate Professor*

Monomer and polymer synthesis, structure-property relationships, nanocomposites, polymerization catalysis, combinatorial synthesis and testing of polymers, synthetic fibers, barrier packaging materials.

Christoph Weder, Ph.D. (ETH Zurich, Switzerland)

*Associate Professor*

Design, synthesis, structure-property relationship and application of novel functional polymer systems; advanced optical applications of polymers; anisotropic polymer...
systems; novel polymers for thin film and fiber applications

EMERITI FACULTY

Charles E. Rogers, Ph.D. (Syracuse University and State University of New York)
Emeritus Professor
Transport and mechanical properties of polymers; synthesis and properties of multicomponent systems; environmental effect on polymers; adhesion, adhesives, and coatings.

Robert Simha, Ph.D. (University of Vienna)
Emeritus Professor
Hydrodynamics of colloidal suspensions. Viscosity and thermodynamics of polymer solutions. Chemical kinetics and statistics of synthetic and biological macromolecules. Statistical thermodynamics and the thermal and pressure properties of polymer melts, glass and crystal. Phase equilibria in polymer mixtures. The glassy state—steady state and relaxational properties

SECONDARY FACULTY

James M. Anderson, Ph.D. (Oregon State University), M.D. (Case Western Reserve University)
Professor of Macromolecular Science, Pathology, and Biomedical Engineering
Development of polymers for medical and dental applications

Donald Feke, Ph.D. (Princeton University)
Professor of Chemical Engineering, and Macromolecular Science
Fine-particle processing; colloidal phenomena; dispersive mixing; acoustic separation methods

LeRoy Klein, Ph.D. (Boston University), M.D. (Case Western Reserve University)
Professor of Orthopaedics, Biochemistry
Collagen physiology

J. Adin Mann, Jr., Ph.D. (Iowa State University)
Professor of Chemical Engineering
Surface phenomena; interfacial dynamics; light scattering; stochastic processes of adsorption and molecular rearrangement at interfaces

Roger Marchant, Ph.D. (Case Western Reserve University)
Professor of Biomedical Engineering
Biopolymers; polymer surface coatings; properties and characterization of polymer surfaces on implants and sensors

Syed Qutubuddin, Ph.D. (Carnegie Mellon University)
Professor of Chemical Engineering
Colloids; polymers and interfacial phenomena; laser light scattering; enhanced oil recovery

Charles Rosenblatt, Ph.D., (Harvard University)
Professor of Physics
Experimental condensed matter physics; liquid crystal physics

Kenneth Singer, Ph.D., (University of Pennsylvania)
Professor of Physics
Nonlinear optical properties of polymers; contributions of molecular order to the nonlinear optical response in polymers; optical probes of polymer relaxation; formation of and propagation of light in polymer waveguides

Masood Tabib-Azar (Rensselaer Polytechnic Institute)
Associate Professor of Electrical, Systems, Computer Engineering and Science

Philip Taylor, Ph.D. (Cambridge University, England)
Perkins Professor of Physics
Phase transitions and equations of state for crystalline polymers; piezoelectricity and pyroelectricity

ADJUNCT FACULTY

Steven D. Hudson, Ph.D. (University of Massachusetts)
Adjunct Professor (National Institute of Standards and Technology)
Development of polymeric materials with novel structure and properties; electron microscopy; diffraction; coalescence, aggregation, phase inversion, nanocomposites, liquid crystals, and supramolecular assemblies

Frank N. Kelley, Ph.D. (University of Akron)
Adjunct Professor (University of Akron)
Polymer structure-property relationships; rheology; material characterization; fracture; life prediction

Scott E. Rickert, Ph.D. (Case Western Reserve University)
Adjunct Professor
Conducting polymers; microdevices; polymer electrodes; polymer adsorption

John C. Weaver, Ph.D. (University of Cincinnati)
Internal Adjunct Professor
Coatings science and technology

James L. White, Ph.D. (University of Delaware)
Adjunct Professor (University of Akron)
Polymer melt-solution rheology and fluid mechanics; elastomers; polymer liquid crystals and aromatic polyamides

UNDERGRADUATE PROGRAM

In 1970, the department introduced a program leading to the Bachelor of Science in Engineering degree with a major in polymer science, which is designed to prepare the student both for employment in polymer-based industry and for graduate education in polymer science. The Case School of Engineering is proud that this was the first such undergraduate program in the country to receive accreditation from the Engineering Council for Professional Development. The curriculum combines courses dealing with all aspects of polymer science and engineering with basic courses in chemistry, physics, mathematics, and biology, depending on the needs and interests of the student. The student chooses a sequence of technical electives, in consultation with a faculty advisor, allowing a degree of specialization in one particular area of interest, e.g., polymer materials, chemical engineering, biopolymers, biochemistry, or physics. In addition to required formal laboratory courses, students are encouraged to participate in the research activities of the department, both through part-time employment as student laboratory technicians and through the senior project requirement-a one-or two-semester project that involves the planning and performance of a research project.

Polymer science undergraduates are also strongly encouraged to seek summer employment in industrial laboratories during at least one of their three years with the
department. In addition to the general undergraduate curriculum in macromolecular science, the department offers three specialized programs which lead to the B.S. with a macromolecular science major. The cooperative program contains all the course work required for full-time resident students plus one or two six-month cooperative sessions in polymer-based industry. The company is selected by the student in consultation with his or her advisor, depending on the available opportunities. The dual-degree program allows students to work simultaneously on two baccalaureate level degrees within the university. It generally takes five years to complete the course requirements for each department for the degree. The B.S./M.S. program leads to the simultaneous completion of requirements for both the master’s and bachelor’s degrees. Students with a minimum GPA of 3.0 may apply for admission to this program in their junior year.

### BACHELOR OF SCIENCE IN ENGINEERING DEGREE
Major in Polymer Science

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities/Social Science or open elective b</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 111 Principles of Chemistry for Engineers</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(2-2-3)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td>Total</td>
<td>(16-5-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities/Social Science or open elective b</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engineering II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 General Physics I</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td>Total</td>
<td>(15-3-15)</td>
</tr>
<tr>
<td><strong>Sophomore Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 223 Organic Chemistry I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 270 Introduction to Polymer Science c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 122 General Physics II</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>Total</td>
<td>(16-0-16)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 224 Organic Chemistry II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 276 Polymer Properties and Design</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 224 Elementary Differential Equations</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>or MATH 234 Introduction to Dynamic Systems</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 225 Thermodynamics, Fluid Mechanics, Heat and Mass Transfer</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>Total</td>
<td>(16-0-16)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence III</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Natural Science elective c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CHEM 290 Chemistry Laboratory Methods for Engineers c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 351 Physical Chemistry for Engineers I</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 200 Statics and Strength of Materials</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(13-5-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>EMAC 352 Physical Chemistry for Engineers II</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 272 Polymer Analysis Laboratory</td>
<td>(2-4-3)</td>
</tr>
<tr>
<td>EMAC 376 Polymer Engineering</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGL 398N Professional Communication</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Technical elective c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(14-4-15)</td>
</tr>
<tr>
<td><strong>Senior Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>ENGR 210 Introduction to Circuits and Instrumentation</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>EMAC 377 Polymer Processing</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 398 Polymer Science and Engineering Project c, d</td>
<td>(0-9-3)</td>
</tr>
<tr>
<td>Technical elective c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(13-9-16)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 378 Polymer Production and Technology</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>EMAC 372 Polymer Processing Laboratory</td>
<td>(2-4-3)</td>
</tr>
<tr>
<td>Technical elective c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Technical elective c</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total</td>
<td>(17-4-18)</td>
</tr>
</tbody>
</table>

**Hours required for graduation: 128**

a. Approved Natural Science electives: PHYS 221 or 223, General Physics III; BIOL 210, Molecular Cell Biology; BIOL 205, Chemical Biology; STAT 312, Basic Statistics for Engr. and Sci.; PHYS 349, Methods of Mathematical Physics; BIOC 307, General Biochemistry.

b. One of these courses must be a humanities/social science course.

c. Engineering Core Courses.

d. Preparation for the polymer science project should commence in the previous semester.

e. Technical sequence must be approved by department advisor.
Mission Statement

To educate students who will excel and lead in the development of polymeric materials and the application of structure-property relationships. The department seeks to prepare students for either professional employment or advanced education, primarily in this or related science or engineering disciplines, but also in professional schools of business, law or medicine. Undergraduate students are offered opportunities for significant research experience, capitalizing on the strength of our graduate program.

Specifically, the undergraduate program provides the following educational objectives:

Mastery of Fundamentals

1. Ability to apply knowledge of mathematics, science, and engineering, in general, and synthetic chemistry, polymer processing and structure property relationships of polymeric materials, in particular.

2. Ability to design and conduct experiments (safely and efficiently), to analyze and interpret data, and to critically evaluate hypotheses, by providing experience with synthetic chemistry, polymer processing and measurement techniques.

3. Practical ability to use analytical techniques, computers, information databases and tools for electronic communication.

Creativity

4. Ability to identify, formulate and solve engineering problems that involve materials selection or improvement.

5. Ability to design a polymeric material or process to meet desired needs.

Societal Awareness

6. Broad education necessary to understand the environmental and economic impact of engineering solutions in a global and societal context.

7. Knowledge of contemporary economic, political, scientific and industrial issues.

Leadership Skills

8. Proficiency in oral and written communication, being able to describe clearly either the results of a project or the need for a proposed one.

9. Awareness of the multidisciplinary nature of macromolecular science and engineering, including synthetic chemistry; polymer fabrication and processing; biomaterials and biomimicry; and mechanical, fluid, electrical, optical, and sensing properties of polymers.

10. Ability to function in teams.

Professionalism

11. Exposure to the issues of professional and ethical responsibility.

12. Recognition of the need for, and an ability to engage in life-long learning.

GRADUATE PROGRAM

Courses leading to the Master of Science and Doctor of Philosophy degrees in macromolecular science are offered within the Case School of Engineering. They are designed to increase the student’s knowledge of macromolecular science and of his or her own basic area of scientific interest, with application to specific polymer research problems. Research programs derive particular benefit from close cooperation with graduate programs in chemistry, physics, materials science, chemical engineering, biological sciences, and other engineering areas. The interdisciplinary academic structure allows the faculty to fit the individual program to the student’s background and career plans. Basic and advanced courses are offered in polymer synthesis, physical chemistry, physics, biopolymers, and applied polymer science and engineering. A laboratory course in polymer characterization instructs students in the use of modern experimental techniques and equipment. Graduate students are also encouraged to take advanced course work in polymer solid-state physics, physical chemistry, synthesis, rheology, and polymer processing. The department also offers, in conjunction with the School of Medicine, a six- to seven-year M.D./Ph.D. program for students interested in the application of polymers and plastics to medicine, as well as for students interested in a molecular structural basis of medicine, particularly related to connective tissues, biomechanics, aging, pharmaceuticals, and blood behavior. Initiated in 1977, it is the only program of its kind in the nation.

FACILITIES

The Kent Hale Smith Science and Engineering Building houses the Department of Macromolecular Science and Engineering. The building was built in 1993, and specifically designed to meet the needs of polymer research. The facility consists of five floors, plus a basement. The laboratories for chemical synthesis are located principally on the top floor, the molecular and materials characterization laboratories on the middle floors, and the major engineering equipment on the ground floor, while the electron microscopes are located in the basement. Electronic classrooms are being installed on the ground floor. Laboratories and instrumentation include the X-ray Laboratory, with diffraction and fluorescence equipment; the Electron Microscopy Laboratory, with transmission and scanning electron microscopes; the Molecular Spectroscopy Laboratory, with a complete range of spectroscopic equipment including FTIR, high resolution solution and solid-state NMR (including imaging, computerized laser Raman spectrophotometers, and a high-speed/high sensitivity polymer analysis system; and the Biological Materials Laboratory, with facilities for characterization of certain aspects of structure, size, and shape of biological materials. The Polymer Microdevice Laboratory operates in an ultra-clean environment and uses the Langmuir-Blodgett technique of film deposition. There are also facilities for polymer characterization, optical microscopy, scanning calorimetry, and for testing and evaluating the mechanical properties of materials. The C. Richard Newpher polymer composite processing laboratory includes a high-temperature Rheometrics RMS-800 dynamic mechanical spectrometer, a Bomem DA-3 FTIR
with FT-Raman capabilities, a pultrusion machine, several RIM machines, a compression molding machine, a Brabender plasticorder, a high-speed Instron testing machine, and a vibrating sample magnetometer. The Charles E. Reed ’34 Laboratory is concerned with the mechanical analysis of polymeric materials. The major testing is done by Instron Universal testing instruments, including an Instron model 1123 with numerous accessories such as an environmental chamber for high- or low-temperature experiments. The laboratory also has an Atomic Force Microscope which probes the morphological and mechanical properties of materials at the nanoscale. The EPIC Molecular Modeling Center contains high-end and low-end Silicon Graphics Computers and various software packages for molecular modeling of polymers.

RESEARCH

The research activities of the department span the entire scope of macromolecular science and polymer technology.

Synthesis

New types of macromolecules are being made in the department’s synthesis laboratories. The emphasis is on creating polymers with novel functional properties such as photoconductivity, selective permeation, and biocompatibility.

Physical Characterization

This is the broad area of polymer analysis that seeks to relate the structure of the polymer at the molecular level to the bulk properties that determine its actual or potential applications. This includes characterization of polymers by infrared, Raman, and NMR spectroscopy; thermal and rheological analysis; determination of structure and morphology by x-ray diffraction, electron microscopy, and atomic force microscopy; and investigation of molecular weights and conformation by light scattering.

Mechanical Behavior and Analysis

Polymeric materials are known for their unusual mechanical capabilities, usually exploited as components of structural systems. Analysis includes the study of viscoelastic behavior, yielding and fracture phenomena and a variety of novel irreversible deformation processes.

Processing

A major concern of industry is the efficient and large-scale production of polymer materials for commercial applications. Research in this area is focusing on reactive processing, multi-layer processing and polymer mixing, i.e., compounding and blends.

Materials Development and Design

Often, newly conceived products require the development of polymeric materials with certain specific properties or design characteristics. Materials can be tailor-made by designing synthesis and processing conditions to yield the best performance under specified conditions. Examples might be the design of perm-selective membranes for use in kidney dialysis, polymers that are stable at high temperatures for fire-retardant construction materials, high temperature polymer electrolytes for use in advanced fuel cells, and high-strength nonreactive polymers for use as biological implants.

Biopolymers

Living systems are composed primarily of macromolecules, and research is in progress on several projects of medical relevance. The department has a long-standing interest in the hierarchical structure and properties of the components of connective tissues (e.g., skin, cartilage, and bone). The department is also engaged in the development of new biocompatible polymers for application as biomaterials.

MACROMOLECULAR SCIENCE AND ENGINEERING (EMAC)

Undergraduate Courses

EMAC 125. Freshman Research on Polymers (1)
Freshman research in polymer chemistry, engineering, and physics. Students will be placed in active research groups and will participate in real research projects under the supervision of graduate students and faculty mentors.

EMAC 270. Introduction to Polymer Science and Engineering (3)

EMAC 276. Polymer Properties and Design (3)
Engineering properties of polymers and their evaluation in terms of selection and design procedures. Relation of properties to the chemical and physical structures of polymers and application conditions. Prereq: ENGR 145.

EMAC 303. Structure of Biological Materials (3)
This course on the structure of biological materials is designed to provide students with: (i) a fundamental understanding of the structure of biologic materials including globular and structural proteins, connective tissue and bone, from the molecular to the microscopic levels of structure (approx. 65% of course); (ii) an introduction to the basic principles and applications of instruments for imaging, identification and measurement of biologic materials (approx. 25% of course) and (iii) an introduction to methods of biotechnology, biological materials, and novel biomaterials (approx. 10% of course). Prereq: EBBME 201 and EBBME 202. Cross-listed as EBBME 303.

EMAC 351. Physical Chemistry for Engineering I (3)
Principles of physical chemistry and their application to systems involving physical and chemical transformations. Gases, liquids, solids and solutions; first, second and third laws of thermodynamics; thermochrometry; physical and chemical equilibria. Prereq: ENGR 145 or MATH 223 or PHYS 122 or consent of instructor.

EMAC 352. Physical Chemistry for Engineering II (3)
Continuation of EMAC 351. Phase rule, electrochemistry, kinetics of chemical reactions, surface phenomena, contact catalysis, and colloids. Prereq: EMAC 351.

EMAC 355. Polymer Analysis Laboratory (3)
Experimental techniques in polymer synthesis and characterization. Synthesis by a variety of polymerization mechanisms. Quantitative investigation of polymer structure by spectroscopy, diffraction and microscopy. Molecular weight determination. Physical properties. Prereq: EMAC 270 or MATH 224 or MATH 234.

EMAC 372. Polymer Processing and Testing Laboratory (3)
Basic techniques for the rheological characterization of thermoplastic and thermoset resins; “hands-on” experience with the equipment used in polymer processing methods such as extrusion, injection molding, compression molding; techniques for mechanical characterization and basic principles of statistical quality control. Prereq: EMAC 377.

EMAC 375. Introduction to Fundamentals and Practice of Rheology (3)
Elementary coverage of principles and concepts pertaining to a basic description of rheological (flow) behavior of polymeric and colloidal systems. Rheometry and rheological measurements of viscoelastic fluids. Modern theories of polymer dynamics and suspension rheology. Molecular theories of polymer processing behavior. Prereq: ENGR 225.
EMAC 376. Polymer Engineering (3)
Mechanical properties of polymer materials as related to polymer structure and composition. Visco-elastic behavior, yielding and fracture behavior including irreversible deformation processes. Prereq: EMAC 276 and ENGR 200.

EMAC 377. Polymer Processing (4)
Application of the principles of fluid mechanics, heat transfer and mass transfer to problems in polymer processing; elementary steps in polymer processing (handling of particulate solids, melting, pressurization and pumping, mixing); principles and procedures for extrusion, injection molding, reaction injection molding, secondary shaping. Prereq: ENGR 225.

EMAC 378. Polymer Production/Technology (3)
Students examine case studies from the literature, which combine the design and structure-property trade-offs of polymeric materials vs. product requirements, with constraints imposed by economics, ethics, intellectual property, regulatory and legal factors. Students work in small teams, each tasked with a design project which requires consideration of the above factors. Prereq: EMAC 276.

EMAC 396. Special Topics (1-18)
(Credit as arranged.)

EMAC 397. Special Topics (1-18)
(Credit as arranged.)

EMAC 398. Polymer Science and Engineering Project I (1-9)
(Senior project.) Research under the guidance of staff, culminating in thesis.

EMAC 399. Polymer Science and Engineering Project II (1-9)
(Senior project.) Research under the guidance of staff, culminating in thesis.

Graduate Courses

EMAC 400T. Graduate Teaching I (0)
This course will engage the Ph.D. students in teaching experiences that will include non-contact (such as preparation and grading of homeworks and tests) and direct contact (leading recitations and monitoring laboratory works, lectures and office hours) activities. The teaching experience will be conducted under the supervision of the faculty. All Ph.D. students will be expected to perform direct contact teaching during the course sequence. The proposed teaching experiences for EMAC Ph.D. students will be conducted under the supervision of the faculty. The individual assignments will depend on the specialization of the students. The activities include grading, recitation, lab supervision and guest lecturing. Prereq: Ph.D. student in Macromolecular Science.

EMAC 470. Macromolecular Synthesis (3)
Organic chemistry of macromolecules; mechanism of polymerizations; preparation of addition, condensation, and biopolymers; the chemical reactions of polymers. Prereq: EMAC 270. Cross-listed as CHEM 470.

EMAC 471. Polymers in Medicine (3)
Distribution of plastic implants in the body, including history and statistics; chemical and physical characteristics of biomedical polymers, including general implant requirements, reactions of the host to implants, reactions of implants to physiological conditions, physiological and biomechanical basis for soft-tissue implants; plastic materials used in medicine and surgery; frontiers in biomedical polymers (current topics directed to the design and development of new biomedical polymers). Prereq: Consent of instructor. Cross-listed as EBME 406.

EMAC 472. Physical Chemistry of Macromolecules (3)
Major areas of physical chemistry of macromolecules; theories and experimental methods of polymer solutions, physical methods for determination of chemical structure, configuration. Prereq: EMAC 270.

EMAC 473. Biopolymers (3)
Application of physical techniques (X-ray, electron microscopy, infrared and Raman spectroscopy, circular dichroism, etc.) to the characterization of biopolymers, including polypeptides, polysaccharides, and poly-nucleotides. Prereq: EMAC 270.

EMAC 474. Macromolecular Physics (3)

EMAC 475. Introduction to Fundamentals and Practice of Rheology (3)
Elementary coverage of principles and concepts pertaining to a basic description of rheological (flow) behavior of polymeric and colloidal systems. Rheometry and rheological measurements of viscoelastic fluids. Modern theories of polymer dynamics and suspension rheology. Molecular theories of polymer processing behavior. Prereq: ENGR 225.

EMAC 476. Polymer Engineering (3)
Mechanical properties of polymer materials as related to polymer structure and composition. Visco-elastic behavior, yielding and fracture behavior including irreversible deformation processes. A term paper is required. Prereq: EMAC 276 and ECIV 110.

EMAC 477. Polymer Processing (3)
Rheological, molecular, structural, engineering, and compounding factors affecting processibility and properties of polymers; principles and procedures for mixing, extrusion, melting, calendering, injection molding, and other primary processing methods. Pertinent mechanisms and theories; the application of theory to practice. Prereq: EMAC 376.

EMAC 479. X-ray Crystallography (3)
Scattering of X-rays by crystalline and semi-crystalline solids, including polymers. Techniques of structure analysis.

EMAC 480. Polymer Morphology (3)
The morphology of semicrystalline and amorphous polymers, fibers, blends, liquid-crystalline polymers, and composites; and the physical and chemical mechanisms that control morphology. Practical knowledge of optical and electron microscopy: lab experiments and a project are included. Prereq: EMAC 474.

EMAC 482. Fundamentals of Adhesives, Sealants, and Coatings (3)
Film formation, application methods, and related fabrication factors and procedures. Relevant adhesion theories and practices, aspect of rheological treatments, and factors which affect these applications. Properties of constituent polymer materials, pigments, solvents, and other additives.

EMAC 500T. Graduate Teaching II (0)
This course will engage the Ph.D. students in teaching experiences that will include non-contact (such as preparation and grading of homework and tests) and direct contact (leading recitations and monitoring laboratory works, lectures and office hours) activities. The teaching experience will be conducted under the supervision of the faculty. All Ph.D. students will be expected to perform direct contact teaching during the course sequence. The proposed teaching experiences for EMAC Ph.D. students will be outlined below in association with graduate classes. The individual assignments will depend on the specialization of the students. The activities include grading, recitation, lab supervision and guest lecturing. Prereq: Ph.D. student in Macromolecular Science.

EMAC 570. Functional and Reactive Polymers: Synthesis and Properties (3)
The design, synthesis, and properties of a number of new and growing areas of polymer science and chemistry. Topics will include (1) Functional polymers e.g., conducting, light emitting, and liquid crystalline polymers. (2) Reactions with polymers e.g., solid-phase synthesis (peptide and DNA synthesis and combinatorial chemistry), polymers reagents. (3) Supramolecular chemistry in polymeric systems e.g., molecular imprinting, main chain supramolecular polymers, effect on miscibility, etc. (4) Synthesis and properties of different polymeric architectures: dendrimers, ladder polymers, polyrotaxanes, etc. and (5) New developments in polymer catalysts.

EMAC 600T. Graduate Teaching III (0)
This course will engage the Ph.D. students in teaching experiences that will include non-contact and direct contact activities. The teaching experience will be conducted under the supervision of the faculty. The proposed teaching experiences for EMAC Ph.D. students in this course will involve instruction in the operation of major instrumentation and equipment used in the daily research activities. The individual assignments will depend on the specialization of the students. Prereq: Ph.D. student in Macromolecular Science.

EMAC 601. Independent Study (1-18)
(Credit as arranged.)

EMAC 651. Thesis M.S. (1-18)
(Credit as arranged.)

EMAC 673. Selected Topics in Polymer Engineering (2-3)
Timely issues in polymer engineering are presented at the advanced graduate level. Content varies, but may include: mechanisms of irreversible deformation: failure, fatigue and fracture of polymers and their composites; processing structure-property relationships; and hierarchical design of polymeric systems. Prereq: EMAC 376 or EMAC 476. EMAC 674. Selected Topics (3)

EMAC 677. Colloquium in Macromolecular Science (0)
Lectures by invited speakers on subjects of current interest in polymer science.

EMAC 678. Characterization of Macromolecules (3)
Laboratory experience through synthesis and characterization of polymers. Methods include light scattering, viscosity, infrared, and NMR spectroscopy. Solid samples characterized by x-ray diffraction, electron and optical microscopy, thermal analysis, and physical properties. Prereq: EMAC 470 and EMAC 472.

EMAC 690. Special Topics in Macromolecular Science (1-18)

EMAC 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

EMAC 703. Dissertation Fellowship (1-8)
Materials science draws on chemistry in its concern for bonding, synthesis, and composition of engineering materials and their chemical interactions with the environment. Physics provides a basis for understanding the mechanical, thermal, and electrical properties of materials, as well as the tools needed to ascertain the structure and properties of materials. Mathematics is used throughout materials manufacture and analysis. Ultimately, however, materials is an engineering discipline, bringing basic science tools to bear on the technological challenges related to materials products and their manufacture.

FACULTY

Gary M. Michal, Ph.D. (Stanford University)
LTV Steel Professor and Chair
Physical metallurgy; rapid solidification technology; application of rapid annealing to nonequilibrium precipitation reactions; transmission electron microscopy; surface science; composite materials; interfacial phenomena

James D. McGuffin-Cawley, Ph.D. (Case Western Reserve University)
Great Lakes Professor of Ceramic Processing and Associate Dean of Engineering
Powder processing of ceramics; aggregation phenomena; oxidation, diffusion, and solid state reactions; silicate and active metal brazing of ceramics; ceramic matrix composites

Mark R. DeGuire, Ph.D. (Massachusetts Institute of Technology)
Associate Professor
Low-temperature synthesis of ceramic thin films, synthesis and properties of electrical ceramics, including dielectrics, ferroelectrics, and ferrites; oxide gas sensors; solid oxide fuel cells; defect chemistry.

Frank Ernst, Ph.D. (University of Göttingen)
Professor
Microstructure and microcharacterization of materials; defects in crystalline materials; interface and stress-related phenomena; semiconductor heterostructures, plated metallization layers; photovoltaic materials; surface hardening of alloys; quantitative methods of transmission electron microscopy

Arthur H. Heuer, Ph.D., D.Sc. (University of Leeds, England)
University Professor and Kyocera Professor of Ceramics
Transformation toughening and plastic deformation of ceramics; phase transformations in ceramics; biological ceramics; interphase interfaces in advanced structural composites; high resolution and analytical electron microscopy; materials science of MEMS; thermal barrier coatings, solid oxide fuel cells, surface hardening of metals

Harold Kahn, Ph.D. (Massachusetts Institute of Technology)
Research Associate Professor
Microelectromechanical systems involving design, fabrication, fatigue and fracture mechanics testing of surface-micromachined polysilicon and SiC devices and bulk-micromachined microfluidic devices using TiNi shape memory actuators.

Peter Lagerlof, Ph.D. (Case Western Reserve University)
Associate Professor
Electron microscopy; high temperature mechanical properties of single crystal and polycrystalline oxide and nitride ceramics; oxygen diffusion in oxide ceramics

John J. Lewandowski, Ph.D. (Carnegie Mellon University)
Leonard Case Jr. Professor and Director - Mechanical Characterization Facility
Mechanical behavior of materials; fracture and fatigue; micromechanisms of deformation and fracture; composite materials; bulk metallic glasses and composites; refractory metals; toughening of brittle materials; high-pressure deformation and fracture studies; hydrostatic extrusion; deformation processing

David H. Matthiesen, Ph.D. (Massachusetts Institute of Technology)
Associate Professor
Crystal growth; electronic materials; materials processing in microgravity; effect of growth conditions on the microstructures and electrical properties of semiconductors; fluid dynamics and heat, mass, and momentum transport

Joe H. Payer, Ph.D. (Ohio State University)
Professor
Electrochemistry and corrosion; reliability and life prediction; hydrogen storage, fuel cells, corrosion monitoring and sensors; polymer/ metal adhesion

Pirouz Pirouz, Ph.D. (Imperial College of Science and Technology, England)
Professor
Defects in semiconductors; heteroepitaxial growth of electronic materials; diffraction theory; transmission electron microscopy and its applications in materials science; fiber-reinforced composites; synthetic growth of diamond

David Schwam, Ph.D. (Israel Institute of Technology)
Research Associate Professor
Gating of advanced aluminum and magnesium alloys, development of die and permanent mold materials, thermal fatigue testing, recycling.

Gerhard E. Welsch, Ph.D. (Case Western Reserve University)
Professor
Metals and oxides; high temperature properties, electrical and mechanical properties. Materials for energy storage; metal sponges; metal-cell composites. Design and synthesis of structure of materials in the nanometer to mm range. Titanium, tantalum, tungsten, rhenium, iron, nickel alloys

EMERITUS FACULTY
John Wallace (Massachusetts Institute of Technology)
Professor
Metallurgical processing, casting processes, effect of processing and material properties, die steels

SECONDARY FACULTY
John Angus, Ph.D. (University of Michigan)
Professor of Chemical Engineering
Roberto Ballarini, Ph.D. (Northwestern University)
Professor of Civil Engineering
Russell Wang, D.D.S. (University of Toronto)
Associate Professor of Dentistry

ADJUNCT FACULTY
Arnon Chait
Adjunct Professor
NASA Glenn Research, Brookpark, Ohio
Marc Constantino
Adjunct Professor
Lawrence Livermore Laboratory, Livermore, CA

George Fischer
Adjunct Professor
IVAC Technologies, Cleveland

N. J. Henry Holroyd
Adjunct Professor
Luxfer, USA, Riverside, California

Warren H. Hunt, Jr.
Adjunct Professor
Aluminum Consultants Group, Inc., Murrysville, PA

Jennie S. Hwang
Adjunct Professor
H-Technologies Group, Cleveland

Terence Mitchell
Adjunct Professor
Los Alamos National Laboratory, Los Alamos, NM

Gary Ruff
Adjunct Professor
Intermet Corp., Troy, Michigan

Urs Häfeli
Adjunct Associate Professor
The Cleveland Clinic Foundation, Cleveland, Ohio

Wendell S. Williams (Retired)
Adjunct Professor
Urbana, Illinois

UNDERGRADUATE PROGRAMS
The goal of the undergraduate program is to prepare our graduates for challenging and productive careers related to the science and engineering of materials, especially metals, ceramics, electronic materials, and composites. The primary means of accomplishing this mission is our undergraduate curriculum and associated activities, through their emphasis on

• The interrelationships among the processing, structure, properties, and performance of engineering materials
• The mutual reinforcement of education and professional development throughout one's career.

The undergraduate curriculum leading to the degree of Bachelor of Science in materials science and engineering consists of the Engineering Core—basic courses in mathematics, physics, chemistry, and engineering, with electives in social sciences and humanities—plus materials courses, technical electives, and open electives. A total of 128 credit hours is required. Please see the table for the recommended semester-by-semester listing of courses.

The educational objectives of the undergraduate program are as follows

1. Graduates will understand the interrelationships among processing, structure, and properties of a wide range of engineering materials, and how these factors together control the materials performance.
2. Graduates will be able to carry out laboratory experiments, analyze data, and interpret the significance of their results, especially with respect to the processing of engineering materials and characterization of their engineering properties.
3. Graduates will be proficient in the oral, written, and electronic communication of their ideas.
4. Graduates will be proficient in the use of computer technology and computer-based information systems.
5. Graduates will be able to function effectively in groups of peers and independently.
6. Graduates will be informed of the impact of engineering on society and of the professional, ethical, safety, and environmental responsibilities that entails.
7. Graduates will regard professional development and education as processes that should continue hand-in-hand throughout their academic and professional careers.

The undergraduate experience in materials science and engineering at Case Western Reserve is marked by a high degree of hands-on experience and many opportunities for professional development before graduation. Lab courses, senior projects, and plant tours ensure that every student sees the field firsthand in current research and industrial settings.

In addition, many of our undergraduate students participate in cooperative education, summer jobs, and professional societies that expose them to the larger
BACHELOR OF SCIENCE IN ENGINEERING DEGREE
Major in Materials Science & Engineering

Freshman Year

<table>
<thead>
<tr>
<th>Class/Lab/Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>CHEM 111 Principles of Chemistry for Engineers ..........(4-0-4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming ....................(3-0-3)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing .....................................(3-0-3)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I .........(4-0-4)</td>
</tr>
<tr>
<td>PHED 1xx Physical Education Activities ......................(0-3-0)</td>
</tr>
<tr>
<td>Open Elective or Humanities/Social Science Elective a,b,g...(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(17-3-17)</td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials...............................(4-0-4)</td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engineering II ........(4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 General Physics I - Mechanics e ...................(3-1-4)</td>
</tr>
<tr>
<td>PHED 1xx Physical Education Activities ......................(0-3-0)</td>
</tr>
<tr>
<td>Open Elective or Humanities/Social Science Elective g .....(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(14-4-15)</td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Class/Lab/Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>CHEM 301 Introduction to Physical Chemistry e ............(3-0-3)</td>
</tr>
<tr>
<td>EMSE 102 Materials Science Seminar ............................(1-0-1)</td>
</tr>
<tr>
<td>EMSE 201 Introduction to Materials Science and Engr. d ...................(3-0-3)</td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III .......(3-0-3)</td>
</tr>
<tr>
<td>PHYS 122 General Physics II - Electricity and Magnetism ...................................................(3-1-4)</td>
</tr>
<tr>
<td>Humanities/Social Science Elective e .......................(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(16-1-17)</td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>EMAE 250 Computers in Mechanical Engineering g ........... (3-0-3)</td>
</tr>
<tr>
<td>EMSE 202 Phase Diagrams &amp; Phase Transformations ..........(3-0-3)</td>
</tr>
<tr>
<td>EMSE 270 Materials Laboratory I ................................(0-3-2)</td>
</tr>
<tr>
<td>MATH 224 Elementary Differential Equations e .............(3-0-3)</td>
</tr>
<tr>
<td>ENGR 200 Statics and Strength of Materials ................(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence I .......................(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(15-3-17)</td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Class/Lab/Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>EMSE 280 Materials Laboratory II ................................(0-3-2)</td>
</tr>
<tr>
<td>ENGR 210 Introduction to Circuits and Instrumentation(3-2-4)</td>
</tr>
<tr>
<td>EMSE 203 Applied Thermodynamics ................................(3-0-3)</td>
</tr>
<tr>
<td>EMSE 314 Electronic, Magnetic, and Optical Properties of Materials ....................................................(3-0-3)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence II ......................(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(12-5-15)</td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>EMSE 290 Materials Laboratory III ................................(0-3-2)</td>
</tr>
<tr>
<td>ENGL 398N Professional Communication f ..........................(3-0-3)</td>
</tr>
<tr>
<td>EMSE 303 Mechanical Behavior of Materials ....................(3-0-3)</td>
</tr>
<tr>
<td>ENGR 225 Thermodynamics, Fluid Mechanics, Heat Mass Transport ..................................................(4-0-4)</td>
</tr>
<tr>
<td>Humanities/Social Science Sequence III .....................(3-0-3)</td>
</tr>
<tr>
<td>Technical Elective ..................................................................(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(16-3-18)</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Class/Lab/Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
</tr>
<tr>
<td>EMSE 301 Fundamentals of Materials Processing ................(3-0-3)</td>
</tr>
<tr>
<td>EMSE 302 Fundamentals of Materials Processing Lab. .......(0-3-1)</td>
</tr>
<tr>
<td>EMSE 310 Applications of Diffraction Principles ............(0-2-1)</td>
</tr>
<tr>
<td>EMSE 312 Diffraction Principles ....................................(3-0-3)</td>
</tr>
<tr>
<td>EMSE 398 Senior Project in Materials I .......................(0-2-1)</td>
</tr>
<tr>
<td>Humanities/Social Science Elective g ............................(3-0-3)</td>
</tr>
<tr>
<td>Technical elective ..................................................................(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(12-7-15)</td>
</tr>
<tr>
<td>Spring</td>
</tr>
<tr>
<td>EMSE 313 Engineering Applications of Materials .............(3-0-3)</td>
</tr>
<tr>
<td>EMSE 399 Senior Project in Materials II .......................(0-4-2)</td>
</tr>
<tr>
<td>Technical Elective ..................................................................(3-0-3)</td>
</tr>
<tr>
<td>Open elective ................................................................(3-0-3)</td>
</tr>
<tr>
<td>Open elective ................................................................(3-0-3)</td>
</tr>
<tr>
<td>Total ............................................................................(12-4-14)</td>
</tr>
</tbody>
</table>

Hours required for graduation: 128

a. Selected students may be invited to take PHYS 123-124; General Physics I-II Honors, in place of PHYS 121-122.
b. One of these must be in the Humanities or Social Sciences.
c. Satisfies the Math, Natural Sciences, or Statistics requirement of the Engineering Core.
d. Or PHYS 250 or EECS 251.
e. Or MATH 234.
f. Satisfies the Professional Communications requirement of the Engineering Core.
g. The Engineering Core requires that if the Humanities/Social Sciences sequence is in Social Science, then 2 of the 3 Humanities/social Sciences electives must be in Humanities; if the sequence is in Humanities, then two of the three electives must be in Social Science.
The following courses are approved technical electives in materials science and engineering. A student is encouraged to discuss with their class advisor a sequence of technical elective courses, which takes into account the biannual nature of some offerings. Students may request approval of other elective courses by submitting a written petition justifying their choices to the department’s Undergraduate Studies Committee.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
<th>Annual</th>
<th>Bi-Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 310</td>
<td>Strength of Materials</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECIV 420</td>
<td>Finite Element Analysis</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EEAP 245</td>
<td>Electronic Circuits</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EECS 246</td>
<td>Signals and Systems</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EECS 309</td>
<td>Electromagnetic Fields I</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EECS 321</td>
<td>Semiconductor Electronic Devices</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EMAC 270</td>
<td>Introduction to Polymer Science</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 201</td>
<td>Foundry Metallurgy</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>EMSE 202</td>
<td>Phase Diagrams and Phase Transformations (3)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 203</td>
<td>Applied Thermodynamics (3)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 204</td>
<td>Diffusion Processes in Solids and Liquids</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 205</td>
<td>Dielectric, Optical and Magnetic Properties of Materials</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 206</td>
<td>Solidification of Materials</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 207</td>
<td>Deformation Processing of Metals</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 208</td>
<td>Environmental Effects on Materials Behavior</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 209</td>
<td>Properties of Materials at High Temperatures</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 210</td>
<td>Oxidation of Materials</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 211</td>
<td>Phase Equilibria and Microstructures of Materials</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 212</td>
<td>Powder Processing</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 213</td>
<td>Fracture of Materials</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 214</td>
<td>Semiconductor Thin Film Science and Technology</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 215</td>
<td>Dislocations in Solids</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 216</td>
<td>Crystallography and Crystal Chemistry</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 331</td>
<td>Introduction to Quantum Mechanics 1</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 315</td>
<td>Introduction to Solid State Physics</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STAT 312</td>
<td>Statistics for Engineering and Science</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>or STAT 313</td>
<td>Statistics for Experimenters</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

MINOR IN MATERIALS SCIENCE AND ENGINEERING

In addition to the Bachelor of Science degree program in materials science and engineering, the department also offers a minor in materials science and engineering. This sequence is intended primarily for students majoring in science or engineering, but it is open to any student with a sound background in introductory calculus, chemistry, and physics. This program requires the completion of five courses with a minimum of 15 credit hours, of which a maximum of six hours can be counted toward the student's major. All students will be required to take EMSE 201 (3) and four of the following courses:

- EMSE 202: Phase Diagrams and Phase Transformations (3)
- EMSE 203: Applied Thermodynamics (3)
- EMSE 260: Transport Phenomena (4)
- EMSE 301: Fundamentals of Materials Processing (3)
- EMSE 303: Mechanical Behavior of Materials (3)
- EMSE 307: Foundry Metallurgy (3)
- EMSE 313: Engineering Applications of Materials (3)
- EMSE 314: Electrical, Magnetic, and Optical Properties (3)
- EMSE 316: Applications of Ceramics (3)
- EMSE 312: Diffraction Principles and Applications (3)
Professor Mark DeGuire (506 White; 368-4221) is the academic advisor for this program and will assist students with their course selection.

**COOPERATIVE EDUCATION IN MATERIALS SCIENCE AND ENGINEERING**

The Cooperative Education program at Case Western Reserve University began in the Department of Materials Science and Engineering, and the department's faculty continues to strongly support student participation. Over the past 10 years approximately three-quarters of the department's undergraduates have completed at least one cooperative education assignment. Most students complete the recommended two assignments. A wide range of opportunities exist for materials majors including heavy industry, mid-size and small firms, and government and corporate research centers. Many opportunities are local to Northern Ohio, but a wide range of possibilities around the country, and, occasionally, international opportunities arise.

The cooperative education experience is monitored to ensure that students progress in job responsibilities during the course of an assignment. It is common for students to assume positions of responsibility, including employee supervision or decision-making on behalf of the company.

The department offers two academic courses, EMSE C100 and EMSE C200, that may be taken for credit upon return from the first and second experience respectively.

**FIVE-YEAR COMBINED B.S./M.S. PROGRAM**

This program offers outstanding undergraduate students the opportunity to obtain an M.S. degree, with a thesis, in one additional year of study beyond the B.S. degree. (Normally, it takes two years beyond the B.S. to earn an M.S. degree.) In this program, an undergraduate student can take up to nine credit hours that simultaneously satisfy undergraduate and graduate requirements. Typically, students in this program start their research leading to the M.S. thesis in the fall semester of the senior year. The department endeavors to support such students through the following summer and academic year at the normal stipend for entering graduate students. The B.S. degree is awarded at the completion of the senior year.

Application for admission to the five-year B.S./M.S. program is made after completion of five semesters of course work. Minimum requirements are a 3.2 grade point average and the recommendation of the department. Interested students should contact Professor James D. McGuffin-Cawley.

**GRADUATE PROGRAMS**

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees with research specialties in metallurgy, ceramics, electronic materials, composite materials, and materials science. A broad range of studies of the theory, properties, and engineering behavior of materials is encompassed in the academic courses and research within the department, with primary areas of specialization in materials processing, mechanical properties, surface and microstructural characterization, environmental effects, and electronic materials.

**M.S. Degree Requirements**

The M.S. degree in materials science and engineering is awarded through either Plan A (Master's Thesis) or Plan B (Master's Comprehensive). Plan A involves a thesis based on individual research and a final oral thesis defense. This plan is appropriate for full-time graduate students. Plan B involves a major project and a comprehensive oral exam. It is typically pursued by part-time graduate students.

Plan A requires successful completion of 6 courses (18 credit hours) and at least 9 credit hours of M.S. research project (EMSE 651). Plan B requires the successful completion of eight courses (24 credit hours) as well as three credit hours of a Special Projects course (EMSE 649). The six courses for Plan A and the eight courses for Plan B may include a maximum of two courses from an engineering or science curriculum outside the department. No more than two courses at the 300 level can be included; all other courses must be at a higher level. Transfer of credit from another university is limited to six credit hours of graduate level courses (with grade B or better) taken in excess of degree requirements at the other university. A Program of Study must be submitted by the end of the first semester for Plan A students, and by the end of two courses for Plan B students. A cumulative GPA of 2.75 or higher is required.

Each plan A student must prepare a written thesis and successfully defend the thesis in a final oral exam. Each plan B student must prepare a written report on his/her special project and satisfactorily pass a comprehensive oral exam. The thesis exam for Plan A and the oral exam for Plan B must be conducted by an examining committee consisting of three faculty members of the department.

**Ph.D. Degree Requirements**

Students entering the graduate program for a Ph.D. will need to fill out the Planned Program of Study within the first semester.

Candidates for a Ph.D. degree in materials science and engineering must meet the following requirements to prove their competency for doctoral study and to be accepted into the doctoral program:

(1) Submit an approved Program of Study form and a Supplementary Information form specifying the Breadth and Basic Science Requirements.

(2) Pass a comprehensive written General Exam within six months following their being awarded an M.S. degree (12 months for students with an M.S. degree from a different science or engineering discipline).

(3) Pass a Thesis Proposal Exam (written and oral) during the semester immediately following the successful completion of the written General Exam. These require-
ments are explained in detail below. At the completion of these requirements, the student must fill out the second part of the Ph.D. Student Permanent Record form.

Upon successful completion of all requirements and research, the Ph.D. candidate must submit a written dissertation as evidence for his or her ability to conduct independent research at an advanced level. The Ph.D. candidate must pass a final oral exam in defense of the dissertation. The Dissertation Committee must consist of three faculty members of the department and one non-departmental member. The candidate must provide each committee member with a copy of the completed dissertation at least 10 days before the exam, so that the committee members may have an opportunity to read and discuss it in advance.

The student must provide two unbound copies of the final approved version of the thesis for the University, and two bound copies of the thesis, one for the department and one for the student’s faculty advisor.

(1) Ph.D. Program of Study (Course Requirements)

A Ph.D. student must take a minimum of 18 credit hours of EMSE 701 and must continue registration each succeeding regular semester (fall and spring) until the dissertation is complete, unless granted a leave of absence. The time limit for the Ph.D. program is five years, starting with the first semester of EMSE 701 registration.

The minimum course requirement for a Ph.D. degree is 12 courses (36 credit hours) beyond the B.S. level, out of which at least six courses (18 credit hours) must be taken at Case Western Reserve University. Of these 12 courses, six courses must satisfy the Breadth Requirement and two courses must satisfy the Basic Science Requirement for the department as outlined below. In the case of a student entering with an M.S. degree from another discipline, additional courses may be required as determined by the department. A G.P.A. of 3.0 is required for Graduate Assistants.

Breadth Requirement

A broad knowledge of the field of materials science and engineering includes a minimum level of understanding of the following six areas:

a. Mechanical Behavior
b. Structure
c. Physical Properties
d. Processing
e. Thermodynamics and Kinetics
f. Phase Transformations

The Breadth Requirement for the Ph.D. can be fulfilled by taking a total of six courses (18 credit hours); these six courses must include at least one course from areas a, b, c, and d and two courses from areas e and f combined. The department maintains a list of approved courses for each of these areas.

Basic Science Requirements

A minimum depth in basic science of two courses (six credit hours) is required for a Ph.D. degree. This requirement can be fulfilled by taking two courses selected from physics, chemistry, mathematics and/or statistics, and/or certain engineering curricula. The department maintains a current list of approved courses for the Basic Science Requirements.

The Program of Study, a list of the courses the student will take to fulfill the Ph.D. requirements, will be discussed and approved at the time of the Thesis Proposal Exam. This form and the associated Supplementary Information form must be approved by the student’s Dissertation Committee (excluding the non-departmental member) and the chair of the department and submitted to the dean of graduate studies within one semester of passing the General Exam.

(2) Ph.D. General Exam

The written General Exam is offered twice a year, typically in January and June, provided at least three students are registered to take the exam. The exam is comprehensive and consists of two parts:

1. Thermodynamics and Kinetics; Materials Processing: covering such topics as phase equilibria, phase transformations, diffusion, defect chemistry, synthesis, fabrication, microstructural development, and thermomechanical processing.

2. Structure; Properties, Performance, and Reliability: covering crystallography and symmetry, analytical techniques (diffraction, imaging, and spectroscopy), line defects, surfaces and interfaces, microstructural analysis, mechanical, thermal, chemical (environmental), and electrical, optical, and magnetic properties, individually and in combination.

The emphasis in both parts of this General Exam will be on inorganic materials: metals, ceramics, semiconductors, and composites.

Each part of the exam will last for three hours. The morning session is devoted to Part 1 and the afternoon session covers Part 2. Each part of the exam is divided into two sections.

Part 1 (morning)

Section 1: Thermodynamics and Kinetics
Section 2: Processing

Part 2 (afternoon)

Section 3: Structure
Section 4: Properties, Performance, and Reliability

The exam is closed book. Each section of the exam will contain a minimum of four questions. Students must answer five questions from Part 1 and five questions from Part 2, with at least two questions being answered from each section.

In order to pass the written General Exam, the criteria are as follows—six out of ten questions in the exam require a 70 percent passing grade as well as a 75 percent average for the whole exam. Students who fail the exam (or the Thesis Proposal Exam described below) may try that exam a second time.
(3) Thesis Proposal Exam

The Thesis Proposal Exam tests the more specific knowledge of the Ph.D. candidate concerning the science underlying the proposed research and his or her intellectual maturity. It is composed of written and oral parts, both dealing with the candidate’s proposed research project. The written document should be given to each member of the student’s Dissertation Advisory Committee (excluding the non-departmental member) during the semester immediately following the successful completion of the General Exam. It should include a literature search, analysis of the research problem, suggested research procedures, and the general results to be expected. The document should be written by the student and not his or her thesis advisor, and will be examined by the student’s Dissertation Committee for this purpose.

The oral part of the Thesis Proposal Exam should last approximately two hours and must be given before the student’s Dissertation Committee within one week of submitting the above written document to the Committee. Both parts of the Thesis Proposal Exam will be graded Pass/Fail.

At the time of this exam, the student will also have his or her Program of Study examined and approved by the Dissertation Committee.

RESEARCH AREAS

Deformation and Fracture

Determination of the relationships between structure and mechanical behavior of traditional and advanced materials—metals, ceramics, intermetallics, composites, and biological materials. State-of-the-art facilities are available for testing over a range of strain rates, test temperatures, stress states, and size scales for both monotonic and cyclic conditions.

Materials Processing

Ceramic and metal powder synthesis and processing, computer-aided manufacturing of laminated materials, metals casting, crystal growth, thin film deposition, deformation processing of metals, synthesis of nanostructural materials, electrode and interfacial processes in fuel cells.

Environmental Effects


Surfaces and Interfaces

Free surfaces, grain boundaries, metal/ceramic, polymer/metal composite interfaces. Major facilities for transmission electron microscopy, scanning electron microscopy, and surface spectroscopies.

Electronic, Magnetic and Optical Materials

Electronic materials—silicon, germanium, gallium arsenide, silicon carbide; gallium nitride; thin film dielectric, optical, and magnetic ceramics; synthesis and characterization of multi-component electromagnetic filters; materials for sensors, catalysts, and fuel cells.

FACILITIES

Materials Processing

The department’s processing laboratories include facilities that permit materials processing from the gaseous state (vapor deposition), the liquid state (crystal growth, cast), and the solid state (powder processing, deformation processing). The department has its own foundry that houses mold-making capabilities (green and bonded sand, permanent mold, and investment casting), induction melting furnaces of various capabilities for air melting of up to 1,500 pounds of steel, electrical resistance furnaces for melting and casting up to 800 pounds of aluminum, and 500 pounds of magnesium under protective atmosphere, a chamber vacuum induction melting unit with a capacity of up to 30 pounds of superalloys, a 350-ton squeeze casting press, and state-of-the-art thermal fatigue testing and characterization equipment. The Crystal Growth Laboratory has facilities for production of high-purity electronic single crystals using a variety of furnaces with the additional capability of solidifying under large magnetic fields. In addition, a CVD and MOCVD reactor has been set up to do research on the growth of SiC and GaN on Si, sapphire, and other substrates. Secondary processing and working can be accomplished using a high-speed hot and cold rolling mill, swaging units, and a state-of-the-art hydrostatic extrusion press. The department has heat treatment capabilities including numerous box, tube, and vacuum furnaces. For the processing of powder metals or ceramics the department possesses a 300,000 pound press, a vacuum hot press (with capabilities of up to seven ksi and 2,300 C), a hot isostatic press (2000 C and 30 ksi), a 60 ksi wet base isostatic press, and glove boxes. Sintering can be performed in a variety of controlled atmospheres while a microcomputer-controlled precision dilatometer is available for sintering studies. Several ball mills, shaker mills, and a laboratory model attritor are also available for powder processing. In addition, facilities are available for sol-gel processing, glass melting, diamond machining; a spray dryer is available for powder granulation.

A Deformation Processing Laboratory has recently been commissioned that contains two dual hydraulic MTS presses. The first press is designed to evaluate the stretching and drawing properties of materials in sheet form. Its maximum punch and hold down forces are 150,000 each. Its maximum punch velocity is 11.8 inch/sec. The second press is designed to evaluate the plastic flow behavior of materials in an environment that simulates modern manufacturing processing. The press can deliver up to five consecutive impacts to a material in less than five seconds with a punch velocity as high as 110 inch/sec. The maximum punch force is 110,000 pounds.

A Computational Materials Processing Laboratory has recently been established. The core of the facilities is a Silicon Graphics Origin 2000 which has high
speed networking with an array of Octane workstations. A host of software packages are available as tools for the simulation and design of materials processing activities that range from crystal growth to powder consolidation to plastic deformation and also maintains a computer lab expressly for student use, including IBM-compatible computers, laser printers, and connections to the campus ethernet network.

Mechanical Testing Facility

The Mechanical Testing Facility permits the determination of mechanical behavior of materials over loading rates ranging from static to impact, with the capability of testing under a variety of stress states under either monotonic or cyclic conditions. A variety of furnaces and environmental chambers are available to enable testing at temperatures ranging from -196º C to 1,800º C. The facility is operated under the direction of a faculty member and under the guidance of a full-time engineer. The facility contains one of the few laboratories in the world for high-pressure deformation and processing, enabling experimentation under a variety of stress states and temperatures. The equipment in this state-of-the-art facility includes:

High Pressure Deformation Apparatus: These units enable tension or compression testing to be conducted under conditions of high hydrostatic pressure. Each apparatus consists of a pressure vessel and diagnostics for measurement of load and strain on deforming specimens, as well as instantaneous pressure in the vessel. Pressures up to 1.0 GPa, loads up to 10kN, and displacements of up to 25 mm are possible. The oil-based apparatus is operated at room temperature while a gas-based (i.e. Ar) apparatus can be used with an internal furnace.

Hydrostatic Extrusion Apparatus: Hydrostatic extrusion (e.g. pressure-to-air, pressure-to-pressure) can be conducted at temperatures up to 300º C on manually operated equipment interfaced with a computer data acquisition package. Pressures up to 2.0 GPa are possible, with reduction ratios up to 6-to-1, while various diagnostics provide real-time monitoring of extrusion pressure and ram displacement.

Advanced Forging Simulation Rig: A multi-actuator MTS machine based on a 330 kip, four post frame enables sub-scale forging simulations over industrially relevant strain rates. A 110 kip forging actuator is powered by five nitrogen accumulators enabling loading rates up to 120 inches/sec on large specimens. A 220 kip indexing actuator provides precise deformation sequences for either single or multiple deformation sequences. Data acquisition at rates sufficient for analysis is available. Testing with heated dies is possible.

Advanced Metal Forming Rig: A four post frame with separate control of punch actuator speed and blank hold down pressure enables determination of forming limit diagrams. Dynamic control of blank hold down pressure is possible, with maximum punch actuator speeds of 11.8 inches/sec. A variety of die sets are available.

The remainder of the equipment in the Mechanical Testing Facility is summarized below:

Servo-hydraulic Machines: Four MTS Model 810 computer-controlled machines with load capacities of 3 kip, 20 kip, 50 kip and 50 kip permit tension, compression, and fatigue studies to be conducted under load, strain, or stroke control. Fatigue crack growth may be monitored via a dc potential drop technique as well as via KRAK gages applied to the specimen surfaces. Fatigue studies may be conducted at frequencies up to 30 Hz.

Universal Testing Machines: Three INSTRON screw-driven machines, including two INSTRON Model 1125 units permit tension, compression and torsion testing.

Electromechanical Testing Machine: A computer-controlled INSTRON Model 1361 can be operated under load, strain, or stroke control. Stroke rates as slow as 1 micrometer/hour are possible.

Fatigue Testing Machines: Three Sonntag fatigue machines and two R. R. Moore rotating-bending fatigue machines are available for producing fatigue-life (S-N) data. The Sonntag machines may be operated at frequencies up to 60 Hz.

Creep Testing Machines: Three constant load frames with temperature capabilities up to 800º C permit creep testing, while recently modified creep frames permit thermal cycling experiments as well as slow cyclic creep experiments.

Impact Testing Machines: Two Charpy impact machines with capacities ranging from 20 ft-lbs to 240 ft-lbs are available. Accessories include a Dynatup instrumentation package interfaced with an IBM PC, which enables recording of load vs. time traces on bend specimens as well as on tension specimens tested under impact conditions.

Instrumented Microhardness Testing: A Nikon Model QM High-Temperature Microhardness Tester permits indentation studies on specimens tested at temperatures ranging from -196º C to 1,600º C under vacuum and inert gas atmospheres. This unit is complemented by a Zwick Model 3212 Microhardness Tester as well as a variety of Rockwell Hardness and Brinell Hardness Testing Machines.

Environmental Stress Laboratories

These facilities include equipment for corrosion, oxidation, and adhesion and wear studies. A wide range of environments can be simulated and controlled:

- Aqueous corrosion: atmospheric, immersion and high-pressure/high-temperature in autoclaves and b) Oxidation: single and mixed gases over a range of temperatures and pressures. Special items include electrochemical test equipment, environmental cracking test equipment, vacuum equipment for permeation studies, high sensitivity Cahn electrobalances for thermogravimetric studies and polymer/metal adhesion test fixtures.
Transmission Electron Microscope Laboratory

Two transmission electron microscopes are available that provide virtually all conventional and advanced microscopy techniques required for state-of-the-art materials research and involve an installed capacity worth $3 million. The microscopes available are (i) an FEI Tecnai F30 300kV field-emission gun energy-filtering high-resolution analytical scanning transmission electron microscope with an information resolution limit better than 0.14nm, equipped with an EDAX system with a high-energy resolution Si-Li detector for X-ray energy-dispersive spectroscopy (XEDS), a Gatan GIF2002 imaging energy filter including a 2k by 2k slow-scan CCD camera, and a high-angle annular dark-field detector for scanning transmission electron microscopy (STEM); (ii) a Philips CM20 200kV analytical transmission electron microscope equipped with a Tracor Northern high-purity Ge X-ray energy-dispersive spectroscopy detector, a Gatan parallel electron energy-loss spectrometer (PEELS), and a STEM unit.

Conventional TEM techniques, such as bright-field and dark-field imaging, electron diffraction, or weak-beam dark-field imaging (WBDF) are used routinely to analyze line defects (dislocations) and planar defects (interfaces, grain boundaries, stacking faults) in crystalline materials. Advanced TEM techniques include (i) high-resolution TEM, which enables assessing the atomistic structure of crystal defects such as heterophase interfaces, grain boundaries, or dislocations; (ii) convergent-beam electron diffraction, which can be used, for example, to obtain crystallographic information (space group) and to determine orientation relationships between small (even nanoscopic) crystallites; and (iii) energy-filtering TEM, which includes zero-loss filtering for improved image contrast and resolution in conventional imaging and diffraction as well as electron spectroscopic imaging (ESI), a technique that enables rapid elemental mapping with high spatial resolution based on element-characteristic energy losses of the primary electrons in the specimen. Specimen preparation facilities for transmission electron microscopy consist of two dimple-grinders, two electropolishing units, three ultra-microtomes, two conventional ion-beam mills, two state-of-the-art precision ion polishing systems (PIPS, by Gatan), and a new focused beam facility (see below).

Scanning Electron Microscopy Laboratory

Scanning electron microscopy (SEM) and spectrochemical analysis provide valuable specimen investigation with great depth of field and realistic three-dimensional imaging at resolutions up to 500,000X. Determination of the topography of nearly any solid surface is possible. Spectrochemical studies are possible with the use of energy dispersive systems capable of detecting elements from boron to uranium. The laboratory houses two instruments. The first is an Hitachi S-4500, a field emission electron microscope with two secondary electron detectors, a backscattered electron detector, and an infrared chamber scope. In addition, it has a Noran energy dispersive X-ray detection system. The microscope is capable of operating at a spatial resolution of less than 1.5 nm at 15 kV. It also performs well at reduced beam energies (1 kV), facilitating the observation of highly insulating materials. The second instrument is a Philips XL-30 ESEM with a large chamber that can be used as a conventional SEM, or in the environmental mode, can be used to examine wet, oily, gassy or non-conducting samples. It has a camera for crystallographic orientation imaging, a deformation stage capable of 1,000 lbs force, hot stages capable of temperatures up to 1,500°C, and a cooling stage that goes down to -20°C. An attached Noran X-ray system permits qualitative and quantitative EDX spectroscopy, X-ray mapping and line scans.

Surface Science Laboratories

The Center for Surface Analysis of Materials (CSAM) enjoys state-of-the-art characterization of metal, alloy, ceramic, and polymer surfaces. These tools include a PHI 680 Scanning Auger Microprobe (SAM) for elemental analysis of surfaces and mapping, and PHI 3600 Secondary Ion Mass Spectrometry (SIMS), which provides surface sensitivities for species in the part per billion range. A PHI model 5600 instrument provides X-ray Photoelectron Spectroscopy (XPS or ESCA) capability, which produces information concerning chemical states. The latter two instruments are particularly useful for ceramic and polymer surfaces. With specimen heating, cooling, and depth profiling capabilities directly incorporated in these devices, subsurface regions and interfaces in composite structures, as well as at thin film substrate interfacial regions, can be examined and fully characterized. The ion beam facility for the analysis of materials consists of a NEC 55DH 1.7 MV tandem pelletron accelerator for the production of 3.4 MeV protons, 5.1 MeV alpha particles, and N ions with energies in excess of 7.0 MeV. Sample analysis takes place in a turbo-molecular pumped high vacuum chamber. The chamber is equipped with a computer-controlled five axis manipulator and has provisions for maintaining sample temperatures from 77°C K to 1,000°C. A Si surface barrier detector, NaI(Tl) scintillator, and liquid nitrogen-cooled Si(Li) detector are used to detect scattered ions, characteristic gamma rays and characteristic X-rays, respectively. This instrumentation can non-destructively provide composition and structure information in the near-surface region of materials using techniques such as Rutherford backscattering spectrometry (RBS), ion channeling, particle-induced X-ray analysis (PIXE), and nuclear reaction analysis (NRA). As with other analytic techniques, sensitivity, sampling depth, and depth resolution are sample dependent. However, sensitivities of 1 atomic percent, accuracies of 5 percent, and a depth resolution of 20 nm are usually easily achieved.

The typical specimen is a solid, vacuum-compatible material with lateral dimensions between 0.5 cm x 0.5 cm and 5 cm x 5 cm. However, PIXE and NRA can also be performed on non-vacuum compatible specimens such as liquids and irreplaceable artifacts of interest to museum curators and archeologists.
A recently acquired FEI Nova Focused Ion Beam (FIB) system used to machine thin foils suitable for TEM directly out of the surface of a specimen is available. The Nova FIB includes an SEM, a computer interface enabling entirely automated milling and an internal “lift out” system for transferring thin films onto support grids.

To investigate the character of surfaces at the nanometer scale the laboratory has a Digital Instruments Dimension 3000 Scanning Probe Microscope which operates as an AFM and contains a Hysitron Nanoindenter.

Electronic Properties Laboratory

Crystal Growth and Analysis Laboratory

The Crystal Growth and Analysis Laboratory is equipped for research studies and characterization of bulk semiconductor and photonic materials. The growth facilities include a high-pressure Czochralski system, low-pressure Czochralski system, and a Vertical Bridgman system with magnetic field stabilization. The characterization facilities include capabilities for sample preparation, a Hall effect system, infra-red microscope, and an Inductively Coupled Plasma-Mass Spectrometer (ICP-MS).

X-Ray Laboratory

The X-ray laboratory contains diffraction equipment for study of the structures of ceramics, metals, polymers, minerals, and single crystals of organic and inorganic compounds. A Scintag diffractometer system includes a theta/theta wide-angle goniometer, a 4.0 kW x-ray generator with copper tube, a third axis stress attachment, a thermoelectrically cooled Peltier germanium detector, a thin film analysis system, a dedicated PC for data acquisition, and a turbomolecular-pumped furnace attachment permitting sample temperatures up to 2,000°C.

MATERIALS SCIENCE AND ENGINEERING (EMSE)

Undergraduate Courses

EMSE 102. Materials Seminar (1)

Topical lectures by faculty on current areas of materials research serving to complement the concepts introduced in EMSE 201. General discussion of overall curriculum and educational objectives. Prereq or Coreq: EMSE 201.

EMSE 103. Materials in Sports (3)

The relationships between optimizing sports activities and the performance requirements of sports equipment are developed. The inherent properties of materials are shown to be the controlling factors in the design of almost all types of sports equipment. Properties of the major classes of materials used to manufacture sports equipment are examined. Materials discussed include advanced composites, foams, metals, ceramics, and natural composites, e.g., wood and leather. The absorption, storage, and release of energy by equipment during sports activities are shown to relate to the basic structure of the materials from which it is made. Demonstration experiments are conducted periodically throughout the course.

EMSE 201. Introduction to Materials Science and Engineering (3)

Introductory treatment of crystallography, phase equilibria, and materials kinetics. Application of these principles to examples in metals, ceramics, semiconductors, and polymers, illustrating the control of structure through processing to obtain desired mechanical and physical properties. Design content includes examples and problems in materials selection and of design of materials for particular performance requirements. Prereq: ENGR 145 and PHYS 121 and MATH 121.

EMSE 202. Phase Diagrams and Transformations (3)


EMSE 203. Applied Thermodynamics (3)

Basic thermodynamics principles as applied to materials. Application of thermodynamics to material processing and performance including condensed phase and gaseous equilibria, stability diagrams, corrosion and oxidation, electrochemical and vapor phase reactions. Prereq: EMSE 201.

EMSE 270. Materials Laboratory I (2)

Introduction to processing, microstructure and property relationships of metal alloys, ceramics and glass. Solidification of a binary alloy and metallurgy by optical and scanning electron microscopy. Synthesis of ceramics powders, thermal analysis using TGA and DTA, powder consolidation, sintering and grain growth kinetics. Processing and coloring of glass and glass-ceramics.

EMSE 280. Materials Laboratory II (2)

Synthesis and processing. Experiments designed to demonstrate and evaluate different ways to process different types of materials. Solidification of metals. Crystallization kinetics, processing using electrochemistry, oxidation and oxidized microstructures. Laboratory teams are selected for all experiments.

EMSE 290. Materials Laboratory III (2)

Experiments designed to characterize and evaluate different microstructural designs produced by variations in processing. Fracture of brittle materials, fractography, thermal shock resistance, hardenability of steels, TTT and CT diagrams, composites, solidification of metals, solution annealing of alloys. Prereq: EMSE 201.

EMSE 301. Fundamentals of Materials Processing (3)

Introduction to material processing technology with an emphasis on the relation of basic concepts to the processes by which materials are made into engineering components. Includes casting, welding, forging, cold-forming, powder processing of metals and ceramics, and polymer and composite processing. Prereq: EMSE 201 and EMSE 202 and EMSE 203.

EMSE 302. Fundamentals of Materials Processing Laboratory (1)

Demonstration of basic processes of materials fabrication. Includes visits to commercial materials processing plants for tours and demonstrations. Graded pass/fail.

EMSE 303. Mechanical Behavior of Materials (3)


EMSE 307. Foundry Metallurgy (3)

Introduction to solid-liquid phase transformations and their application to foundry and metal casting processes. Includes application of nucleation and growth to microstructural development, application of thermodynamics to melt metal reactions, application of the principles of fluid flow and heat transfer to gating and risering techniques, and introduction to basic foundry and metal casting technology. Prereq: EMSE 202 and EMSE 203 and ENGR 225.

EMSE 310. Applications of Diffraction Principles (1)

A lab sequence in conjunction with EMSE 312. Diffraction Principles, involving experiments on crystallography, optical diffraction, Laue backscattering on single crystals, powder diffraction of unknown compounds, electron diffraction and imaging, and chemical analysis using energy dispersive x-ray spectroscopy. Prereq: EMSE 312 or consent of instructor.

EMSE 312. Diffraction Principles (3)


EMSE 313. Engineering Applications of Materials (3)

Optimum use of materials taking into account not only the basic engineering characteristics and properties of the materials, but also necessary constraints of component design, manufacture (including machining), abuse allowance (safety factors), and cost. Interrelations among parameters based on total system design

EMSE 314. Electric, Magnetic, and Optical Properties of Materials (3)

EMSE 316. Applications of Ceramic Materials (3)

EMSE 360. Transport Phenomena in Materials Science (3)
Review of momentum, mass, and heat transport from a unified point of view. Application of these principles to various phenomena in materials science and engineering with an emphasis on materials processing. Both analytical and numerical methodologies applied in the solution of problems. Prereq: ENGR 225 and MATH 224 or equivalent.

EMSE 396. Special Project or Thesis (1-18) Special research projects or undergraduate thesis in selected material areas.

EMSE 398. Senior Project in Materials I (1) Independent research project. Projects selected from those suggested by faculty; usually entail original research.

EMSE 399. Senior Project in Materials II (2) Independent research project. Projects selected from those suggested by faculty; usually entail original research.

Graduate Courses

EMSE 400T. Graduate Teaching I (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exams/quizzes/homework, leading recitation sessions, tutoring, providing laboratory assistance, and developing teaching aids that include both web-based and classroom materials. Graduate student will meet with supervising faculty member throughout the semester. Grading is pass/fail. Students must receive three passing grades and up to two assignments may be taken concurrently. Prereq: Ph.D. student in Materials Science and Engineering.

EMSE 401. Transformations in Materials (3)

EMSE 403. Modern Ceramic Processing (3)
Fundamental science and technology of modern ceramic powder processing and fabrication techniques. Powder synthesis techniques. Physical chemistry of aqueous and nonaqueous colloidal suspensions of solids. Shape forming techniques: extrusion; injection molding; slip and tape casting; dry, isostatic, and hot isostatic pressing. Prereq: EMSE 316 (or concur).

EMSE 404. Diffusion Processes in Solids and Melts (3)

EMSE 405. Dielectric, Optical and Magnetic Properties of Materials (3)
Electrical properties of nonmetals: ionic conductors, dielectrics, ferroelectrics, and piezo-electrics. Magnetic phenomena and properties of metals and oxides, including superconductors. Mechanisms of optical absorption in dielectrics. Optoelectronics. Applications in devices such as oxygen sensors, multilayer capacitors, soft and hard magnets, optical fibers, and lasers. Prereq: Consent of instructor.

EMSE 409. Deformation Processing (3)
Flow stress as a function of material and processing parameters; yielding criteria; stress states in elastic-plastic deformation; forming methods: forging, rolling, extrusion, drawing, stretching forming, composite forming. Prereq: EMSE 303.

EMSE 411. Environmental Effects on Materials Behavior (3)
Aqueous corrosion; principles and fundamental concepts; recognition of modes; monitoring and testing; methods to control and prediction. Applications of engineering problems: design, and economics. Mixed potential theory; principles of protection, hydrogen effects, and behavior in metal systems.

EMSE 412. Materials Science and Engineering Seminar (0)

EMSE 413. Fundamentals of Materials Engineering and Science (3)
Provides a background in materials for graduate students with undergraduate majors in other branches of engineering and science: reviews basic bonding relations, structure, and defects in crystals. Lattice dynamics; thermodynamic relations in multi-component systems; microstructural control in metals and ceramics; mechanical and chemical properties of materials as affected by structure; control of properties by techniques involving structure property relations; basic electrical, magnetic and optical properties.

EMSE 417. Properties of Materials at High Temperatures (3)

EMSE 418. Oxidation of Materials (3)
Experimental techniques; thermodynamics of oxidation reactions; defects and diffusion in oxides; oxidation rate laws. Effects of alloying, surface treatment and stress on oxidation. High-temperature corrosion.

EMSE 419. Phase Equilibria and Microstructures of Materials (3)
The multi-component nature of most material systems require understanding of phase equilibria and descriptions of microstructure. Attention will be given to phase equilibria in multi-component (ternary and higher) systems, and the stereological description of the microstructure of multiphase systems.

EMSE 421. Fracture of Materials (3)

EMSE 426. Semiconductor Thin Film Science and Technology (3)

EMSE 427. Dislocations in Solids (3)
Elasticity and dislocation theory; dislocation slip systems; links and dislocation motion; jog and dislocation interactions; dislocation dissociation and stacking faults; dislocation multiplication, applications to yield phenomena, work hardening and other mechanical properties. Prereq: Consent of instructor.

EMSE 429. Crystallography and Crystal Chemistry (3)
Crystal symmetries, point groups, translocation symmetries, space lattices, crystal classes, space groups, crystal chemistry, crystal structures, and physical properties. Prereq: Consent of instructor.

EMSE 500T. Graduate Teaching II (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exams/quizzes/homework, leading recitation sessions, tutoring, providing laboratory assistance, and developing teaching aids that include both web-based and classroom materials. Graduate student will meet with supervising faculty member throughout the semester. Grading is pass/fail. Students must receive three passing grades and up to two assignments may be taken concurrently. Prereq: Ph.D. student in Materials Science and Engineering.

EMSE 502. Mechanical Properties of Metals and Composites (3)
Microstructural effects on strength and toughness of advanced metals and composites. Review of dispersion hardening and composite strengthening mechanisms. Toughening of brittle materials via composite approaches such as fiber reinforcement, ductile phases, and combinations of approaches. Prereq: ENGR 200 and EMSE 303 or EMSE 421; or consent.

EMSE 504. Thermodynamics of Solids (3)

EMSE 511. Failure Analysis (3)
Methods and procedures for determining the basic causes of failures in structures and components. Recognition of fractures and excessive deformations in terms of their nature and origin. Development and full characterization of fractures. Legal, ethical, and professional aspects of failures from service. Prereq: EMSE 201 and EMSE 303 and ENGR 200; or consent.
EMSE 512. Advanced Electron Microscopy Techniques (3)
Theory and laboratory experiments to learn advanced techniques in electron microscopy; high resolution electron microscopy (HREM), convergent beam electron microscopy (CBED), and chemical analysis using energy dispersive x-ray spectroscopy (EDX). Prereq: EMSE 515 and EMSE 516.

EMSE 514. Defects in Semiconductors (3)
Presentation of the main crystallographic defects in semiconductors: point defects (e.g., vacancies, interstitials, substitutional and interstitial impurities, line defects (e.g., grain boundaries). Structural, electrical and optical properties of various defects. Interpretation of the properties from the perspective of semiconductor physics and materials science and correlation of these defects to physical properties of the material. Experimental methods including TEM, EBIC, CL, DLTS, etc. Prereq: EMSE 406.

EMSE 515. Analytical Methods in Materials Science: Lecture (3)
The common advanced analytical methods used in materials science are: TEM, SEM, SIMS, SAM and ESCA. These acronyms will be defined and the theory and application of each will be explained.

EMSE 516. Analytical Methods in Materials Science (3)
A laboratory course designed to achieve proficiency in TEM, SEM, SIMS, SAM and ESCA.

EMSE 600T. Graduate Teaching III (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exam/quizzes/homework, leading recitation sessions, tutoring, providing laboratory assistance, and developing teaching aids that include both web-based and classroom materials. Graduate students will meet with supervising faculty member throughout the semester. Grading is pass/fail. Students must receive three passing grades and up to two assignments may be taken concurrently. Prereq: Ph.D. student in Materials Science and Engineering.

EMSE 601. Independent Study (1-18)
EMSE 633. Special Topics (1-18)
EMSE 649. Special Projects (1-18)
EMSE 651. Thesis M.S. (1-18)
Required for Master's degree. A research problem in metallurgy, ceramics, electronic materials, biomaterials or archeological and art historical materials, culminating in the writing of a thesis.

EMSE 701. Dissertation Ph.D. (1-18)
Required for Ph.D. degree. A research problem in metallurgy, ceramics, electronic materials, biomaterials or archeological and art historical materials, culminating in the writing of a thesis.

EMSE 703. Dissertation Fellowship (1-8)
EMSE C100. Co-Op Seminar I for Materials Science and Engineering (1)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 001.

EMSE C200. Co-Op Seminar II for Materials Science and Engineering (2)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 002 and EMSE C100.

Department of Mechanical and Aerospace Engineering
418 Glennan Building (7222)
Phone 216-368-2941; Fax 216-368-6445
Joseph M. Prahl, Chair
e-mail: joseph.prahl@case.edu
http://mae1.cwru.edu/mae/Pages/Faculty_Staff/Faculty/Prahl/Prahl.htm

The Department of Mechanical and Aerospace Engineering of the Case School of Engineering offers programs leading to bachelor’s, master’s, and doctoral degrees. It administers the programs leading to the degrees of Bachelor of Science in Engineering with a major in aerospace engineering, Bachelor of Science in Engineering with a major in fluid and thermal engineering sciences and Bachelor of Science in Engineering with a major in mechanical engineering. All three curricula are based on four-year programs of preparation for productive engineering careers or further academic training. All three are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

The mission of the Department of Mechanical and Aerospace Engineering is to challenge students to reach toward positions of leadership in the professions of aerospace engineering, fluid and thermal engineering science, and mechanical engineering. The undergraduate program emphasizes fundamental engineering science, analysis and design to insulate that graduates will be strong contributors in their work environment, be prepared for advanced study at top graduate schools and be proficient lifelong learners. The graduate programs emphasize advanced methods of analysis, mathematical modeling, computational and experimental techniques applied to a variety of mechanical and aerospace engineering specialties including, applied mechanics, dynamic systems, robotics, biomechanics, fluid mechanics, heat transfer, propulsion and combustion. Leadership skills are developed by infusing the program with current engineering practice, design, and professionalism lead by concerned educators and researchers.

The department’s research applies the principles of mechanics, thermodynamics, heat and mass transfer, and engineering design to problems in aeronautics, astronautics, biomechanics and orthopaedic engineering, biomimetics and biological inspired robotics, energy, environment, machinery dynamics, mechanics of materials, and tribology. Many of these activities involve strong collaborations with the departments of biology, electrical engineering and computer science, and orthopaedics of the School of Medicine. The department programs provide:

Mastery of Fundamentals
• A strong background in the fundamentals of chemistry, physics and mathematics.
• Methods of modern experimental analysis, both numerical and mathematical, applied to mechanics, dynamic systems and control, thermodynamics, fluid mechanics and heat transfer.
• Methods of modern experimental engineering analysis and data acquisition.

Creativity
• Ability to identify, model, and solve mechanical and aerospace engineering design problems.
• Ability to design experiments to resolve mechanical and aerospace engineering issues.
• Ability to perform an individual senior project that demonstrates original research and/or design content.

Societal Awareness
• Issues of environmental impact, efficient use of energy and resources, benefits of recycling.
• An awareness of the multi-disciplinary nature of mechanical and aerospace engineering.
• Impact of economic, product liability and other legal issues on mechanical engineering.
and aerospace engineering manufacturing and design.

Leadership Skills
• An ability to work in teams.
• Ethical considerations in engineering decisions.
• Proficiency in oral and written communication.

Professionalism
• Students are encouraged to develop as professionals through participation in the student chapters of the American Society of Mechanical Engineers (ASME) and the American Institute of Aeronautics and Astronautics (AIAA).
• Students are encouraged to augment their classroom experiences with the cooperative education program and the strong graduate research program of the department.
• Students are encouraged to take the Fundamentals of Engineering Examination as the first step in the process of becoming a registered professional engineer.
• The bachelor's candidate must complete an independent design project with an oral and written final report.
• The master's candidate must demonstrate independent research resulting in a thesis or project suitable for publication and/or presentation in peer reviewed journals and/or conferences.
• The doctoral candidate must complete a rigorous independent thesis containing original research results appropriate for publication in archival journals and presentation at leading technical conferences.

FACULTY

Joseph M. Prahl, Ph.D. (Harvard University), P.E.
Professor, Chair
Fluid dynamics; heat transfer; tribology

Alexis R. Abramson, Ph.D. (University of California, Berkeley)
Warren E. Rupp Assistant Professor
Micro/nanoscale heat transfer, nanotechnology, biomimetics, nanoscale biomedical applications

Maurice L. Adams, Ph.D. (University of Pittsburgh)
Professor
Dynamics of rotating machinery; nonlinear dynamics; vibration; tribology; turbomachinery

J. Iwan D. Alexander, Ph.D. (Washington State University)
Professor and Chief Scientist for Fluids National Center for Microgravity Research for Fluids and Combustion
Fluid dynamics; heat and mass transfer; low gravity fluid dynamics, interfacial transport capillary surface equilibria and dynamics, two-phase flow in porous media, vibrational convection

R. Balasubramanian, Ph.D. (Case Western Reserve University)
Research Associate Professor
National Center for Microgravity Research for Fluids and Combustion
Microgravity Fluid Mechanics

Dwight T. Davy, Ph.D. (University of Iowa), P.E.
Professor
Musculo-skeletal biomechanics; applied mechanics

Isaac Greber, Ph.D. (Massachusetts Institute of Technology)
Professor
Fluid dynamics; molecular dynamics and kinetic theory; biological fluid mechanics; acoustics

Uday Hegde, Ph.D. (Georgia Institute of Technology)
Research Associate Professor, National Center for Microgravity Research for Fluids and Combustion
Combustion, turbulence and acoustics

Jaikrishnan R. Kadambi, Ph.D. (University of Pittsburgh)
Professor
Experimental fluid mechanics; multiphase flows; laser diagnostics; biological fluid mechanics; turbomachinery; heat transfer

Yasuhiro Kamotani, Ph.D. (Case Western Reserve University)
Professor
Experimental fluid dynamics; heat transfer; microgravity fluid mechanics

Mohammad Kassemi, Ph.D. (University of Akron)
Research Associate Professor
National Center for Microgravity Research for Fluids and Combustion

Vedha Nayagam, Ph.D. (University of Kentucky)
Research Associate Professor
National Center for Microgravity Research for Fluids and Combustion

J. Iwan D. Alexander, Ph.D. (Princeton University)
Professor and Chief Scientist for Combustion National Center of Microgravity Research for Fluids and Combustion
Combustion, fire research, laser diagnostics

Vedha Nayagam, Ph.D. (University of Kentucky)
Research Associate Professor
National Center for Microgravity Research for Fluids and Combustion

Kentucky)

James S. T’ien, Ph.D. (Princeton University)
Professor
Experimental solid mechanics; nanomechanics; dynamic deformation and failure; time resolved high-speed friction; stress waves in solids

Roger D. Quinn, Ph.D. (Virginia Polytechnic Institute and State University)
Arthur P. Armington Professor of Engineering
Biologically inspired robotics; agile manufacturing systems; structural dynamics, vibration and control

Clare M. Rimnac, Ph.D. (Lehigh University)
Associate Professor
Musculoskeletal Mechanics and Materials Laboratories
Biomechanics; fatigue and fracture mechanics

Chih-Jen Sung, Ph.D. (Princeton University)
Associate Professor
Combustion: propulsion; laser diagnostics

Fumiaki Takahashi, Ph.D. (Keio University)
Research Associate Professor
National Center of Microgravity Research for Fluids and Combustion
Combustion, fire research, laser diagnostics

James S. T’ien, Ph.D. (Princeton University)
Professor and Chief Scientist for Combustion National Center for Research for Fluids and Combustion
Combustion: propulsion, and microgravity fire research
AEROSPACE ENGINEERING

Aerospace engineering has grown dramatically with the rapid development of the computer in experiments, design and numerical analysis. The wealth of scientific information developed as a result of aerospace activity forms the foundation for the aerospace engineering major.
MECHANICAL ENGINEERING

Civilization as we know it today depends on the intelligent and humane use of our energy resources and machines. The mechanical engineer's function is to apply science and technology to the design, analysis, development, manufacture, and use of machines that convert and transmit energy, and to apply energy to the completion of useful operations. The top 10 choices of the millennium committee of the National Academy of Engineering, asked to select the 20 top engineering accomplishments of the 20th century, was abundant with mechanical engineering accomplishments: electrification (large-scale power generation and distribution), automobiles, air travel (development of aircraft and propulsion), mechanized agriculture, and refrigeration and air conditioning.

5-YEAR PROGRAMS OF STUDY

The department curriculum offers a five-year cooperative (co-op) education program and five-year combined bach-
elors-master’s programs. Co-op weaves
two seven-month industrial internships
into the normal four-year program by
combining a summer with either a fall
or spring semester to form the seven-
month industrial experiences. Students
apply to participate in the middle of the
sophomore year and nominally begin the
internship in the spring semester of the
junior year. After completing the second
internship, students return to campus in
the spring or fall to complete their final
year of study.

Alternative to the co-op five-year
program, is the year-year combined
bachelor’s/master’s program in which a
student can, by double counting nine
credit hours, complete a bachelor of sci-
ence degree in anyone of the department’s
three degree programs as well as a master
of science degree in mechanical and
aerospace engineering with a thesis by the
end of the fifth year. Application to this
program is initiated in the spring of the
junior year with the department’s gradu-
ate student programs office. A minimum
grade point of 3.2 is required for consid-
eration for this accelerated program.

A third alternative is the five-year TIME
program taught in conjunction with the
Weatherhead School of Management,

BACHELOR OF SCIENCE IN ENGINEERING DEGREE
Major in Fluid and Thermal Engineering Sciences

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 111 Properties and Structure of Matter I (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHYS 121 General Physics I a b (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming (2-2-3)</td>
<td></td>
</tr>
<tr>
<td>ENGL 150 Expository Writing (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities (0-3-0)</td>
<td></td>
</tr>
<tr>
<td>Total (17-5-18)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engr. II (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHYS 122 General Physics II a b (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>Humanities and Social Science or Open Elective (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 145 The Chemistry of Materials a (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities (0-3-0)</td>
<td></td>
</tr>
<tr>
<td>Total (15-3-15)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence I (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 200 Introduction to Mechanics a c (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 172 Mechanical Manufacturing a (3-3-4)</td>
<td></td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 250 Computers in Mechanical Engineering a (2-2-3)</td>
<td></td>
</tr>
<tr>
<td>Total (14-5-16)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence II (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 181 Dynamics a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>MATH 224 Elementary Differential Equations (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 225 Introduction to Fluid and Thermal Engr a (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>Science Elective a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total (16-0-16)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence III (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 325 Fluid and Thermal Engineering II (4-0-4)</td>
<td></td>
</tr>
<tr>
<td>EMAE 152 Thermodynamics II (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 282 Mechanical Engineering Lab I (1-3-2)</td>
<td></td>
</tr>
<tr>
<td>EMAE 350 Mechanical Engineering Analysis (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total (14-3-15)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence Elective (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 210 Electronic Circuits a (3-2-4)</td>
<td></td>
</tr>
<tr>
<td>EMAE 283 Mechanical Engineering Laboratory II (1-3-2)</td>
<td></td>
</tr>
<tr>
<td>EMAE 359 Aero/Gas Dynamics (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical Elective a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total (13-5-15)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Elective (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EECS 212 Intro to Signals, Systemsd, and Control I (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EECS 214 Signal and Systems Lab (0-2-1)</td>
<td></td>
</tr>
<tr>
<td>EMAE 355 Design of Fluid and Thermal Elements a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 360 Engineering Design (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical Elective a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total (15-2-16)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Elective (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 356 Aerospace Design (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 398 Senior Project a c (1-6-3)</td>
<td></td>
</tr>
<tr>
<td>ENGL 398N Professional Communication a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical Elective a (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Open Elective (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total (16-6-18)</td>
<td></td>
</tr>
</tbody>
</table>

Hours required for graduation: 129

a. Engineering Core Course
b. Selected students may be invited to take PHYS 123-124, General Phys-
ics I, II-Honors (3) in place of PHYS 121-122, General Physics I, II (4).
c. May be taken fall or spring semester.
in which a student completes a B.S. in aerospace, fluid and thermal, or mechanical engineering and receives a Master of Engineering Management.

GRADUATE PROGRAMS

Master of Science Program

Each M.S. candidate must complete a minimum of 27 hours of graduate-level credits. These credits can be distributed in one of two ways.

Students electing to take 18 hours of graduate-level courses and complete at least nine credit hours of M.S. thesis research.

Students complete 27 credit hours distributed in either of two ways 21 or 24 credit hours (seven or eight courses) of approved graduate course work and six or three credit hours of project replacing the M.S. thesis.

Master of Engineering Program

The Department of Mechanical and Aerospace Engineering participates in the practice-oriented Master of Engineering program offered by the Case School of Engineering. In this program, students

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Mechanical Engineering

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 111 Properties and Structure of Matter I........(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I........(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHYS 121 General Physics I b ................................(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming ..............(2-2-3)</td>
<td></td>
</tr>
<tr>
<td>ENGL 150 Expository Writing ................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities ....................(0-3-0)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(17-5-18)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engr. II .............(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHYS 122 General Physics II b ...............................(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>Humanities and Social Science or Open Elective ..........(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 145 The Chemistry of Materials c .....................(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities ....................(0-3-0)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(15-3-15)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence I ................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 200 Introduction to Mechanics a,c ..................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 172 Mechanical Manufacturing c ......................(3-3-4)</td>
<td></td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III ......(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 250 Computers in Mechanical Engineering c .........(2-2-3)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(14-5-16)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence II ................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 181 Dynamics c ............................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>MATH 224 Elementary Differential Equations ..............(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 225 Introduction to Fluid and Thermal Engr c ....(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>Science Elective c ...............................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(16-0-16)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Sequence III ...............(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 325 Fluid and Thermal Engineering II ...............(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>EMAE 282 Mechanical Engineering Lab I .....................(1-3-2)</td>
<td></td>
</tr>
<tr>
<td>ECIV 310 Strength of Materials c .........................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 350 Mechanical Engineering Analysis ................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(14-3-15)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Elective ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 210 Electronic Circuits c ..............................(3-2-4)</td>
<td></td>
</tr>
<tr>
<td>EMAE 271 Kinematic Analysis and Synthesis ...............(2-2-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 283 Mechanical Engineering Laboratory II ........... (1-3-2)</td>
<td></td>
</tr>
<tr>
<td>EMAE 370 Design of Mechanical Elements ..................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical Elective c ............................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(15-7-18)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Elective ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EECS 212 Intro to Signals, Systems, and Control I ......(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EECS 214 Signal and Systems Lab ...........................(0-2-1)</td>
<td></td>
</tr>
<tr>
<td>EMAE 355 Design of Fluid and Thermal Elements c ......(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 360 Engineering Design ................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EECS 352 Engr Econ, or Tech. Elec. .........................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(15-2-16)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Humanities or Social Science Elective ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical Elective ................................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>EMAE 398 Senior Project a,c ..................................(1-6-3)</td>
<td></td>
</tr>
<tr>
<td>ENGL 398N Professional Communication c ...................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>OPRE 345 Decision Theory or Tech Elect ........................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Total .................................................................(13-6-15)</td>
<td></td>
</tr>
</tbody>
</table>

Hours required for graduation: 129

a. Engineering Core Course
b. Selected students may be invited to take PHYS 123-124, General Physics I, II-Honors (3) in place of PHYS 121-122, General Physics I, II (4).
c. May be taken fall or spring semester.
The following list of technical electives has been established for both the Fluid and Thermal Engineering Sciences Program and the Mechanical Engineering Program. The courses must be selected to provide a minimum of two additional design credits for each program. Once the design credit minimum is met, the technical electives can be selected from the list of Approved Technical Electives for students of the department and must be approved by the student’s adviser to insure a coherent program of courses to meet the student’s professional objectives.

Design Electives

**Fluid and Thermal Engineering Science Program**
- EMAE 271 Kinematic Analysis and Synthesis
- EMAE 370 Design of Mechanical Elements

**Mechanical Engineering Program**
- EMAE 152 Thermodynamics II
- EMAE 356 Aerospace Design
- EMAE 359 Aero/Gas Dynamics

**All Programs**
- EMAE 372 Relation of Materials to Design
- EMAE 376 Aerostructures
- EMAE 378 Mechanics of Machinery I
- EMAE 387/487 Vibration Problems in Engr.
- EMAE 381 Flight and Orbital Mechanics
- EMAE 382 Propulsion

Technical Electives

**Aerospace**
- EMAE 356 Aerospace Design
- EMAE 359 Aero/Gas Dynamics
- EMAE 376 Aerostructures
- EMAE 381 Flight and Orbital Mechanics
- EMAE 382 Propulsion

**Biomechanics**
- EBME 201 Physiology-Biophysics I
- EBME 202 Physiology-Biophysics II
- EBME 306 Introduction to Biomedical Materials
- EBME 309 Modeling of Biomedical Systems
- EBME 310 Principles of Biomedical Instrumentation
- EMAE 366 Biologically Inspired Robotics
- EMAE 402 Muscles, Biomechanics and Control of Movement
- EMAE 415 Introduction to Musculo-skeletal Biomechanics

**Digital Electronics and Control**
- EECS 245 Electronic Circuits
- EECS 246 Circuits, Signals and Systems II
- EECS 304 Control Engr. I
- EECS 281 Logic Design and Computer Organization
- EECS 382 Microprocessor-based Design

**Dynamics and Vibration**
- EMAE 378/478 Mechanics of Machinery I
- EMAE 387/487 Vibration Problems in Engineering
- EMAE 479 Mechanics of Machinery II
- EMAE 481 Advanced Dynamics I
- EMAE 484 Mechanisms and Motion Synthesis

**Fluid and Thermal Engineering**
- EMAE 152 Thermodynamics II
- EMAE 359 Aero/Gas Dynamics
- EMAE 424 Intro to Nanotechnology
- EMAE 453 Advanced Fluid Dynamics I
- EMAE 460 Theory and Design of Fluid Power Machinery

**Fluid and Thermal Sciences**
- EMAE 453 Advanced Fluid Dynamics I
- EMAE 454 Advanced Fluid Dynamics II
- EMAE 455 Advanced Thermodynamics
- EMAE 457 Combustion

**Mathematics and Statistics**
- MATH 323 Advanced Calculus
- MATH 324 Introduction to Complex Analysis
- MATH 331 Computational Linear Algebra
- STAT 312 Statistics for Engr and Sci.
- STAT 333 Uncertainty in Engr and Sci

**Materials**
- EMSE 301 Fundamentals of Materials Processing
- EMSE 303 Mechanical Behavior of Materials
- EMSE 307 Foundry Metallurgy
- EMSE 313 Engineering Applications of Materials
- EMAE 473 Mechanical Behavior of Composite Materials
- EMAE 480 Fatigue of Materials

**Mechanical Design**
- EMAE 372 Relation of Materials to Design
- EMAE 471 Design Methods
- EMAE 472 Computers, Optimization and Design
- Mechanical Manufacturing
- EMAE 290 Computer Aided Manufacturing
- EMAE 390 Advanced Manufacturing
- EECS 350 Production and Operational Systems
- EECS 360 Manufacturing and Integrated Systems
- OPMT 350 Operations Management
- OPMT 352 Design of Production Systems
- OPRE 201 Introduction to Operations Research I

**Solid Mechanics**
- ECIV 220 Structural Analysis I
- ECIV 221 Structural Design I
- EMAE 372 Relation of Materials to Design
- EMAE 376 Aerostructures
- ECIV 410 Advanced Strength of Materials
- EMAE 473 Mechanical Behavior of Composite Material
- EMAE 480 Fatigue of Materials
complete a core program consisting of five courses, and select a four-course sequence in an area of interest.

Doctor of Philosophy Program

Students wishing to pursue the doctoral degree in mechanical and aerospace engineering must successfully pass the doctoral qualifying examination consisting of both written and oral components. Qualifying exams are offered on applied mechanics, dynamics and design or fluid and thermal engineering sciences. Students can choose to take it at the beginning of fall or spring semesters. The minimum course requirements for the Ph.D. degree are as follows:

**Depth Courses**

All programs of study must include six graduate-level mechanical courses in mechanical engineering or closely related engineering disciplines. Usually these courses follow a logical development of a branch of mechanics, dynamics and design or fluid and thermal engineering science determined in conjunction with the student’s thesis advisor to meet the objectives of the thesis research topic.

**Breadth and Basic Science Courses**

A minimum of six courses outside the department must be taken. These can be chosen from other engineering departments and the departments of mathematics and natural science. A minimum of two elective courses must be in mathematics.

**Thesis Research**

All doctoral programs must include a minimum of 18 credit hours of thesis research, EMAE 701.

**Residence and Teaching Requirements**

All doctoral programs require a minimum of one year of full-time residence in the program of study, three semesters of teaching experience, and must meet the rules of the School of Graduate Studies and the Case School of Engineering.

**FACILITIES**

The education and research philosophy of the Department of Mechanical and Aerospace Engineering for both the undergraduate and graduate programs is based on a balanced operation of analytical, experimental, and computational activities. All three of these tools are used in a fundamental approach to the professional activities of research, development, and design. Among the major assets of the department are the experimental facilities maintained and available for the faculty, students, and staff.

The introductory undergraduate courses are taught through the Robert M. Ward ‘41 Laboratory, the Reinberger Product and Process Development Laboratory, the Alden Laboratory for Numerically Controlled Machine Instruction and the General Motors Design Studio. The Ward Laboratory is modular in concept and available to the student at regularly scheduled class periods to conduct a variety of prepared experimental assignments. The lab is equipped with a variety of instruments ranging from classic analog devices to modern digital computer devices for the collection of data and the control of processes. Advanced facilities are available for more specialized experimental tasks in the various laboratories dedicated to each specific discipline. Most of these laboratories also house the research activities of the department, so students are exposed to the latest technology in their prospective professional practice. Finally, every undergraduate and graduate degree program involves a requirement, i.e., project, thesis or dissertation, in which the student is exposed to a variety of facilities of the department.

The following is a listing of the major laboratory facilities used for the advanced courses and research of the department.

**Biorobotics Laboratory Facilities**

The Biorobotics Laboratory consists of approximately 1,080 square feet of laboratory and 460 square feet of office space. The lab includes two CNC machines for fabrication of smaller robot components. The lab’s relationship with CAISR (Center for Automation and Intelligent Systems Research) provides access to a fully equipped machine shop where larger components are fabricated. The laboratory hardware features several biologically inspired cockroach-like robots including two cockroach-like robots, Robot III and Robot IV. Both are based on the Blaberus cockroach and have 24 actuated revolute joints. They are a 17 times larger than the insect (30 inches long). Robot IV is actuated with pneumatic artificial muscles. A compressed air facility has been installed to operate the robots. In addition, the lab contains structural dynamic testing equipment (sensors, DAQ boards, shakers) and an automated treadmill (five feet by six feet) for developing walking robots. The Biorobotics Laboratory contains 20 PCs, and a dedicated LAN connected to the campus. Algor Finite Element Analysis software, Mechanical Desktop, and Pro/Engineer are installed for mechanical design and structural analysis. Also, the lab has developed dynamic simulation software for analyzing walking animals and designing walking robots.

**Combustion Diagnostics Laboratory**

The combustion diagnostics laboratory is designed toward the experimental and computational investigation of combustion and propulsion phenomena to gain insights into efficient and environmentally friendly combustion. Research activities are conducted via state-of-the-art, non-intrusive, laser-based diagnostic techniques; computation with detailed chemistry and transport; and mathematical analysis of flame structure and dynamics, with strong coupling between the individual components. The laboratory is equipped to conduct laser diagnostics measurements, including Spontaneous Raman Spectroscopy, Planar Laser Induced Fluorescence, Raleigh Scattering, Coherent Anti-Stoke Raman Spectroscopy, and Particle Imaging Velocimetry. Current projects include laser diagnostics of reacting and non-reacting flows, aerodynamics and chemical structure of flames, ignition and flame stabilization in supersonic flows, development of reduced chemistry, soot and NOx formation, microgravity combustion, emission reduction in internal com-
bustion engines, and advanced propulsion systems.

Laser Flow Diagnostics Laboratory

A laser diagnostics laboratory is directed toward investigation of complex two-phase flow fields involved in energy-related areas, fluid mechanics of the heart, and slurry flow in pumps and spray characterization. The laboratory is equipped with state-of-the-art Particle Image Velocimetry (PIV) equipment, phase Doppler and laser Doppler anemometers and modern data acquisition and analysis equipment, including PCs. The laboratory houses a pulsatile flow loop simulating flow through the heart, a clear centrifugal slurry flow pump loop, and a particle laden jet facility simulating flow in fossil fuel flue gas flow conditions. Current research projects include investigation of flow through heart valves, development of simultaneous particle/droplet size and velocity measurement technique using PIV, development of innovative nozzles for sorbent laden flows for removal of toxins from flue gas, solid-slurry flow through centrifugal pump impellers.

The National Center for Microgravity Research on Fluids and Combustion

The mission of the National Center for Microgravity Research on Fluids and Combustion is to lead a national effort to increase both the number and quality of microgravity researchers. The center will perform the critical-path research in microgravity fluids and combustion sciences necessary to support the long-term human presence, development and exploration of space as well as to enhance life on earth by applying the resultant advances in human knowledge and technology acquired through experimentation in the space environment. The center is dedicated to research in fluid mechanics, heat transfer and combustion in micro-gravity, such as that found on shuttle flights, the International Space Station, and long-duration space flight. This activity is directed toward a fundamental understanding of thermocapillary flow, double-diffusive convection, convection in the float-zone crystal growth process, various types of combustion phenomena and spacecraft fire safety.

Mechanics of Materials Experimental Facility

The major instructional and research facility for experimental methods in mechanics of materials is the Daniel K. Wright, Jr. Laboratory. Presently, the facility houses a single-stage gas gun along with tension/compression split Hopkinson bar and torsional Kolsky bar apparatus for carrying out fundamental studies in dynamic deformation and failure of advanced materials. Hewlett Packard and Tektronix high-speed, wide-bandwidth digitizing oscilloscopes along with strain-gage conditioners and amplifiers are available for data recording and processing. The facility houses state-of-the-art laser interferometry equipment for making spatial and temporal measurements of deformation. High-speed Hg-Cd-Te detector arrays are available for making time-resolved, multi-point, non-contact temperature measurements.

A Schenck Pegasus digital servo-controlled hydraulic testing system with a 20Kip Universal testing load frame equipped with hydraulic grips and instrumentation is available for quasi-static mechanical testing under load or displacement control. A newly developed moirémicroscope is available for studying large-scale inelastic deformation processes on micron size scales. CCD camera along with the appropriate hardware/software for image-acquisition, processing and analyzing of full field experimental data from optical interferometers such as moiré microscope, photo-elasticity, and other laser-based spatial interferometers are available.

Rotating Machinery Dynamics and Tribology Laboratory

This laboratory focuses on rotating machinery monitoring and diagnostic methods relating chaos content of dynamic non-linearity and model-based observers’ statistical measures to wear and impending failure modes. A double-spool-shaft rotor dynamics test rig provides independent control over spin speed and frequency of an adjustable magnitude circular rotor vibration orbit for bearing and seal rotor-dynamic characterizations.

Simultaneous radial and axial time-varying loads on any type of bearing can be applied on a second test rig. Real-time control of rotor-mass unbalance at two locations on the rotor while it is spinning up to 10,000 rpm, simultaneous with rotor rubbing and shaft crack propagation, can be tested on a third rig. Self-excited instability rotovibrations can be investigated on a fourth test rig.

Musculoskeletal Mechanics and Materials Laboratories

These laboratories are a collaborative effort between the Department of Mechanical and Aerospace Engineering of the Case School of Engineering and the Department of Orthopaedics of the School of Medicine. The program has its origins in the pioneering research in musculoskeletal biomechanics of Dr. Victor Frankel and Dr. Albert Burstein, who began their research activities at the university in the 1960s. Research activities have ranged from basic studies of mechanics of skeletal tissues and skeletal structures, experimental investigation of prosthetic joints and implants, measurement of musculoskeletal motion and forces, and theoretical modeling of mechanics of musculoskeletal systems. Many studies are collaborative, combining the forces of engineering, biology, biochemistry, and surgery. The Biomechanics Test labs include Instron mechanical test machines with simultaneous axial and torsional loading capabilities, a non-contacting video extensometer for evaluation of biological materials and engineering polymers used in joint replacements, acoustic emission hardware and software, and specialized test apparatus for analysis of joint kinematics. An Orthopaedic Implant Retrieval Analysis lab has resources for characterization and analysis of hard tissues and engineering polymers, as well as resources to maintain a growing collection of retrieved total hip and total knee replacements that are available for the study of implant design. There are also a Soft Tissue-testing lab.
with several standard and special test machines, an Instrumentation Laboratory, and a Biomechanical Computations and Design lab.

Case Low-Speed Research Wind Tunnel

The Case Low-Speed Research Wind Tunnel has completed a major rebuilding effort during which flow quality, instrumentation, operability, flexibility, and noise and vibration levels, have been significantly improved. The tunnel provides very low freestream turbulence levels, making it suitable for highly sensitive boundary-layer stability experiments that require excellent flow quality. The tunnel is completely modular, allowing a variety of different experimental configurations to be realized, greatly extending the tunnel’s functionality.

The tunnel, originally constructed in the late 1940s, has undergone a rebuilding effort with the construction of a new test section, the replacement of the entire upstream half of the wind tunnel, the rebuilding of the drive section, and installation of a new drive motor and motor controller. The new upstream portion provides the incoming flow treatment necessary to produce a low freestream turbulence level. The improved drive section and motor increase the tunnel’s maximum speed while reducing noise and vibration levels. With these improvements, the tunnel now supports research of the highest quality.

Nanoengineering Laboratory

The Nanoengineering Laboratory focuses on research related to various nanotechnology applications with particular emphasis on energy conversion, generation and storage in nanostructured materials. Synthesis of polymer-based nanocomposites is accomplished with tools available in the laboratory. Furthermore, the laboratory houses various pieces of equipment for thermal and electrical characterization of materials, including nanostructures and nanocomposites. A high-resolution optical microscope with thin-film measurement capabilities is also available. Atomic-force microscopy (AFM) equipment is employed for local investigation of coupled mechanical, thermal and electrical characteristics of materials. The laboratory is also equipped with a high-end computer workstation for computational simulations of nanoscale phenomena. Current research projects include investigation of nanocomposites for thermoelectric devices, molecular simulation of thermal transport across interfacial regions, and biomimetic research on protein-based shark gel.

Other Experimental Facilities

The department facilities also include several specialized laboratories
- The GM Engines Laboratory is a modern facility for measuring the dynamic performance of internal combustion engines while monitoring behavioral parameters such as pressures, temperatures and exhaust emissions. The test cells can be operated completely by remote control with all data collected by digital computers.
- The Structural Dynamics Laboratory was developed with a grant from NSF and includes facilities for performing vibration and modal testing. This equipment includes laser vibrometers, accelerometers, electrodynamic shakers, computers and data-acquisition systems.
- In association with the Department of Electrical Engineering and Computer Science, the department has agile manufacturing facilities including flexible parts feeders of our design.
- Well-equipped, manned central shops and instrument rooms are available, as well as a controlled-environment room for experiments requiring extreme precision.

Graphical and Computational Facilities

The Computer-Aided Engineering Laboratory (CAEL) includes 18 Dell 500MHz Pentium III computers attached to a Dell dual 500 MHz Pentium III server, running Windows NT 4.0, via local area network running at 100 Mb/s. The CAEL provides access to a number of software packages. Some of these include Pro/Engineer, Release 2000i; Visual Fortran, Release 6.0; AutoCAD, Release 13; Matlab, Release 5.3; and Microsoft Office 2000 Professional. All of the laboratory’s computers are directly linked to the campus network giving students access to a large variety of software on different libraries across campus. The lab is open for student use seven days a week from 6 a.m. through midnight via card access.

The General Motors Design Studio includes 13 Dell 400MHz Pentium II workstations and 6 Net Power 233MHz Pentium II workstations. These machines are connected via local network to a Dell Dual 333MHz Pentium II server running Windows NT 4.0. The GM Lab is tied directly to the campus network allowing information to be shared with the CAEL. The GM Design Studio is used for instruction on Pro/Engineer CAD/CAM software, and offers a Rapid Prototyping Machine for creating wax models from Pro/Engineer models.

Supercomputing

The department has recently been awarded an 8-node, 32-processor Beowulf-class computing cluster by the Ohio Supercomputer Center. The cluster features libraries, compilers, and debuggers specifically designed for computationally intensive numerical simulations and parallel-code development. Extensive data-utilization tools are also available on the cluster. The department also has access to all NSF supercomputing centers, primarily the Pittsburgh and Ohio Supercomputing Centers. Research projects carried on in cooperation with NASA Glenn Research Center can have access to NASA computing facilities.

RESEARCH

The research in the department encompasses many areas of modern technology. Among them are:

Aerospace Technology and Transportation

Aerospace mechanics, aircraft aerodynamics (supersonic, supersonic and hypersonic), stability and transition of boundary layers and free shear layers, flow in turboma-
chine, molecular dynamics simulation of rarefied gas flow, two-phase flow, supersonic combustion and control of internal combustion engines

Combustion

Flame spread, microgravity combustion, fire research, chemical kinetic models and pollutant formation

Dynamics of Rotating Machinery

Forced and instability vibration of rotor/bearing/seal systems, nonlinear rotor dynamics, torsional rotor vibration, rotor dynamic characteristics of bearings and seals (computational and experimental approach), control of rotor system dynamics, rub-impact studies on bearings and compressor/turbine blading systems; advanced rotating machinery monitoring and diagnostics

Engineering Design

Optimization and computer-aided design, feasibility studies of kinematic mechanisms, kinematics of rolling element-bearing geometries, mechanical control systems, experimental stress analysis, failure analysis, and development of biologically inspired methodologies

Manufacturing

Agile manufacturing work cells developed to facilitate quick change over from assembly of one object to assembly of other objects contains multiple robots, a conveyor system and flexible parts feeders

Materials

Development of novel experimental techniques to investigate material response at elevated temperatures and high rates of deformation; constitutive modeling of damage evolution, shear localization and failure of advanced engineering materials; fabrication of mechanical properties of composite materials; creep, rupture, and fatigue properties of engineering materials at elevated temperatures

Microgravity Research

Gravitational effects on transport phenomena, fluids and thermal processes

in advance life support systems for long duration space travel, interfacial processes, g-jitter effects on microgravity flows; two phase flow in zero and reduced gravity. Combustion phenomena in microgravity, spacecraft fire safety

Multiphase Flow Research

Application of non-intrusive, laser-based diagnostic techniques to study solid-liquid, solid-gas, liquid-gas, and solid-liquid-gas, multiphase flows encountered in slurry transport, flue gas desulfurization processes, spray diagnostics and bio-fluidic mechanics

Orthopaedic Engineering

Kinematics and mechanical joint dynamics of the knee, hip, ankle, and spine; dynamic stability of the human spine; neuromuscular control; mechanics of injuries; gait analysis; design and failure analysis of medical prostheses and material selection; biomechanical measurements, tools and instrumentation; mechanical properties of bone and soft tissue

Robotics

Biologically inspired and biologically based design and control of legged robots; dynamics, control and simulation of animals and robots

Tribology

Time-resolved friction on nano- and microsecond time scale with applications to high-speed machining and mechanics of armor penetration; study of gas-lubricated foil bearing systems and magnetic bearing systems with application to oil-free turbomachinery; retainerless bearings for space applications such as long duration instrument and guidance systems and momentum wheels

Turbomachinery

Vibration characteristics of seals and bearings and measurement of chaotic motion; rub impact studies of blade tip/casing interactions, particle-blade/casing interactions in centrifugal pumps

MECHANICAL AND AEROSPACE ENGINEERING (EMAE)

Undergraduate Courses

EMAE 152. Thermodynamics II (3)
Thermodynamic properties of liquids, vapors and real gases, non-reactive mixtures, psychrometrics and reactive systems; combustion; thermodynamic cycles. Prereq: ENGR 225.

EMAE 170. Introduction to Mechanical Engineering (3)
Introduces beginning engineering student to how things work through an insightful overview of mechanical and aerospace engineering. Focus is on automobiles, airplanes and flight mechanics, turbomachinery and electric power generation, manufacturing methods, heating and air conditioning, rockets and space flight mechanics. Relevance of math, science and engineering fundamentals to well-founded B.S. engineering programs.

EMAE 172. Mechanical Manufacturing (4)
The course is taught in two sections (Graphics and Manufacturing Processes) through a series of lectures, laboratory sessions and weekly engineering workshop classes. The course aim is to provide a solid manufacturing engineering foundation. The course includes: manual and computer-aided drafting and design (CAD), primary and secondary engineering processes, engineering materials and a field trip to a local company. Laboratory sessions will provide hands-on experience using Pro/ENGINEER CAD software.

EMAE 181. Dynamics (3)
Elements of classical dynamics: particle kinematics and dynamics, including concepts of force, mass, acceleration, work, energy, impulse, momentum. Kinetics of systems of particles and of rigid bodies, including concepts of mass center, momentum, mass moment of inertia, dynamic equilibrium. Elementary vibrations. Prereq: MATH 122 and PHYS 121. ENGR 200 recommended.

EMAE 250. Computers in Mechanical Engineering (3)

EMAE 271. Kinematic Analysis and Synthesis (3)
Graphical, analytical, and computer techniques for analyzing displacements, velocities, and accelerations in mechanisms. Analysis and synthesis of linkages, cams, and gears. Laboratory projects include analysis, design, construction, and evaluation of student's mechanisms. Prereq: EMAE 181.

EMAE 282. Mechanical Engineering Laboratory I (2)
Techniques and devices used for experimental work in mechanical engineering and fluid and thermal science. Lectures on topics in the theory of experimentation. Laboratory includes typical experiments, measurements, analysis, and report writing. Prereq: EMAE 181 and ENGR 225.

EMAE 283. Mechanical Engineering Laboratory II (2)
Application of techniques developed in EMAE 282 to solution of individual semester-long experimental projects, including complete report on results. Prereq: EMAE 282.
EMAE 355. Design of Fluid and Thermal Elements (3)

EMAE 356. Aerospace Design (3)
Interactive and interdisciplinary activities in areas of fluid mechanics, heat transfer, solid mechanics, thermodynamics, and systems analysis approach to design of aerospace vehicles. Projects involve developing (or improving) design of aerospace vehicles of current interest (e.g., hypersonic aircraft) starting from mission requirements to research developments in relevant areas and using them to obtain conceptual design. Senior standing required.

EMAE 359. Aero/Gas Dynamics (3)

EMAE 360. Engineering Design (3)
The various elements of design: formulation, conceptualization, selection, and evaluation for the initiation of new designs and the modification of existing designs. Various design methodologies including optimization methods, search techniques, constrained gradient methods, penalty functions, statistical design methods, risk analysis, probabilities of failure, and computer applications. Prereq: ECIV 310.

EMAE 370. Design of Mechanical Elements (3)
Application of mechanics and mechanics of solids in machine design situations. Design of production machinery and consumer products considering fatigue and mechanical behavior. Selection and sizing of basic mechanical components: fasteners, springs, bearings, gears, fluid power elements. Prereq: ECIV 310 and EMAE 271.

EMAE 372. Relation of Materials to Design (4)
The design of mechanical and structural elements considering static failure, elastic stability, residual stresses, stress concentration, impact, fatigue, creep and environmental conditions on the mechanical behavior of engineering materials. Rational approaches to materials selection for new and existing designs of structures. Laboratory experiments coordinated with the classroom lectures. Prereq: ECIV 310.

EMAE 376. Aerostructures (3)

EMAE 378. Mechanics of Machinery I (3)
Comprehensive treatment of design analysis methods and computational tools for machine components. Emphasis is on bearings, seals, gears, hydraulic drives and actuators, with applications to machine tools. Prereq: EMAE 370.

EMAE 379. Mechanics of Machinery II (3)
The focus of this course is Rotating Machinery Vibration, and it is comprised of four major components: 1) modeling, 2) analyses, 3) measurement techniques, and 4) physical insights into rotor vibration phenomena. Prereq: EMAE 181.

EMAE 381. Flight and Orbital Mechanics (3)
Aircraft performance: take-off and landing, unaccelerated flight, range and endurance, flight trajectories, static stability and control, simple maneuvers. Orbital mechanics: the solar system, elements of celestial mechanics, orbit transfer under impulsive thrust, continuous thrust, orbit transfer, decay of orbits due to drag, elements of lift-off and re-entry. Prereq: ENGR 225. EMAE 359 suggested.

EMAE 382. Propulsion (3)

EMAE 387. Vibration Problems in Engineering (4)

EMAE 390. Computer-Integrated Manufacturing (3)
The course is taught through a series of lectures, class discussions, group projects, and laboratory sessions. The course aim is to provide a solid understanding of the many aspects of the engineering processes and systems associated with the integration of product design through to manufacture. Laboratory sessions will provide hands-on experience using a number of Pro/ENGINEER modules to become aware of the integration of manufacturing issues. Prereq: EMAE 290.

EMAE 396. Special Topics in Mechanical and Aerospace Engineering I (1-18)
(Credit as arranged.) Prereq: Consent of instructor.

EMAE 397. Special Topics in Mechanical and Aerospace Engineering II (1-18)
(Credit as arranged.) Prereq: Consent of instructor.

EMAE 398. Senior Project I (3)
Individual or team design or experimental project under faculty supervisor. Prereq: Senior standing, EMAE 360, and consent of instructor.

EMAE 399. Senior Project II (3)
Continuation of EMAE 398.

Graduate Courses

EMAE 400T. Graduate Teaching I (0)
This course will engage the Ph.D. candidate in a variety of teaching experiences that will include direct contact (for example, teaching recitations and laboratories, guest lectures, office hours) as well non-contact preparation (exams, quizzes, demonstrations) and grading activities. The teaching experiences will be conducted under the supervision of the faculty member(s) responsible for coordinating student teaching activities. All Ph.D. candidates enrolled in this course sequence will be expected to perform direct contact teaching at some point in the sequence. Prereq: Ph.D. student in Mechanical Engineering.

EMAE 401. Mechanics of Continuous Media (3)
Vector and tensor calculus. Stress and traction, finite strain and deformation tensors. Kinematics of continuous media, general conservation and balance laws. Material symmetry groups and observer transformation. Constitutive relations with applications to solid and fluid mechanics problems.

EMAE 402. Muscles, Biomechanics, and Control of Movement (4)

EMAE 403. Aerodynamics (3)
The course introduces the physical and chemical topics of basic importance in modern fluid mechanics, plasma dynamics, and combustion sciences: statistical calculations of thermodynamic properties of gases; quantum mechanical analysis of atomic and molecular structure; transport phenomena; propagation, emission, and absorption of radiation; chemical and physical equilibrium; adiabatic flame temperatures of complex reacting systems; and reaction kinetics.

EMAE 404. Molecular Gasdynamics (3)
This course first discusses the basic kinetic theory model of a gas, including the essential physical ideas and some of the important fundamental results (equilibrium state, entropy, transport coefficients). The major emphasis of the course is on computer simulation methods, especially molecular dynamics and Monte-Carlo methods. A variety of applications is discussed, including basic fluid flows, low earth orbit flight, gas-surface interaction, and nanoscale devices.

EMAE 415. Introduction to Musculo-skeletal Biomechanics (3)
Structural behavior of the musculo-skeletal system. Function of joints, joint loading, and lubrication. Stress-strain properties of bone and connective tissue.

EMAE 424. Introduction to Nanotechnology (3) An exploration of emerging nanotechnology research. Lectures and class discussion on 1) nanostructures: superlattices, nanowires, nanotubes, quantum dots, nanoparticles, nanocomposites, proteins, bacteria, DNA; 2) nanoscale physical phenomena: mechanical, electrical, chemical, thermal, biological, optical, magnetic; 3) nanofabrication: bottom up and top down methods; 4) characterization: microscopy, property measurement techniques; 5) devices/applications: electronics, sensors, actuators, biomedicine, energy conversion. Topics will cover interdisciplinary aspects of the field. Cross-listed as ECES 424.

EMAE 453. Advanced Fluid Dynamics I (3) Derivation and discussion of the general equations for conservation of mass, momentum, and energy using tensors. Several exact solutions of the incompressible Newtonian viscous equations. Kinematics and dynamics of inviscid, incompressible flow including free streamline theory developed using vector, complex variable, and numerical techniques.


EMAE 457. Combustion (3) Chemical kinetics and thermodynamics; governing conservation equations for chemically reacting flows; laminar premixed and diffusion flames; turbulent flames; ignition; extinction and flame stabilization; detonation; liquid droplet and solid particle combustion; flame spread, combustion-generated air pollution; applications of combustion processes to engines, rockets, and fire research.

EMAE 458. Propulsion (3) Energy sources of propulsion. Momentum theorems and performance criteria. Air breathing systems and their components; chemical rockets—liquid and solid propellant; nuclear rockets—solid core, liquid core and gaseous core; rocket heat transfer and heat protection; electric propulsion—electrothermal, electrostatic and plasma thrusters; thermonuclear propulsion. Prereq: Consent of instructor.

EMAE 459. Advanced Heat Transfer (3) Analysis of engineering heat transfer from first principles including conduction, convection, radiation, and combined heat and mass transfer. Examples of significance and role of analytic solutions, approximate methods (including integral methods) and numerical methods in the solution of heat transfer problems. Prereq: EMAE 453.

EMAE 460. Theory and Design of Fluid Power Machinery (3) Fluid mechanic and thermodynamic aspects of the design of fluid power machinery such as axial and radial flow turbomachinery, positive displacement devices and their component characterizations. Prereq: Consent of instructor.

EMAE 471. Design Methods (3) An advanced course on design methodologies. Conceptualization, preliminary design, detail design, and manufacturing. Failure analysis, materials selection, methods of design optimization, and current approaches in computer-aided design. Prereq: EMAE 360.

EMAE 478. Mechanics of Machinery I (3) (See EMAE 378.)

EMAE 479. Mechanics of Machinery II (3) A comprehensive treatment of design analysis methods and computational tools for machine components. Emphasis is on vibration and machinery dynamics.


EMAE 490. World-Class Manufacturing (3) The course is taught through a series of lectures, class discussions, and group projects. The course aim is to provide a solid understanding of the changing technologies and management strategies for companies to maintain competitive advantage in an increasingly global market. Issues such as ‘Order Winning Criteria,’ ‘Lean Manufacturing,’ and ‘Cellular Manufacturing’ will be reviewed and guest speakers will be invited to give an industrial perspective on specific topics of the course. Prereq: EMAE 290, EMAE 390 or permission of instructor.

EMAE 500T. Graduate Teaching II (0) This course will engage the Ph.D. candidate in a variety of teaching experiences that will include direct contact (for example, teaching, recitations and laboratories, guest lectures, office hours) as well as non-contact preparation (exams, quizzes, demonstration) and grading activities. The teaching experience will be conducted under the supervision of the faculty member(s) responsible for coordinating student teaching activities. All Ph.D. candidates enrolled in this course sequence will be expected to perform direct contact teaching at some point in the sequence. Prereq: Ph.D. student in Mechanical Engineering.


EMAE 550. Neuromechanics Seminar (0) (See EBME 550.) Cross-listed as EBME 550.

EMAE 552. Viscous Flow Theory (3) Compressible boundary layer theory; Blowing and suction effects. Three-dimensional flows; unsteady flows. Introduction to real gas effects. Prereq: EMAE 454.


EMAE 557. Convection Heat Transfer (3) Energy equation of viscous fluids. Dimensional analysis. Forced convection; heat transfer from non-isothermal and unsteady boundaries, free convection and combined free and forced convection; stability of free convection flow; thermal instabilities. Real gas effects, combined heat and mass transfer; ablation, condensa- tion, boiling. Prereq: EMAE 453 and EMAE 454.

EMAE 558. Conduction and Radiation (3) Fundamental law, initial and boundary conditions, basic equations for isotropic and anisotropic media, related physical problems, steady and transient temperature distributions in solid structures. Analytical, graphical, numerical, and experimental methods for constant and variable material properties. Prereq: Consent of instructor.


EMAE 600T. Graduate Teaching III (0)
This course will engage the Ph.D. candidate in a variety of teaching experiences that will include direct (for example, teaching recitations and laboratories, guest lectures, office hours) as well non-contact preparation (exams, quizzes, demonstrations) and grading activities. The teaching experience will be conducted under the supervision of the faculty member(s) responsible for coordinating student teaching activities. All Ph.D. candidates enrolled in this course sequence will be expected to perform direct contact teaching at some point in the sequence. Prereq: Ph.D. student in Mechanical Engineering.

EMAE 601. Independent Study (1-18)
EMAE 651. Thesis M.S. (1-18)

EMAE 655. Theories of Hydrodynamic Stability (3)
Stability of parallel flows: general development with application to channel flows and boundary layer flows; magnetohydrodynamic parallel flows; rotating Couette flow; superposed fluids; thermal instability of fluids heated from below; non-linear considerations. Prereq: EMAE 454.

EMAE 657. Experimental Techniques in Fluid and Thermal Engineering Sciences (3)
Exposure to experimental problems and techniques provided by the planning, design, execution, and evaluation of an original project. Lectures: review of the measuring techniques for flow, pressure, temperature, etc.; statistical analysis of data: information theory concepts of instrumentation; electrical measurements and sensing devices; and the use of digital computer for data acquisition and reduction. Graduate standing or consent of instructor required.

EMAE 689. Special Topics (1-18)
EMAE 701. Dissertation Ph.D. (1-18)
EMAE 703. Dissertation Fellowship (1-8)

EMAE C100. Co-Op Seminar I for Mechanical Engineering (1)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 001.

EMAE C200. Co-Op Seminar II for Mechanical Engineering (2)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 002 and EMAE C100.
The College of Arts and Sciences houses educational and research programs in the arts, humanities, social sciences, physical and biological sciences, and mathematics. Students in the College can choose a major or minor from almost 60 undergraduate programs, design their own courses of study, or enroll in integrated bachelor’s/master’s degree programs. The College is also responsible for a significant portion of the educational experiences of undergraduates in the Case School of Engineering, the Weatherhead School of Management, and the Frances Payne Bolton School of Nursing. Finally, the College offers graduate programs in several fields where Case’s small size and special expertise allow it to make a distinctive contribution to advanced education and research.

The College is organized into 22 academic departments and several interdisciplinary programs and centers, including Childhood Studies, International Studies, Evolutionary Biology, History and Philosophy of Science, and Women’s Studies. Undergraduates as well as graduate students are encouraged to conduct independent research, in their chosen fields or related ones, within the College, in other units of the University, or in nearby medical and cultural institutions. The academic experience can extend into the community in the form of service-learning projects as well as student practica and internships in research institutions, businesses, cultural institutions, and governmental agencies.

The College’s curricular offerings are enhanced by its affiliations with other University Circle institutions, including the Cleveland Museum of Art, the Cleveland Orchestra, the Cleveland Museum of Natural History, the Cleveland Institute of Music, the Western Reserve Historical Society, the Children’s Museum, the Cleveland Institute of Art, and the Cleveland Playhouse. The College itself offers many arts presentations, lecture series, and symposia, both within academic departments and through its Office of Interdisciplinary Programs and Centers. It also provides ample opportunities for students to participate in musical, theater, and dance performances.

In addition to in-depth study of one or more major (or minor) fields, undergraduates in the College complete a general education curriculum that is designed to foster communication skills, critical thinking, an appreciation of cultural history, richness and diversity, and an understanding of experimental and theoretical approaches to scientific knowledge. In the fall of 2004, entering first-year students may be selected to participate in the pilot phase of a new general education curriculum, SAGES (Seminar Approach to General Education and Scholarship). SAGES includes a series of three small, interdisciplinary seminars taken in the first and second years; a discipline-based seminar, usually in a student’s major field, taken in the third year; and a senior capstone experience. The first-year seminars give special emphasis to writing skills, information literacy, quantitative reasoning, and ethical decision-making. Beginning in the fall of 2005, all entering first-year students will be enrolled in SAGES.

ALUMNI/SENIOR AUDIT

Molly W. Berger, Assistant Dean
www.case.edu/artssci/audit

The Alumni/Senior Audit is a program sponsored by the College of Arts and Sciences that enables Case Western Reserve University alumni of all ages and members of the community age 65 years and older to audit regular College of Arts and Sciences classes for ten percent of regular tuition. Audit enrollment is limited to ten percent of Case student enrollment and is subject to approval by the specific faculty teaching the course. Auditors do not receive a grade or credit. Courses taken through the audit do not appear on existing transcripts nor do they generate transcripts for students new to the university. Complete information is available on the Alumni/Senior Audit website.

INTERDISCIPLINARY CENTERS

Baker-Nord Center for the Humanities
Timothy K. Beal, Director; Marie Lathers, Associate Director

The Baker-Nord Center for the Humanities, established in 1996, works to raise the profile of the humanities and performing arts disciplines at CASE, both on campus and in the Cleveland community. It provides a forum for presentation of faculty work, facilitates and encourages conversation and collaboration among faculty and students, with colleagues in the sciences and social sciences, and through joint programs with other University Circle institutions. It sponsors conferences, colloquia, seminars, lectures, and other special events, fosters collegiality, and provides a home for new research and intellectual ventures in the humanities. The Center also offers grants and fellowships to Case Western Reserve faculty and students in the humanities, and to Case faculty in the natural, medical, and social sciences working with issues related to the humanities.

Center for Science and Mathematics Education

The Center for Science and Mathematics Education was established in 1998 to serve as a clearinghouse for the preK-12 education outreach programs in the College and to provide a local base for the national JASON Project, an annual expedition-based science and technology curriculum for middle and high school students. The role of the Center has grown and it now also serves as the administrative home for the Northeast
Ohio Regional Science Olympiad and the NSF-funded Cleveland Mathematics and Science Partnership. The Center supports the more than 75 events, competitions, and professional development programs throughout the University. The Center serves as a single point of access to these and other resources at the University and acts as a catalyst in the development of new programs.

College Scholars Program
Jonathan Sadowsky, Director
www.cwru.edu/artsci/scholars/

The College Scholars Program, instituted in 1997, is a three-year academic enhancement program open to undergraduates interested in forming a community of learners dedicated both to excellence in individual intellectual pursuits and applying classroom learning to larger world concerns. The program emphasizes broad interdisciplinary learning beyond the requirements of professional or disciplinary competence, connection of academic learning to the larger society, and development of a sense of the relationship between service and leadership. The scholars collaborate with faculty in the design, operation, and evaluation of the curriculum. The program takes up the equivalent of one course for each of six semesters.

Samuel Rosenthal Center for Judaic Studies
Peter Haas, Director
www.cwru.edu/artsci/rosenthal/

The Samuel Rosenthal Center for Judaic Studies, funded by a gift from the Samuel Rosenthal Foundation, was established in 1996 to broaden the scope of the University’s Jewish Studies curriculum and to strengthen interest in Judaic Studies on campus and throughout the local, national, and international communities. To this end, the center supports a variety of initiatives, including visiting professorships, guest lectures, student scholarships and prizes, Hebrew language instruction, and the acquisition of library materials.

Schubert Center for Child Development
Jill Korbin, Co-Director
Richard Settersten, Co-Director
www.cwru.edu/artsci/schubert/

The Schubert Center for Child Development supports multidisciplinary research and education on children and childhood at Case Western Reserve University. Initiatives of the SCCD promote understanding of child development from infancy through adolescence, and in local, national, and international contexts. The primary goals of the Schubert Center are to support basic and applied research on children and childhood; to promote interdisciplinary connections for research and education at Case Western Reserve and in the community; and to disseminate new research findings through conferences, lectures, and the SCCD newsletter and website.

American Studies Program
206 Mather House
Renee Sentilles, Director

The American Studies program is designed to give students the flexibility to cross traditional intellectual boundaries in order to develop perspectives on American life that are more expansive and critical than those normally found within the limits of a single discipline. The interdisciplinary approach makes available a wide variety of materials, methods, theories and themes to use as tools to investigate the complexities of the American past and present. The process is as important as the outcome, teaching students to analyze with breadth as well as depth, to think creatively as well as critically.

American studies will enrich any primary major and offers interdepartmental concentrations to students with interests in areas such as women's studies. Students will take required core courses and work with the director to select elective courses and create their own individual approach to the major.

What can you do with a degree in American Studies? Just about anything. The interdisciplinary nature of American Studies encourages the kind of initiative and creative thinking that gives our majors an advantage in later life. American Studies provides excellent preparation for planning careers in a variety of fields, including but not limited to law, journalism, social work, museum studies, teaching, and communications.

AMERICAN STUDIES STEERING COMMITTEE
Renee M. Sentilles, Ph.D. (College of William and Mary)
Assistant Professor of American History
American social and cultural history; American Women's history; Race relations; American West; American South; popular culture.
Henry Adams, Ph.D. (Yale University)
Professor of American Art; Curator of American Art, Cleveland Museum of Art
American Art of the 19th and early 20th centuries
Eleanor P. Stoller, Ph.D. (Washington University)
Selah Chamberlain Professor of Sociology
Aging and the Life Course, Medical Sociology, Social Inequality, work and family
Alexander P. Lamis, Ph.D. (Vanderbilt), J.D. (University of Maryland Law School)
Associate Professor of Political Science
American government and politics; elections and political parties, public opinion and constitutional law

UNDERGRADUATE PROGRAMS

Major
30 credit hours

Required courses (12 hours): AMST 117, HSTY 112, AMST 390, and one of the following courses: ARTH 270, HSTY 381, SOC 349.

Elective Courses (18 hours): Students are to choose 18 hours in consultation with the director of the program.

The major requires four core courses (three in American studies, one in history) and six courses (18 hours) in two areas of concentration. An area of concentration consists of either 1) courses in a single department, or 2) courses from
more than one department focusing on a theme or issue such as technology and culture, urban studies, literature and society, etc. The student will work out a program of study in consultation with the program director.

Minor

A minor consists of five courses: the intro class and four electives that focus on a significant period, problem area, or aspect of American civilization. The rationale for selecting such a minor program, and its relation to the student’s career or intellectual interests, must be discussed with and approved by the minor advisor.

General Education Requirements

The following American studies courses may be used to satisfy the History, Philosophy, and Religion portion of the college’s General Education Requirements:

AMST 117.

Departmental Honors in American Studies

Majors with a cumulative average of 3.85 in American Studies courses are nominated by the faculty for departmental honors. Candidates present to the faculty a term paper or project of outstanding quality as the basis for the award of honors.

AMERICAN STUDIES (AMST)

Undergraduate Courses

AMST 117. Introduction to American Studies (3)
This course is designed to introduce students to the interdisciplinary field of American Studies while also empowering them to use the tools and perspectives of several disciplines, such as history, literature, art, history, and anthropology. This course aims to introduce students to the various disciplines that constitute American Studies while paying special attention to the ways in which these disciplines can work together to illuminate the study of American cultures, past and present. Students will combine different methodologies in the process of completing assignments designed to make use of a variety of University Circle institutions. For the purposes of this course, biography is treated as a constructed genre that comes in a variety of forms, including autobiography, biographical novels, oral histories, and film. The class will focus on how certain biographies have created archetypal American identities, and how gender/race/class/historical context, etc. have affected the writing and reading of biography and restructured notions of identity. Cross-listed as HSTY 117.

AMST 270. American Art and Culture Before 1900 (3)
(See ARTH 270.) Cross-listed as ARTH 270.
AMST 271. American Art and Culture - 20th Century (3)
(See ARTH 271.) Cross-listed as ARTH 271.
AMST 327. American Theater and Playwrights (3)
Designed to provide students an overview of the development of theater in the United States and to familiarize them with the work and themes of selected American playwrights. Cross-listed as THTR 327.
AMST 390. Independent Study (1-3)
AMST 550. American Studies Research Seminar (3)
AMST 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)
AMST 703. Dissertation Fellowship (1-8)

Department of Anthropology

238 Mather Memorial Building
Phone 216-368-2264; Fax 216-368-5334
Thomas Csordas, Chair

Anthropology, with its broad comparative approach, is in a strategic position to contribute to the identification and resolution of many of the problems that challenge society today. The Department of Anthropology offers programs leading to both undergraduate (Bachelor of Arts) and graduate (Master of Arts, Doctor of Philosophy, and combined Doctor of Medicine-Doctor of Philosophy, and Master of Arts/Doctor of Philosophy in Anthropology-Master of Public Health, and Master of Science in Nursing-Master of Arts) degrees. Students graduating with a B.A. in anthropology normally must continue for the M.A. or Ph.D. degree if they are interested in working as anthropologists.

FACULTY

Thomas Csordas, Ph.D. (Duke University)
Professor of Anthropology and Religion and Chair

Psychological anthropology; medical anthropology; comparative religion; anthropological theory; language and culture; American Indian cultures; United States.

Cynthia Beall, Ph.D. (Pennsylvania State University)
Sarah Idell Pyle Professor; Co-Director, Center for Research on Tibet

Physical anthropology; human growth, development and aging; human ecology; nomads; Andes, Tibet, Himalayas; Mongolia.

Rachel R. Chapman, Ph.D. (University of California, Los Angeles)
Assistant Professor
Social cultural anthropology; urban health, racial and ethnic disparities in health, reproductive health; gender systems; women’s health; political economy; medical anthropology; medical pluralism; applied international health; Africa, Mozambique, United States.

Awood D. Gaines, Ph.D. (University of California, Berkeley), M.P.H. (University of California, Berkeley, School of Public Health)
Professor; Professor of Nursing, Frances Payne Bolton School of Nursing; Professor of Psychiatry and Professor of Biomedical Ethics, School of Medicine
Medical and psychiatric anthropology; religion; aging; cultural studies of science; bioethics; social identity; United States, the Mediterranean.

Melvyn C. Goldstein, Ph.D. (University of Washington)
John Reynolds Harkness Professor; Co-Director, Center for Research on Tibet
Social cultural anthropology; development; population anthropology; cross-cultural aging; cultural ecology, ethnicity and nationalism; anthropology and history; Tibet, China, Mongolia, Himalayas.

Lawrence P. Greksa, Ph.D. (Pennsylvania State University)
Professor
Physical anthropology; human biology; growth and development; nutrition; modernization; Polynesia; Andes; Old Order Amish

T.S. Harvey, Ph.D. (University of Virginia)
Assistant Professor
Linguistic anthropology; Maya language; ethnography of communication; language use in health care; biomedical globalization; Mesoamerican cultures, religion, the body and embodiment, and culture theory.

Charlotte Ikels, Ph.D. (University of Hawaii)
Professor
Gerontology; healthcare; urban life; comparative bioethics; Hong Kong, China, United States.

Janis Hunter Jenkins, Ph.D. (University of California, Los Angeles)
Professor; Professor Psychiatry, School of Medicine
Medical and psychological anthropology; culture and feminist theory; schizophrenia, depression, trauma; political violence; refugees and immigrants; Latinos; Euro-Americans; Central America, North America, the Caribbean.

Jill E. Korbin, Ph.D. (University of California, Los Angeles)
Professor; Associate Dean of Arts and Sciences; Director, Childhood Studies; Co-Director, Schubert Center for Child Development
Cultural and medical anthropology; cross-cultural child rearing and family studies; child abuse and neglect; family violence; neighborhood; United States; Old Order Amish.

Janet McGrath, Ph.D. (Northwestern University)
Associate Professor; Director of Graduate Programs; Assistant Professor of International Health, School of Medicine
Biological and biomedical anthropology; anthropology of disease; international health; AIDS, urban health; United States, Africa.

James Pfeiffer, Ph.D., M.P.H. (University of California, Los Angeles)
Assistant Professor
Medical anthropology; international health; political economy; nutritional anthropology; development studies; applied anthropology; Southern Africa; Central America; Mozambique

Jim Shaffer, Ph.D. (University of Wisconsin, Madison)
Assistant Professor
Archaeology, Middle East; Central Asia; Indus Valley, India.

Adjunct Faculty
Katia Almeida, Ph.D. (Federal University of Rio Janeiro)
Adjunct Associate Professor
Cultural and social anthropology; art and aesthetics in cross-cultural perspective; Amazonian ethnology; Latin American studies.

Robbie Davis-Floyd, Ph.D. (University of Texas at Austin)
Adjunct Associate Professor
Medical anthropology; women's studies; symbolic anthropology; science and technology studies; futures research; U.S., Mexico, Brazil.

Sharon Dean, Ph.D. (New School University)
Adjunct Assistant Professor

Photography and anthropology; Great Basin and California basketry; West Africa.

N’omi Greber, Ph.D. (Case Western Reserve University)
Adjunct Associate Professor; Curator of Archaeology, Cleveland Museum of Natural History
Computer and remote sensing applications; early/middle Woodland; eastern U.S.; archaeology, prehistory of eastern North America; prehistoric social organization; Shawnee ethnohistory.

Yohannes Haile-Selassie, Ph.D. (University of California, Berkeley)
Adjunct Assistant Professor
Curator/Head of Physical Anthropology, Cleveland Museum of Natural History
Human evolution.

Bruce Latimer, Ph.D. (Kent State University)
Adjunct Assistant Professor; Executive Director, Cleveland Museum of Natural History
Biological anthropology; Plio-Pleistocene hominin evolution; comparative primate anatomy; biomechanics of locomotor system

Ellen S. Lazarus, Ph.D. (Case Western Reserve University)
Adjunct Assistant Professor, MetroHealth Medical Center
Sociocultural and medical anthropology; maternal and child health, gender, ethnicity and social class, medical ethics and education, and urban anthropology; longitudinal reproductive patterns of childbirth including birth outcomes, family planning and patient assessment of perinatal healthcare.

Jeffrey Longhofer, Ph.D. (University of Kansas)
Adjunct Associate Professor
Medical anthropology, mental health, applied anthropology; gender and sexuality, philosophy of social science/theory.

Isabel Parraga, Ph.D. (Case Western Reserve University)
Adjunct Assistant Professor; Associate Professor of Nutrition
Nutritional anthropology; international nutrition; nutrition and growth; maternal and child nutrition; schistosomiasis and growth and nutrition; public health nutrition.

Brian Redmond, Ph.D. (Indiana University)
Adjunct Associate Professor; Director of Science, Collections and Research; Curator and Head of Archaeology, Cleveland Museum of Natural History
North American prehistory, Eastern Woodland settlement patterns, ceramic analysis, museum archaeology.

Christina Saunders Sturm, Ph.D. (Case Western Reserve University)
Adjunct Assistant Professor
Chronic illness; anthropology of infectious diseases; HIV/AIDS.

Scott Simpson, Ph.D. (Kent State University)
Adjunct Associate Professor; Associate Professor, Department of Anatomy, School of Medicine
Biological Anthropology, Plio-Pleistocene hominin evolution.

Medical Anthropologists in Other Departments

Patricia A. Marshall, Ph.D. (University of Kentucky)
Adjunct Associate Professor
Associate Professor Biomedical Ethics, Center for Biomedical Ethics.
Bioethics; HIV/AIDS.

UNDERGRADUATE PROGRAM

Major

The undergraduate major requires a minimum of 36 semester hours in anthropology. The undergraduate program provides a cross-cultural perspective on human behavior, culture, and biology. Students study other cultures as well as their own. Students may choose from four major concentrations, or may consult with the department to tailor the major to their individual interests and goals.

The general anthropology concentration includes three subdisciplines of anthropology. The first, sociocultural anthropology, emphasizes relationships among socioeconomic institutions, cultural ecology, health and medicine, religion and symbolism, individual psychological variables, and language. The second, physical and biological anthropology, emphasizes human ecology and adaptability, human growth and development, nutritional adaptation, epidemiology, and human and nonhuman primate evolution. The third, archaeology, deals with the long sequences of independent sociocultural, technological, and ecological evolution that have taken place under diverse conditions.
Paleoanthropology documents the biology and environment interact. Students learn about the three subdisciplines discussed above, but with a focus on their relationship to physical and mental health, illness, disease, and medicine. Archaeology anthropology concentration reconstructs the customs and daily life of people who lived in the past by excavating and analyzing the material remains of the sites of human occupation. At the same time, archaeology seeks to understand the evolution of culture and society by determining how and why changes in human society occurred over the past 5 million years that our species has inhabited the earth.

Physical anthropology concentration deals with the biological nature of humans past and present. The physical anthropologist looks beyond purely biological phenomena to understand how biology, behavior and environment interact.

Paleoanthropology documents the biological history of humans and, in conjunction with archaeology, analyzes those relationships for past humans. Human biology studies physiology, genetics, nutrition and epidemiology in modern human populations throughout the world in order to understand those relationships.

The anthropology scholars' concentration permits highly qualified and motivated Anthropology majors, with well-defined interests and goals that could be met by an alternative course sequence, to tailor an individual program of study.

**General Anthropology Concentration**

ANTH 102 and 103
ANTH 319

One course dealing with a geographic area (e.g., ANTH 330, 331, 341, 352, 353, 356, or 357)

At least three courses dealing with health-related topics (e.g., ANTH 301, 304, 306, 309, 318, 351, 359, 365, 369, 371, 376, 393, or 397)

Approved anthropology electives: 12 semester hours

**Archaeology Anthropology Concentration**

ANTH 102, 103, and 107
ANTH 319

One course dealing with a geographic area (e.g., ANTH 202, 330, 331, 341, 352, 353, 356, or 357)

Three approved archaeology courses: ANTH 202, 321, 324, 330, 331, 333, 399, summer fieldwork

Four approved electives: 12 semester hours

**Physical Anthropology Concentration**

ANTH 102 and 103
ANTH 319

One course dealing with a geographic area (e.g., ANTH 330, 331, 341, 352, 353, 356, or 357)

At least three courses dealing with physical anthropology (e.g., ANTH 295, 301, 302, 369, 393, 397, ANAT 375, 377, 383)

Approved anthropology electives: 15 semester hours

**Minor**

The department offers four minor emphases in anthropology: a general anthropology emphasis, a health science-oriented anthropology emphasis, an archaeological anthropology emphasis, and a physical anthropology emphasis. All require a minimum of 15 semester hours in anthropology.

**General Anthropology Minor**

ANTH 102 and 103
ANTH 319

One course dealing with a geographic area (e.g., ANTH 330, 331, 341, 352, 353, 356, or 357)

At least three courses dealing with health-related topics (e.g., ANTH 301, 304, 306, 309, 318, 351, 359, 365, 369, 371, 376, 393, or 397)

**Archaeology Anthropology Minor**

ANTH 102, 103, and 107

One course dealing with a geographical area (e.g., ANTH 330, 331, 341, 352, 353, 356, or 357)

One approved archaeology elective: ANTH 202, 321, 330, 331, 333, 399, summer fieldwork

**Physical Anthropology Minor**

ANTH 102 and 103

One course dealing with a geographical area (e.g., ANTH 330, 331, 341, 352, 353, 356, or 357)

Two approved physical anthropology electives: ANTH 295, 301, 302, 369, 393, 397, ANAT 375, 377, 383

**Engineering Core**

A social science sequence for the B.S. based on the Engineering Core requires ANTH 102 or 103 and two other courses of which at least one must be a 300-level course.

**Departmental Honors**

This program is open to qualified majors in anthropology who have completed 15 hours of anthropology with a 3.25 grade point average and who have a 3.0 grade point overall average. Students should apply for the program in the fall semester of their junior year and, if approved, register for ANTH 391 and 392, Honors Tutorial, in the spring of their junior year and fall of their senior year.

Honors students are required to undertake a research project under the supervision of one or more faculty members and to present an acceptable research paper in the fall semester of their senior year. Students interested in the program should contact the department's undergraduate advisor.

**Integrated Graduate Studies**

The Department of Anthropology participates in the Integrated Graduate Studies program. Interested students should note
the general requirements and the admission procedures for the Integrated Graduate Studies program in the Undergraduate Studies section of this bulletin and may consult the department for further information.

GRADUATE PROGRAM

The Department of Anthropology offers graduate programs leading to the Master of Arts and Doctor of Philosophy degrees in anthropology with specializations in medical anthropology, cross-cultural gerontology, physical anthropology/human biology, international health, urban health, psychological anthropology and other areas.

The Anthropology department also offers three combined degrees, which are the following:

1. Master of Science in Nursing/Master of Arts degree with the School of Nursing.
2. Doctor of Medicine/Doctor of Philosophy degree with the School of Medicine.
3. M.A./Ph.D./M.P.H. degree with the School of Medicine.

Requirements for the Master of Arts Degree

The main purpose of the Master of Arts degree program is to prepare students to begin teaching, research, or service careers with a solid background in anthropology. Undergraduate course work in anthropology, while helpful, is not a prerequisite for admission. However, students with no previous training in anthropology are expected to remedy deficiencies prior to taking the M.A. examination.

Requirements for the master's degree include credit hour requirements, core course requirements, and a six-hour comprehensive written Master of Arts examination. A candidate for the master's degree is required to complete 27 hours of classwork, including an approved statistics course (3 hours) in which the student has earned a grade of C or better. Not more than 6 credit hours of electives may be taken in 300-level courses (advanced undergraduate courses). All master's degree candidates are required to attain a minimum cumulative grade point average of 3.0 in the core courses (described below) in order to qualify for the degree. Any student may retake an examination in a required course the next time it is given. The second grade will be the one considered for the student's overall average.

All master's degree candidates are required to take a six-hour comprehensive written examination in their field set by the Department Examination Committee. This examination must be taken before the completion of 27 semester hours of graduate work. Written master's degree examinations can receive one of three grades: High Pass, Pass, or Fail. “High Pass” signifies performance sufficient for both the Master of Arts degree and advancement to the Doctor of Philosophy program, provided other requirements also have been satisfied. “Pass” signifies performance adequate for the master's degree but insufficient to enter the doctoral program. “Fail” means a performance inadequate for the master's degree. In the case of grades of Pass and Fail, the written examination may be retaken once.

Requirements for Doctor of Philosophy Degree

The Doctor of Philosophy degree program in anthropology includes specializations in medical anthropology, international health, psychological anthropology, cross-cultural gerontology, urban health, human biology/physical anthropology, and sociocultural anthropology. It requires a minimum of 36 credit hours.

After completing course requirements, a student must take the written Doctor of Philosophy candidacy examination. Within one semester of successfully completing the written Doctor of Philosophy candidacy examination, the student is required to defend a dissertation prospectus with the cooperation of his or her advisor and committee. Before a candidate is permitted to defend the dissertation, he or she must demonstrate a reading knowledge in a foreign language in which there is a scholarly literature relevant to his or her program of studies. A foreign-born student may substitute his or her native language (if it is not English) if it meets the above conditions.

DESCRIPTION OF PROGRAMS

Medical Anthropology Program

The objective of the Medical Anthropology Program is to train medical anthropologists, physicians, nurses, and other health professionals (1) to recognize and deal with, on both theoretical and practical levels, the complex relations between the biological, social, cultural, psychological, economic, and techno-environmental determinants and concomitants of sickness and health; and (2) to analyze and evaluate how health services are organized and delivered. A student who chooses this specialty concentrates on the methods and perspectives of either social-cultural or physical anthropology in his or her studies and research.

Within the Medical Anthropology Program, students may choose to specialize in medical anthropology, cross-cultural gerontology, international health, urban health, or psychological anthropology.

M.A. Requirements

The curriculum covers the range of medical anthropology interests: ethnomedicine, human adaptation and disease, nutrition, international health, urban health, psychiatric anthropology, social demography, and so on. All Master of Arts degree students in medical anthropology must complete 27 hours, including the following core courses: ANTH 462, 480, 481, and 504 as well as an approved statistics course. The remaining 12 credit hours are taken as electives in anthropology or in other departments with the advisor's approval.

Ph.D. Requirements

All Ph.D. students in medical anthropology are required to complete the Ph.D. requirements. A specific plan of study is developed in consultation with their advi-
and Western experiences in terms of the relationship between non-Western particular emphasis is given to understanding the required to defend a dissertation prospectus candidacy examination, the student is repleting the written Doctor of Philosophy 480, 481, 497, and 504, as well as an approved statistics course. The remaining 6 credit hours are taken as electives in anthropology or other departments with the advisor’s approval. At the Ph.D. level, students specializing in international health must develop a program with their advisor to meet all Ph.D. requirements.

International Health
The international health specialization within the graduate program in Medical Anthropology offers students training in international health research as well as evaluation of international health projects. The curriculum includes course work in medical anthropology, epidemiology, and special topics in international health, including child survival, fertility and family planning, and nutritional intervention. Students are qualified to work in international health research, academic, or administrative positions in governmental or private agencies. All Master of Arts students in international health must complete 27 credit hours including the following core courses: ANTH 459, 462, 480, 481, 497, and 504, as well as an approved statistics course. The remaining 6 credit hours are taken as electives in anthropology or other departments with the advisor’s approval. At the Ph.D. level, students specializing international health must develop a program with their advisor to meet all Ph.D. requirements.

Urban Health Anthropology
The urban health specialization within the graduate program in Medical Anthropology prepares students for careers in anthropology, public health, or allied fields, with a special focus on racial and ethnic disparities in health and underserved populations in urban areas around the world. Under the guidance of faculty with research experience both domestically and internationally, students will learn anthropological theory and methods focusing on health and illness among urban populations.

All Master of Arts students in urban health must complete 27 credit hours including the following core courses: ANTH 462, 480, 481, and 504, as well as an approved statistics course, plus the remaining 3 credit hours are taken as elective in anthropology or other departments with the advisor’s approval. At the Ph.D. level, students specializing in urban health anthropology must develop a program with their advisor to meet all Ph.D. requirements.

Psychological Anthropology
The psychological anthropology specialization within the graduate program in Medical Anthropology prepares students for positions in teaching and research institutions. It is also relevant for mental health professionals concerned with research and theoretical issues related to multiethnic patient populations. All Master of Arts students in the psychological anthropology specialization must complete ANTH 462, 471, 480, 481, and 504 as well as an approved statistics course. The remaining 9 credit hours are taken as electives in anthropology or other departments with the advisor’s approval. At the Ph.D. level, students specializing in psychological anthropology must develop a program with their advisor to meet all Ph.D. requirements.

The Cross-Cultural Gerontology Program
In addition to the cross-cultural gerontology specialization in the Medical Anthropology Program, the department offers a distinct Cross-Cultural Gerontology Program. Degree candidates are required to demonstrate mastery of the literature, theories, and methods appropriate to Western and non-Western gerontology, and are encouraged to gain research experience in both Western and non-Western settings. The program emphasizes the integration of qualitative and quantitative methodologies.

M.A. Requirements
Graduates of this program are qualified to work in research or administrative positions in governmental and private agencies, as well as teach at the college and university levels. All Master of Arts students in cross-cultural gerontology, as approved by their advisor. At the Ph.D. level, students specializing international health must develop a program with their advisor to meet all Ph.D. requirements.

Urban Health core courses: ANTH 461, 444, and EPBI 490. The remaining 3 credit hours are taken as elective in anthropology or other departments with the advisor’s approval. At the Ph.D. level, students specializing in urban health anthropology must develop a program with their advisor to meet all Ph.D. requirements.
must complete 27 credit hours including the following core courses: ANTH 401, 404, 462, and 504. In addition to the four core courses, students must take an approved statistics course. Twelve credit hours are taken as electives in anthropology or in other departments with advisor’s approval.

Ph.D. Requirements

All Ph.D. students in cross-cultural gerontology are required to develop a specific plan of study in consultation with their advisor. It requires a minimum of 36 credit hours:

1. Students must take 18 credit hours in electives as approved by their advisory committee. (For those students who have not completed the M.A. statistics requirement, an approved 3-credit course in statistics is required.)
2. Students must take 18 credit hours in dissertation (ANTH 701).

After completing course requirements, a student must take the written Doctor of Philosophy candidacy examination. Within one semester of successfully completing the written Doctor of Philosophy candidacy examination, the student is required to defend a dissertation prospectus with the cooperation of his or her advisor and committee. Before a candidate is permitted to defend the dissertation, he or she must demonstrate a reading knowledge in a foreign language in which there is a scholarly literature relevant to his or her program of studies. A foreign-born student may substitute his or her native language (if it is not English) if it meets the above conditions.

M.A./Ph.D./M.P.H. Program with the School of Medicine

The joint M.A./Ph.D./M.P.H. program provides students with the opportunity to receive an anthropology graduate degree and a public health degree simultaneously. A combined public health/anthropology degree will be especially valuable to students interested in working in urban health or international health, or within health policy programs. The joint M.A./M.P.H. requires 54 credit hours (21 in Anthropology and 33 in Public Health). The joint Ph.D./M.P.H. requires an additional 18 credit hours in Anthropology beyond the M.A. level and 18 hours of ANTH 701 (Dissertation Research), for a total of 90 credit hours. Each joint degree student will develop a program of study with their advisors in both Anthropology and Public Health.

Joint M.S. Nursing/M.A. Anthropology Program

The joint M.S.N./M.A. program affords students a unique opportunity to combine the cross-cultural expertise of medical anthropology with clinical expertise in nursing. This combination of skills and knowledge will be of particular value in preparing students for careers in international health and in our multicultural society. Students must complete a minimum of 19 credits in nursing core courses, 12 to 22 credits in clinical major courses, and a minimum of 18 credits in anthropology courses. The actual number of credits depends upon the nursing major selected. The total M.S.N./M.A. degree requirement is a minimum of 55 hours.

Joint Doctor of Medicine/Doctor of Philosophy Program

The objectives of the joint M.D./Ph.D. programs are to train unusually qualified students

1. to conduct research on a broad range of bio-cultural problems, with emphasis on the relationship between medicine, ecology, subsistence variables, population dynamics, and disease epidemiology; and
2. to identify and analyze sociocultural impediments to the successful introduction of effective functioning, and evaluation of programs of health care in diverse contexts.

Applicants should make separate application for admission to the School of Medicine and the Department of Anthropology (through the School of Graduate Studies). Applications to the Department of Anthropology must include MCAT scores, in addition to other information indicated on the graduate school forms.

Application to the School of Medicine is initiated through the American Medical College Application Service in Washington, D.C., but applicants may write to the Admission Office of the School of Medicine for further information about the application procedure. The names of students whose applications have been reviewed favorably by the Department of Anthropology will be forwarded to the Admissions Committee of the School of Medicine with a recommendation that, if accepted by the School of Medicine, these applicants be admitted to the joint-degree program. The Department of Anthropology’s recommendation does not imply automatic admission to that school. The credentials presented by applicants to the program will be considered competitively among all other applicants to the School of Medicine.

Other Specializations

Students interested in graduate degrees in social-cultural or physical anthropology should contact the department about requirements.

ANTHROPOLOGY (ANTH)

Undergraduate Courses

ANTH 102. Being Human: An Introduction to Social and Cultural Anthropology (3)

The nature of culture and humans as culture-bearing animals. The range of cultural phenomena including language, social organization, religion, and culture change, and the relevance of anthropology for contemporary social, economic, and ecological problems.

ANTH 103. Introduction to Human Evolution (3)

Physical, cultural, and technological evolution of humans. The systematic interrelationships between humans, culture, and environment.

ANTH 105. Worldwide Variation in Human Biology (3)

The genetic, ontogenetic, and physiological bases for biological variation within human populations. These variations in the context of adaptation to the natural environment, human-made environment, and continuing environmental change.

ANTH 107. Archaeology: An Introduction (3)

Basic archaeological concepts are discussed followed by a review of human cultural and biological evolution from the earliest times through development of state organized societies. Geographical scope is worldwide with special attention given to ecological and cultural relationships affecting human societies through time.
ANTH 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

ANTH 202. Archaeology of Eastern North America (3)
This course is an introduction to the archaeology and prehistory of the eastern woodlands of North America. Course material will focus on the archaeological record of native societies living east of the Mississippi River from the first arrivals at the end of the Pleistocene up to the coming of Europeans. Specific topics for discussion include late Pleistocene settlement, hunter-gatherer environmental adaptations, the origin of food production, and the development of ranked societies.

ANTH 212. Popular Culture in the United States (3)
This course considers the history, character and constituents of popular culture in the U.S. and the various methods by which it is defined and studied. Key elements of popular culture in the United States are considered in their social (ethnic, gender, age) and historical contexts. The course provides an introduction to other more specialized courses in the anthropology of Gender, Popular Music and Science and Medicine. We will consider both themes and images (icons) of Usonian popular culture, their origins and transformations.

ANTH 215. Health, Culture, and Disease: An Introduction to Medical Anthropology (3)
This course is an introduction to the field of Medical Anthropology. Medical Anthropology is concerned with the cross-cultural study of culture, health, and illness. During the course of the semester, our survey will include: (1) theoretical orientations and key concepts; (2) the cross-cultural diversity of health beliefs and practices (abroad and at home); and (3) contemporary issues and special populations (e.g., AIDS, homelessness, refugees, women's health, and children at risk).

ANTH 220. Language Culture and Communication (3)
This course is an introduction to the scientific study of language and communication in the context of culture and social life. The goal of this class is to provide you with a linguistic perspective that is theoretically based and ethnographically constituted. We will examine diverse topics and issues essential to gaining an understanding of the complex inter-relationships between language, communication and culture. The topics will include: the nature of language, its structure, the effects of linguistic categories on thought and social behaviors, analyses of talk-in-interactions across a wide range of social settings and cultural contexts, gestures, comportment practices and the use of space, linguistic variation and change, verbal art, language and emotion, the limits of language, institutional language, and issues of language and identity. Students with interest in language and culture as well as those who are new to linguistic anthropology are welcome. No prior training in linguistics is presupposed.

ANTH 225. Evolution (3)
(See PHIL 225.) Cross-listed as PHIL 225.

ANTH 295. Comparative Primate Behavior (3)
The behavior of non-human primates (prosimians, monkeys, and apes) and the relevance of these studies for understanding the evolution of human behavior. Biological and ecological influences on behavior. The social aspects of primate life, both human and nonhuman. Prereq: ANTH 102 or ANTH 103 or consent of department.

ANTH 301. Biological Aging in Humans (3)
Biological aging phenomena, evidence that various socioeconomic and environmental influences may slow or accelerate the aging process, and theories explaining the evolution of the aging process. Prereq: ANTH 103 or consent of department.

ANTH 302. Darwinian Medicine (3)
Darwinian medicine deals with evolutionary aspects of modern human disease. It applies the concepts and methods of evolutionary biology to the question of why we are vulnerable to disease. Darwinian (or evolutionary) medicine proposes several general hypotheses about disease causation including disease as evolutionary legacy and design compromise, the result of a novel environment, a consequence of genetic adaptation, the result of infectious organisms’ evolutionary adaptations, and disease symptoms as manifestation of defense mechanisms. It proposes that evolutionary ideas can explain, help to prevent and perhaps help to treat some diseases. This course presents the basic logic of Darwinian medicine and evaluates hypotheses about specific diseases that illustrate each of the hypotheses about disease causation. Prereq: ANTH 103 or ANTH 105 or consent of department.

ANTH 304. Introduction to the Anthropology of Aging (3)
Reviews historical and methodological approaches to the study of aging. Examines theoretical assumptions about aging by comparing studies from Western and non-Western societies that illustrate the differential importance of culture in the experience of aging. Prereq: ANTH 102 or consent of department.

ANTH 306. The Anthropology of Childhood and the Family (3)
Child-rearing patterns and the family as an institution, using evidence from Western and non-Western cultures. Human universals and cultural variation, the experience of childhood and recent changes in the American family. Prereq: ANTH 102 or consent of department.

ANTH 309. Family Violence and Child Abuse (3)
The prevalence and causes of intrafamilial violence. Spouse abuse, child abuse, adolescent abuse, sexual abuse, parent abuse, and sibling violence. Major theoretical positions on the occurrence of these behaviors in light of information from both Western and non-Western cultures. Prereq: ANTH 102 or consent of department.

ANTH 314. Cultures of the United States (3)
This course considers the rich ethnic diversity of the U.S. from the perspective of social/cultural anthropologists. Conquest, immigrations, problems of conflicts and accommodation, and the character of the diverse regional and ethnic cultures are considered as are forms of racism, discrimination, and their consequences. Groups of interest include various Latino and Native peoples, African-American groups, and specific ethnic groups of Pacific, Mediterranean, European, Asian, and Caribbean origin.

ANTH 317. Asian Medical Systems (3)
Examines the philosophical assumptions and therapies of the traditional and contemporary medical systems of India, Tibet, China, and Japan. Particular attention will be given to the folk, popular, and institutional sectors of medical practice as well as to the contemporary relationship between traditional medicine and Western medicine in each of these societies. Prereq: ANTH 102 or consent of department.

ANTH 318. Death and Dying (3)
Examines cultural context of death and dying. Topics include social and psychological consequences of changing patterns of mortality, attitudes towards the taking of life, preparation for death, mortuary rituals, grief and mourning, and nature of relationship between living and dead. Prereq: ANTH 102 or consent of department.

ANTH 319. Introduction to Statistical Analysis in the Social Sciences (3)
Statistical description (central tendency, variation, correlation, etc.) and statistical evaluation (two sample comparisons, regression, analysis of variance, non-parametric statistics). Developing an understanding of statistical inference, particularly on proper usage of statistical methods. Examples from the social sciences. Cannot be used to meet the A&S Humanities and Social Sciences requirement. Not available for credit to students who have completed STAT 201 or PSCL 282.

ANTH 321. Methods in Archaeology (3)
This course reviews the basic methods and techniques used in modern anthropological archaeology. Topics to be discussed include the nature of the archaeological record, research design, techniques of field archaeology, methods of laboratory analysis, museum archaeology, ethnoarchaeology, and cultural interpretation. Prereq: ANTH 107 or consent of department.

ANTH 322. Living Africa (3)
This course is an introduction to the peoples and cultures of Africa. Rather than a traditional, survey approach, this course takes a thematic approach to issues regarding core aspects of African societies such as history, political organization, family and kinship, art and literature, religion, gender, international relations, and economy. Taking a multidisciplinary perspective, the course will draw on diverse sources, from classical ethnographic writings to popular cultural criticism, literature, films, poetry, and news media.

ANTH 323. AIDS: Epidemiology, Biology, and Culture (3)
This course will examine the biological and cultural impact of AIDS in different societies around the world. Topics include: the origin and evolution of the virus, the evolutionary implications of the epidemic, routes of transmission, a historical comparison of AIDS to other epidemics in human history, current worldwide prevalences of AIDS, and cultural responses to the epidemic. Special emphasis will be placed on the long-term biological and social consequences of the epidemic. Prereq: ANTH 102 or ANTH 103 or ANTH 105 or consent of department.

ANTH 324. Field Methods in Archaeology (6)
This field course is designed to give the student a comprehensive introduction to archaeological field work. All participants will be introduced to the methods of archaeological survey, techniques of hand excavation, artifact identification, and the preparation of field notes and documentation. In large measure this is a “learning through doing” course which is supplement ed by formal and informal lectures and discussions about archaeological methods and regional prehistory. The Field School is held as a two, three-week sessions of instruction in the field. All participants are required to attend an orientation meeting that is held at the Museum on the first day of each session. The remainder of each session will take place from Monday through Friday at an archaeological site in northeast Ohio. Students are responsible for their own transportation to and from the field site and must bring a sack lunch. All
participants will receive a field manual which will provide detailed information on the course and techniques of field work. Prereq: Permission of department.

ANTH 326. Power, Illness, and Inequality: The Political Economy of Health (3)
This course explores the relationship between social inequality and the distribution of health and illness across class, race, gender, sexual orientation, and national boundaries. Class readings drawn from critical anthropological approaches to the study of health emphasize the fundamental importance of power relations and economic constraints in explaining patterns of disease. The course critically examines the nature of Western biomedicine and inequality in the delivery of health services. Special consideration is given to political economic analysis of health issues in the developing world such as AIDS, hunger, reproductive health, and primary health care provision. Prereq: ANTH 102 or ANTH 215 or consent of department.

ANTH 327. Great Lakes Archaeology (3)
This course surveys the archaeology of Native American cultures in the Great Lakes region from ca. 10,000 B.C. to A.D. 1700. The geographic scope of this course is the upper Midwest, southern Ontario, and the St. Lawrence Valley with a focus on the Ohio region. Prereq: ANTH 107 or consent of the department.

ANTH 330. Special Topics in Prehistory (3)
Special topics or geographical areas of archaeological significance (e.g., the origins of food production, the archaeology of the Mediterranean, the archaeology of North America). Prereq: ANTH 215 or ANTH 107 or consent of department.

ANTH 331. Ancient Civilizations of the Near East (3)
The social, economic, and ecological factors involved in the formation of the earliest Asian civilizations. The developmental role of cities, warfare, trade, and irrigation considered with respect to “state” formation in Mesopotamia, Iran, and the Indus Valley. Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 333. Roots of Ancient India: Archaeology of South Asia (3)
Examination of the archaeological record of cultural development from earliest times through the Iron Age in India, Pakistan, Sri Lanka, and Bangladesh. Particular attention devoted to how these ancient cultural developments laid the foundations for the early historic civilizations of this region. Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 334. Urban Anthropology (3)
This urban anthropology course will focus on contemporary understandings of the institutions of urban, national and transnational life. We will explore the complex ways that urban worlds and social problems are shaped by globalization, capitalism, national, and transnational processes. As well, we will examine how and why various identities, nations, and transnational institutions are expressed in and by people living in current global urban hierarchies. In particular, we will look at how the urban, national, and transnational dynamically produce and are produced by the everyday cultural practices of people living and struggling in North American urban spaces. Prereq: ANTH 102 or consent of department.

ANTH 337. Comparative Medical Systems (3)
This course considers the world’s major medical systems. Foci include professional and folk medical systems of Asia and South Asia, North and South America, Europe and the Mediterranean, including the Christian and Islamic medical traditions. Attention is paid to medical origins and the relationship of popular to professional medicines. The examination of each medical tradition includes consideration of its psychological medicine and system of medical ethics. Prereq: ANTH 215.

ANTH 340. Culture and Emotion (3)
The cross-cultural consideration of the relationship of culture and emotion. The cultural construction of the experience and expression of emotion. Key substantive issues include: ethnopsychological variations in indigenous conceptualizations and displays of emotion; the socialization of affect; the self and emotion; contextual variations in emotional expression with respect to gender, power relations, patterns of subsistence, and the individual; and the relationship between emotion and illness processes. Prereq: ANTH 102 or consent of department.

ANTH 341. Cultural Area Studies in Anthropology (3)
Prereq: ANTH 102.

ANTH 343. Psychoanalytic Anthropology (3)
Psychoanalytic theory and its application to cross-cultural materials. The cultural context of analytic theory’s development and its applications in social/cultural and medical anthropology; application of cultural criticism to psychoanalytic conceptions and its constructions of the following: social evolution; religious ideology; praxis; patterns and dynamics; altered states of consciousness; individual personality and psychopathology; individual and cultural defense mechanisms; socialization; cognition; emotion; symbolism; and gender. Also considers bases for a culturally relative analytic theory. Prereq: ANTH 102 or consent of department.

ANTH 345. Ethnicity, Gender, and Mental Health (3)
An overview of mental health status and ethnicity. Analysis of ethnicity in relation to culture, social class, gender, sociopolitical conflict and the world refugee crisis. Consideration of populations at special risk for the development of specific mental disorders (e.g., schizophrenia, affective disorders, adjustment and stress disorders). Contemporary ethnographic survey of ethnic groups at risk both at home and abroad. Prereq: ANTH 102 or consent of department.

ANTH 348. Sexuality and Gender (3)
This course examines the relationships among gender, sexuality, race, nation, and the body. In particular, it focuses on contemporary ideas and theories in the study of the complex historical and cultural relationships between sexuality and gender. In addition, we examine sexuality and social movements, identity politics, and the so-called “culture wars.” In short, this class will not be a voyeuristic narration of exotic sexual or gender practices; and where we use the “other” it will be solely for the purpose of exploring our own practices and ideologies. Prereq: ANTH 102 or consent of department.

ANTH 351. Topics in International Health (3)
Special topics of interest in International Health. Prereq: ANTH 215 or ANTH 216 or consent of department.

ANTH 352. Japanese Culture and Society (3)
Focuses on contemporary Japanese cultural and social institutions. Topics include child-rearing, personality, values, education, gender roles, the dual economy, and popular culture. Prereq: ANTH 102 or consent of department.

ANTH 353. Chinese Culture and Society (3)
Focuses on Chinese cultural and social institutions during the Maoist and post-Maoist eras. Topics include ideology, economics, politics, religion, family life, and popular culture. Prereq: ANTH 102 or consent of department.

ANTH 356. Mediterranean Culture and Society (3)
Ethnography of the Mediterranean culture area. Topics include geography, topography, climate, rural and urban life styles, economy, social identity (encompassing gender, ethnic, national, provincial, tribal and religious identity), religion, ritual relations, concepts of self, health and healing, politics, worldview and values, family and kinship, aging, death and dying. Past and present methods and problems of anthropological research in the region and the theoretical frameworks that have guided researchers. Prereq: ANTH 102 or consent of department.

ANTH 357. Native American Cultures (3)
Intensive examination of the cultures of selected Native American peoples, including historical, political, religious, social organizational, linguistic, and medical/psychiatric aspects of American Indian life. Prereq: ANTH 102.

ANTH 358. Women’s Mental Health (3)
This anthropological course is an examination of the cultural psychology of women in the following domains: (1) women’s social status cross-culturally; (2) specific psychiatric syndromes, such as psychoses, mood and personality disorders as they affect women; and (3) power and resilience. Issues of the cultural validity of psychological theories for women across diverse settings is the subject of critique throughout the seminar. Prereq: ANTH 102 or ANTH 215.

ANTH 359. Introduction to International Health (3)
Critical health problems and needs in developing countries. Prevalence of infectious disease, malnutrition, chronic disease, injury control. Examines strategies for improvement of health in less developed countries. Prereq: ANTH 102.

ANTH 361. Urban Health (3)
This course provides an anthropological perspective on the most important health problems facing urban population around the world. Special attention will be given to an examination of disparities in health among urban residents based on poverty, race/ethnicity, gender, and nationality.

ANTH 362. Contemporary Theory in Anthropology (3)
A critical examination of anthropological thought in England, France and the United States during the second half of the twentieth century. Emphasis will be on the way authors formulate questions that motivate anthropological discourse, on the way central concepts are formulated and applied and on the controversies and debates that result. Readings are drawn from influential texts by prominent contemporary anthropologists. Prereq: ANTH 102 or consent of department.

ANTH 363. Anthropology and Bioethics (3)
The course will review theoretical work on anthropological and values, the discipline of bioethics, its philosophical roots, the body of anthropological work in bioethics, and critically examine a number of current bioethical issues in the United States and internationally. Prereq: ANTH 102 or consent of department.

ANTH 365. Gender and Sexual Differences: Cross-cultural Perspective (3)
Gender roles and sex differences throughout the life cycle considered from a cross-cultural perspective. Ma-
jor approaches to explaining sex roles discussed in light of information from both Western and non-Western cultures. Prereq: ANTH 102 or consent of department.

ANTH 367, Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. Prereq: ANTH/BIOL/PHIL 225 and consent. Cross-listed as BIOL 367, GEOL 367, and PHIL 367.

ANTH 369, The Anthropology of Nutrition (3)Examines human nutrition and physical performance within the framework of human adaptability theory. The emphasis is on the measurement of energetic intake and expenditure in human populations; the assessment, health consequences, and bio-cultural correlates of malnutrition and obesity; and the uses of energetic data in assessing human population adaptation. Prereq: ANTH 103 or consent of department.

ANTH 371, Culture, Behavior, and Person: Psychological Anthropology (3)Cross-cultural perspectives on personality, human development, individual variability, cognition, deviant behavior, and the role of the individual in his/her society. Classic and contemporary anthropological writings on Western and non-Western societies. Prereq: ANTH 102 or consent of department.

ANTH 372, Anthropological Approaches to Religion (3)The development of, and current approaches to, comparative religion from an anthropological perspective. Topics include witchcraft, ritual, myth, healing, religious language and symbolism, religion and gender, religious experience, the nature of the sacred, religion and social change, altered states of consciousness, and evil. Using material from a wide range of world cultures, critical assessment is made of conventional distinctions such as those between rational/irrational, natural/supernatural, magic/religion, and primitive/civilized. Prereq: ANTH 102 or consent of department. Cross-listed as RLGN 372.

ANTH 375, Human Evolution: The Fossil Evidence (3)This course will survey the biological and behavioral changes that occurred in the hominid lineage during the past five million years. In addition to a thorough review of the fossil evidence for human evolution, students will develop the theoretical framework in evolutionary biology. Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 375.

ANTH 376, Topics in the Anthropology of Health and Medicine (3)Special topics of interest, such as the biology of human adaptability; the ecology of the human life cycle health delivery systems; transcultural psychiatry; nutrition, health, and disease; paleoepidemiology; and population anthropology. Prereq: ANTH 102 or ANTH 103.

ANTH 377, Human Osteology (4)This course for upper division undergraduates and graduate students will review the following topics: human skeletal development and identification; and forensic identification (skeletal aging, sex identification and population affiliation). Cross-listed as ANAT 377.

ANTH 379, Topics in Cultural and Social Anthropology (3)Special topics of interest across the range of social and cultural anthropology. Prereq: ANTH 102.

ANTH 380, Independent Study in Laboratory Anthropology I (1-3)This course provides an introduction to the basic methods and techniques of artifact curation and laboratory analysis in archaeology. Under the supervision of the instructor, each student will develop and carry out a focused project of material analysis and interpretation using the archaeology collections of the Cleveland Museum of Natural History. Each student is required to spend a minimum of two hours per week in the Archaeology laboratory for each credit hour taken. By the end of the course, the student will prepare a short report describing the results of their particular project. Prereq: ANTH 107 and permission of department, and prior permission of Department of Anthropology at the Cleveland Museum of Natural History.

ANTH 381, Independent Study in Laboratory Anthropology II (1-3)This course provides an introduction to the basic methods and techniques of artifact curation and laboratory analysis in archaeology. Under the supervision of the instructor, each student will develop and carry out a focused project of material analysis and interpretation using the archaeology collections of the Cleveland Museum of Natural History. Each student is required to spend a minimum of two hours per week in the Archaeology laboratory for each credit hour taken. By the end of the course, the student will prepare a short report describing the results of their particular project. Prereq: ANTH 107 and permission of department, and prior permission of Department of Anthropology at the Cleveland Museum of Natural History.

ANTH 383, Evolutionary Anatomy (4)This course will introduce graduate and advanced undergraduate students to primate comparative anatomy and will examine methods of reconstructing physiology and behavior from fossil remains. Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 383.

ANTH 388, Globalization, Development & Underdevelopment: Anthropological Perspectives (3)This course examines both theoretical and practical perspectives on globalization and economic development in the “Third World.” From “Dependency,” “Modernization,” and “World System” theory to poststructuralist critiques of development discourse, the class seeks to provide a framework for understanding current debates on development and globalization. The “neoliberal monologue” that dominates the contemporary development enterprise is critically examined in the context of growing global inequality. Special consideration is given to the roles of international agencies such as the World Bank, International Monetary Fund, United Nations, and non-governmental organizations (NGOs) in the “development industry.” The course also focuses on the contributions of anthropologists to development theory and practice with emphasis on the impact of development on the health of the poor and survival of indigenous cultures. Opportunities for professional anthropologists in the development field are reviewed.

ANTH 389, Crossroads: Transformation of Rural Communities (3)A multimedia approach to the development and transformation of an American musical form, the blues. Foci include the social and cultural history of rural and urban blues, rhythm and blues, rock ‘n’ roll, and the later forms of rock, the social context and life histories of modern music’s creators and innovators, the development of vocal and instrumental styles, blues and rock, visual and performance iconography, milestones in the development of musical genres and the major roles of racism and discrimination in the development of these forms of popular music. Prereq: ANTH 102.

ANTH 391, Honors Tutorial (3)Prereq: Acceptance into Honors Program.

ANTH 392, Honors Tutorial (3)Prereq: Acceptance into Honors Program.

ANTH 393, Human Ecology: The Biology of Human Adaptability (3)The place of human populations in the ecosystem. The importance of biological and behavioral responses of populations ranging from hunters and gatherers to contemporary and industrial societies. The effect of various natural and manmade stresses on man’s adaptation to the environment. Prereq: ANTH 103 or consent of department.

ANTH 394, Seminar in Evolutionary Biology (3) (See PHIL 394.) Cross-listed as PHIL 394.

ANTH 396, Undergraduate Research in Evolutionary Biology (3)Students propose and conduct guided research on an aspect of evolutionary biology. The research will be sponsored and supervised by a member of the CWRU faculty or other qualified professional. A written report must be submitted to the Evolutionary Biology Steering Committee before credit is granted. Prereq: ANTH/BIOL/GEOL/PHIL 225 and consent. Cross-listed as BIOL 396, GEOL 396, and PHIL 396.

ANTH 397, Epidemiology and the Evolution of Human Diseases (3)Basic concepts of infectious and degenerative diseases. Description and analysis of the changing distribution and determinants of disease in prehistoric, historic, and contemporary human populations. Prereq: ANTH 103 or consent of department.

ANTH 399, Independent Study (1-6)Students may propose topics for independent reading and research. Prereq: Consent of department.

Graduate Courses

ANTH 401, Biological Aging in Humans (3) (See ANTH 301.) Prereq: ANTH 103 or consent of department.

ANTH 402, Darwinian Medicine (3) (See ANTH 302.) Prereq: ANTH 103 or ANTH 105 or consent of department.

ANTH 404, Introduction to the Anthropology of Aging (3) (See ANTH 304.) Prereq: ANTH 102 or consent of department.

ANTH 406, The Anthropology of Childhood and the Family (3) (See ANTH 306.) Prereq: ANTH 102 or consent of department.

ANTH 409, Family Violence and Child Abuse (3) (See ANTH 309.) Prereq: ANTH 102 or consent of department.

ANTH 414, Cultures of the United States (3) (See ANTH 314.)

ANTH 417, Asian Medical Systems (3) (See ANTH 317.) Prereq: ANTH 102 or consent of department.

ANTH 418, Death and Dying (3) (See ANTH 318.) Prereq: ANTH 102 or consent of department.

ANTH 422, Living Africa (3) (See ANTH 322.)
and from the field site and must bring a sack lunch. All Students are responsible for their own transportation to Friday at an archaeological site in northeast Ohio.

The Field School is held as two, three-week sessions of instruction in the field. All participants are required to attend an orientation meeting that is held at the Museum on the first day of each session. The remainder of each session will take place from Monday through Friday at an archaeological site in northeast Ohio. Students are responsible for their own transportation to and from the field site and must bring a sack lunch. All participants will receive a field manual which will provide detailed information on the course and techniques of field work. Prereq: Permission of department.

ANTH 426. Power, Illness, and Inequality: The Political Economy of Health (3)
(See ANTH 326.) Prereq: ANTH 102 or ANTH 215 or consent of department.

ANTH 427. Great Lakes Archaeology (3)
(See ANTH 327.) Prereq: ANTH 107 or consent of department.

ANTH 433. Roots of Ancient India: Archaeology of South Asia (3)
(See ANTH 333.) Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 434. Urban Anthropology (3)
(See ANTH 334.) Prereq: ANTH 102 or consent of department.

ANTH 437. Comparative Medical Systems (3)
(See ANTH 337.) Prereq: ANTH 215.

ANTH 440. Culture and Emotion (3)
(See ANTH 340.) Prereq: ANTH 102 or consent of department.

ANTH 441. Cultural Area Studies in Anthropology (3)
(See ANTH 341.) Prereq: ANTH 102.

ANTH 443. Psychoanalytic Anthropology (3)
(See ANTH 343.) Prereq: ANTH 102 or consent of department.

ANTH 445. Ethnicity, Gender, and Mental Health (3)
(See ANTH 345.) Prereq: ANTH 102 or consent of department.

ANTH 448. Sexuality and Gender (3)
(See ANTH 348.) Prereq: ANTH 102 or consent of department.

ANTH 451. Topics in International Health (3)
(See ANTH 351.) Prereq: ANTH 102 or ANTH 215.

ANTH 452. Japanese Culture and Society (3)
(See ANTH 352.) Prereq: ANTH 102 or consent of department.

ANTH 453. Chinese Culture and Society (3)
(See ANTH 353.) Prereq: ANTH 102 or consent of department.

ANTH 456. Mediterranean Culture and Society (3)
(See ANTH 356.) Prereq: ANTH 102 or consent of department.

ANTH 457. Native American Cultures (3)
(See ANTH 357.) Prereq: ANTH 102.

ANTH 458. Women’s Mental Health (3)
(See ANTH 358.) Prereq: ANTH 102 or ANTH 215.

ANTH 459. Introduction to International Health (3)
(See ANTH 359.) Prereq: ANTH 102.

ANTH 461. Urban Health (3)
(See ANTH 361.)

ANTH 462. Contemporary Theory in Anthropology (3)
(See ANTH 362.) Prereq: ANTH 102 or consent of department.

ANTH 463. Anthropology and Bioethics (3)
(See ANTH 363.) Prereq: ANTH 102 or consent of department. Cross-listed as BETH 463.

ANTH 465. Gender and Sex Differences: Cross-cultural Perspective (3)
(See ANTH 365.) Prereq: ANTH 102 or consent of department.

ANTH 466. The Anthropology of Nutrition (3)
(See ANTH 369.) Prereq: ANTH 103 or consent of department.

ANTH 470. Tutorial in Physical Anthropology (3)
Guided readings in physical anthropology. Prereq: Graduate standing and consent of department.

ANTH 471. Culture, Behavior, and Person: Psychological Anthropology (3)
(See ANTH 371.) Prereq: ANTH 102 or consent of department.

ANTH 472. Anthropological Approaches to Religion (3)
(See ANTH 372.) Prereq: ANTH 102 or consent of department.

ANTH 475. Human Evolution: The Fossil Evidence (3)
(See ANTH 375.) Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 475.

ANTH 476. Topics in the Anthropology of Health and Medicine (3)
(See ANTH 376.) Prereq: ANTH 102 or ANTH 103.

ANTH 477. Human Osteology (4)
(See ANTH 377.) Cross-listed as ANAT 477.

ANTH 479. Topics in Cultural and Social Anthropology (3)
(See ANTH 379.) Prereq: ANTH 102.

ANTH 480. The Anthropology of Health and Illness I (3)
Part one of the graduate core course in medical anthropology includes sections giving an overview of topics such as the history and conceptual development of medical anthropology, anthropological epidemiology, psychiatric anthropology, social networks/support systems, and health care systems. Prereq: Graduate standing.

ANTH 481. The Anthropology of Health and Illness II (3)
Part two of the graduate core course in medical anthropology includes sections giving an overview of topics such as human adaptability theory, nutritional anthropology, demography, the anthropology of biomedicine, cross-cultural aging, clinical anthropology, and international health. Prereq: ANTH 480.

ANTH 483. Evolutionary Anatomy (4)
(See ANTH 383.) Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 483.

ANTH 488. Globalization, Development, & Under-development: Anthropological Persp. (3)
(See ANTH 388.)

ANTH 489. Crossroads: Transformation of Rural Blues into Urban Rock (3)
(See ANTH 389.) Prereq: ANTH 102.

ANTH 493. Human Ecology: The Biology of Human Adaptability (3)
(See ANTH 393.) Prereq: ANTH 103 or consent of department.

ANTH 494. Seminar in Evolutionary Biology (3)
(See PHIL 494.) Cross-listed as PHIL 494.

ANTH 497. Epidemiology and the Evolution of Human Diseases (3)
(See ANTH 397.) Prereq: ANTH 103 or consent of department.

ANTH 498. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

ANTH 502. Research Practicum in Med Anthropology and Cross-cultural Gerontology (3)
Provides M.A. students with firsthand experience in applying anthropology to health and aging problems. Prereq: Graduate standing.

ANTH 503. Seminar in Social Cultural Anthropology (3)

ANTH 504. Anthropological Research Design (3)
Practical and theoretical issues in the selection of questions for health and aging research in societal settings. Illustration of frameworks and designs for research. Discussion of the problems of collection, analysis, and interpretation of data along with the nonscientific influences on the research process and the use of results. Prereq: Graduate standing.

ANTH 505. Women’s Mental Health (3)
This anthropological course is a feminist examination of the cultural psychology of women in the following domains: (1) contextualized modes of attention, perception, and orientations for being-in-the-world; (2) power, resistance and resilience; and (3) specific psychiatric syndromes of schizophrenia and depression as they affect women. Issues of the cultural validity of theories premised upon an Euro-American ethnopsychology will be the subject of critique throughout the seminar. Prereq: Graduate standing and consent of department.

ANTH 506. Seminar in Comparative Health Systems (3)
Prereq: ANTH 480 or consent of department.

ANTH 507. Seminar in Controversial Issues in Anthropology (3)
The goals of this course are to provide students with opportunities to: (1) Familiarize themselves with the (alleged) facts of various controversial issues that have characterized the field of anthropology over the past 50 years; (2) enhance their skills in analyzing and assessing the nature and quality of the arguments and empirical data employed by parties to the controversies; (3) develop an appreciation of the role of historical and political contexts in shaping the emergence and evolution of the controversies; and (4) consider the ethics involved in the practice and public representation of anthropology. The course is organized around the following controversies: (1) The Native American Graves Protection and Repatriation Act (NAGPRA); (2) ethnicity and its determination; (3) representing studied populations; (4) politics and fieldwork; (5) the works of Carlos Castaneda; (6) the Mead-Freeman debate; (7) sociobiology and cultural anthropology; (8) Darkness in El Dorado and the Yanomami, and (9)
cultural relativism and human rights. Prereq: ANTH 480 and ANTH 481.  
ANTH 508. Seminar in Policy and Program Planning and Evaluation (3)  
Prereq: ANTH 504.  
ANTH 509. Seminar in the Ethnopsychology of Emotion (3)  
In this seminar we will be concerned with the relationship of culture and emotion. The study of emotion, traditionally the domain of philosophy, psychology, and physiology, has increasingly attracted the attention of psychological and medical anthropologists. Contemporary anthropological approaches to the problem have documented the substantial role that culture plays in mediating both the experience and the expression of emotion. These issues will be examined through review of cross-cultural, ethnographic materials. Prereq: ANTH 480.  
ANTH 510. Seminar in International Health (3)  
This seminar will survey the major areas of research in the field of international health, including anthropology and public health research in international health. Emphasis will be on critical evaluation of current international health theory and methods and review of relevant literature, in regard to the health of the world’s population. Prereq: ANTH 480 and ANTH 481.  
ANTH 511. Seminar in Anthropology: Topics (3)  
Various topics will be offered for graduate students in medical anthropology, such as “Anthropological Perspectives on Women’s Health and Reproduction” and “Biocultural Anthropology.” Prereq: ANTH 480.  
ANTH 542. Human Body: Discourse and Experience (3)  
Interdisciplinary approach to embodiment as a starting point for rethinking the concepts of culture and existence. Methodological distinction between phenom-enological and semiotic approaches. Topics include cultural uses of the body, the body as representation and expression, the body as an object of domination, the body of health and illness, sexuality and gendered body, religion and the sacred body, and technology and the body. Prereq: Graduate standing or consent of department.  
ANTH 591. Seminar in Physical Anthropology (3)  
ANTH 599. Tutorial: Advanced Studies in Anthropology (1-18) (Credit as arranged.) Advanced studies in anthropology.  
ANTH 601. Independent Research (1-18) (Credit as arranged.)  
ANTH 651. Thesis M.A. (1-18)  
ANTH 700. Dissertation Fieldwork (0)  
Students conducting dissertation fieldwork off-campus may choose to register for this course with the permission of their dissertation advisor. Students may register for a maximum of two academic years. Prereq: Must be Ph.D. candidate and have permission of department.  
ANTH 701. Dissertation Ph.D. (1-18) (Credit as arranged.)  
ANTH 703. Dissertation Fellowship (1-8)  

Department of Art History and Art

ART HISTORY

Mather House  
Phone 216-368-4118; Fax 216-368-4681  
William R. Siebenschu, Acting Chair

ART EDUCATION/ART STUDIO

Art Studio Facility, 2215 Adelbert Road  
Phone 216-368-2714; Fax 216-368-2715  
Tim Shuckerow, Director of Art Education and Art Studio

ART HISTORY AND ART

The Department of Art History and Art offers opportunities to study art history, both Western and Non-Western, to participate in a broad range of studio offerings, to pursue state teacher licensure in art education, and to engage in pre-professional museum training. The Bachelor of Arts degree is granted in art history and in pre-architecture (second major only), and the Bachelor of Science degree in art education. In addition, the department offers graduate programs leading to the degrees of Master of Arts in art history, in art history and museum studies, and in art education; and the Doctor of Philosophy in art history, and in art history and museum studies. All art programs are considerably enhanced by close cooperation with and access to the facilities of cultural institutions located in University Circle, in particular the Cleveland Museum of Art and the Cleveland Institute of Art. The undergraduate and graduate programs in art history are offered as part of the Joint Program in Art History of Case Western Reserve University and the Cleveland Museum of Art. All classes are taught at the museum, and courses are occasionally offered by the museum curators who hold adjunct appointments in the department. Students taking advanced-level courses use the museum’s extensive research library, and all students have an opportunity to study original works of art in the museum’s superb collections. Students majoring in art history have a wide variety of career opportunities. Graduates with a strong background in art are employed as teachers; as museum professionals (both curatorial and administrative); as art librarians and archivists; as journalists or as sales representatives in commercial art galleries, auction houses, and bookstores; as art conservators and restorers; as art specialists in the diplomatic service and at all levels of government; and in industry, film, and television. Some of these specialties require additional study and professional preparation beyond the bachelor’s degree.

ART EDUCATION

The Art Education program’s mission is “to prepare committed, knowledgeable, and creative professional art educators who will develop into leaders, teachers, and talented artists in the field of art education.” The undergraduate and graduate degree programs in art education are given jointly with the Cleveland Institute of Art. Art education majors have the advantage of pursuing their academic studies in a university environment and their studio studies at a professional art school which educates artists and designers. Students participate in educational field experiences conducted in many of greater Cleveland’s urban, suburban and rural school systems, its hospitals, museums and cultural institutions. Graduates of the University’s art education programs have pursued careers as teachers, supervisors and consultants in public and private schools, colleges, art schools and museums; as administrators of galleries and art organizations; as art therapists in hospitals and community centers; as designers of educational programs for industry; and as practicing artists. A second major and a minor sequence in pre-architecture are offered for those...
students expecting to continue architectural studies at the graduate level (or who simply wish to pursue an area of interest).

The university offers a variety of introductory and intermediate art studio courses taught by experienced artists/teachers in a newly renovated art building to students interested in developing and nurturing their artistic and creative talents.

Qualified undergraduates majoring in art history or art education may also participate in the Integrated Graduate Studies Program (see separate listing in this bulletin).

FACULTY

Art History

Henry Adams, Ph.D. (Yale University)
Professor
American art

David Carrier, Ph.D. (Columbia University)
Champney Family Professor
Methodology of Art History, Contemporary Art and Art Criticism

John J. Ciofalo, Ph.D. (University of Iowa)
Associate Professor
19th and 20th Century European Art

Anne Helmreich, Ph.D. (Northwestern University)
Associate Professor and Undergraduate Advisor
Art History (18th and 19th Century European Art)

Ellen G. Landau, Ph.D. (University of Delaware)
Andrew W. Mellon Professor of the Humanities
20th Century American and European art; Critical Theory and Gender Studies

Jennifer Neils, Ph.D. (Princeton University)
Ruth Coulter Heede Professor
Art and classical archaeology

Edward J. Olszewski, Ph.D. (University of Minnesota)
Professor
Italian Renaissance and Baroque art

Catherine B. Scallen, Ph.D. (Princeton University)
Associate Professor
Northern Renaissance and Baroque art and historiography

Adjunct Faculty

Michael Bennett, Ph.D. (Harvard University)
Ancient Art

Susan Bergh, Ph.D. (Columbia University)
Art of the Ancient Americas

Michael Cunningham, Ph.D. (University of Chicago)
Japanese and Korean Art

Stephen Fliegel, M.A. (University of Sheffield)
Medieval Art

Jeffrey D. Grove, PhD. (Case Western Reserve University)
Contemporary Art

William Robinson, Ph.D. (Case Western Reserve University)
Modern European Art

J. Stanton Thomas, Ph.D. (Case Western Reserve University)
Medieval and Northern Renaissance Art

Marjorie Williams, M.A. (University of Michigan)
Asian Art

Art Education

Tim Shuckerow, M.A. (Case Western Reserve University)
Director of Art Education and Art Studio

Amelia Joynes M.Ed. (Cleveland State University)
Supervisor of Art Education Secondary Student Teaching

Sandra Noble, M.A. (Cleveland State University)
Supervisor of Art Education Elementary Student Teaching and Clinical/Field-Based Experience

UNDERGRADUATE PROGRAMS

MAJORS

Art History

The curriculum in art history is designed to give students a broad grounding in painting, sculpture, architecture and the decorative arts, with a strong emphasis on understanding the cultural context in which they were produced. Students also develop a technical and critical vocabulary as well as sound writing skills to analyze works of art.

The major in art history, which leads to the Bachelor of Arts degree, requires 36 hours of course work in art history, including:

ARTH 101, Art History I (3)
ARTH 102, Art History II (3)
ARTH 396, Majors Seminar (3)

At least 6 credit hours must be taken at the 200 level. At least 15 credit hours must be taken at the 300 level. One approved art studio course is also required. Foreign language study (French, German, or Italian) is highly recommended.

Pre-Architecture

The pre-architecture major leads to the Bachelor of Arts degree. However, it may be chosen only as a second major. The double major is required so that the perspectives provided by this interdisciplinary program may be complemented by a concentrated disciplinary experience. The pre-architecture program introduces the student to the forms, history, and functions of architecture as well as the studio skills relevant to its practice. The program is designed to provide a background for undergraduate students who plan to continue architectural studies at the graduate level, as well as for those interested in the study of architecture as part of a liberal or technical education.

To declare a pre-architecture major, students should have declared a first major and have sophomore or junior standing. Up to 6 credits in general education requirements and elective courses taken by students for their first major may be applied to their pre-architecture major.

The major consists of a minimum of 30 credit hours, 15 of which are in required courses and the remainder of which are approved elective courses. Detailed information about approved electives is available in the departmental office.
The required courses are:
ARTS 302, 303, Architecture and City Design I, II (3, 3)
ARTH 101, Art History I (3)
ARTH 102, Art History II (3)
ARTS 106, Creative Drawing I (3)

Fifteen hours of electives must be selected from the following groups:
A. 6 hours from selected art history courses.
B. 6 hours from:
    ARTS 101, 201, Design and Color I, II (3,3)
    ARTS 206, Creative Drawing II (3)
    ARTS 220, Photography Studio I (3)
    THTR 223, 224, Stagecraft I, II (3,3)

C. For students whose interests lie in aesthetics and the history of architecture, 3 hours in sociology, American studies, anthropology, history of science and technology, civil engineering, or geology. Students are encouraged to include as many of the courses listed below as possible in their schedules:
    MATH 125, 126, Mathematics I, II (4,4)
    PHYS 115, 116, Introduction to Physics (4,4) and Laboratory (4,4)
    PHYS 121, General Physics-Mechanics (4)
    PHYS 122, General Physics II-Electricity and Magnetism (4) and Laboratory

Art Education
The program in art education, which leads to the Bachelor of Science degree, requires a total of 123 credits and is designed to educate professional teachers of art for the public and private schools who are also competent, creative artists. The program meets all requirements of the Ohio Board of Education to qualify its University-recommended students for PreK-12 Art Specialist Licensure to teach art in the public schools of Ohio and over 40 reciprocating states.

This program is conducted jointly by Case Western Reserve University and the Cleveland Institute of Art. Admission requires application to Case Western Reserve and submission of an art portfolio to the Cleveland Institute of Art. Credentials must be acceptable to both institutions. Academic work is taken at Case Western Reserve University and studio courses at the Cleveland Institute of Art, as follows:

**Academic Courses at Case Western Reserve University**
- ENGL 150 3
- PHED (two semesters-Lifetime Sports Activities) 0
- *GER: Mathematics 3
- *GER: Natural Sciences 3
- *GER: Natural Science or Science and Society 3
- Art History 101, 102 6
- *GER: History, Philosophy, Religion 6
- PSCL 101, EDUC 304 6
- EDUC 301 3
- ARTH electives (one must be at 300 level) 6
- ENGL elective (300 level) 3
- *GER: Global and Cultural Diversity 3
- One open elective (300 level) 3
* indicates courses fulfilling Arts and Sciences General Education

**Requirements**

**Art Studio at Cleveland Institute of Art**

Total of 51 hours of studio possible, taken at the Cleveland Institute of Art
- Computer Basics 101, 201 3
- Design 107, 108, 209 9
- Drawing 117, 118, 217 9
- Painting 121, 122, 210 9
- Sculpture 227 3
- 5 studio electives at 3 hours each 15
- CIA open elective 3

**Retention and Advanced Standing**

(Undergraduate Level)

Students in art education who expect to meet Ohio’s licensure requirements must apply for advanced standing by the end of their first semester junior year. To apply, students must submit to the art education faculty information about grade point average, written personal goals, three faculty recommendations, self-analysis of program progress up to the point of evaluation, and have an interview with the program director. Art education faculty may (1) accept a student for advanced standing; (2) accept a student with reservation, with a remedial plan; or (3) reject a student and recommend a career change.

To enter student teaching, a 2.5 cumulative University grade point average is required, a 3.0 cumulative G.P.A. average in professional education courses, and a total of 300 contact hours of clinical field-based experience acquired in a variety of settings as required by the State of Ohio. Fingerprinting for a criminal background check by the Ohio Bureau of Criminal Identification is required. For students who have not lived in Ohio consecutively for the past five years, a background check through the Federal Bureau of Investigation is also required.

To be recommended by the university’s director of teacher licensure for State Teacher Licensure, a 3.0 cumulative G.P.A. must be maintained in all professional education courses. An overall G.P.A. of 2.5 must be maintained. The Ohio Department of Education requires passing scores on the Praxis II Principles of Learning and Teaching and Art Content Knowledge exams in addition to the requirements stated above.

Completion of the Bachelor of Science degree exists separately from the assurance that State of Ohio Visual Art Teacher Licensure will be awarded.

Additional information on this program is available in the office of the director of art education.

**MINORS**

Four minors are available in art: one in art history, and three through the art studio program:

**Art History**

Requires 18 hours of art history including:
- ARTH 101, Art History I (3)
- ARTH 102, Art History II (3)
At least three credit hours must be taken at the 200 level.

**Art Studio**

Requires 18 hours in art studio including:
- ARTS 101, Design and Color (3)
- ARTS 106, Creative Drawing (3)
Four additional studio courses, two of which must be in the same area (i.e., drawing, painting, design, photography, or ceramics).

Photography

Requires 18 hours including:
ARTS 220, Photography Studio I (3)
ARTS 320, Photography Studio II (3)
ARTS 322, Photography: Color Studio (3)
ARTS 325, Creative Photography (3)
or ARTS 365D, Black and White Photography Studio
ARTS 365E, Color Studio (3) or ARTS 365K, Creative Photography
An elective, either ARTS 399, Independent Study in Art Studio (3) or ARTH102, Art History II (3)

Pre-Architecture

Requires 18 hours including:
ARTS 302, 303, Architecture and City Design I, II (3, 3)
ARTH 101, Art History I (3)
ARTH 102, Art History II (3)
ARTH 106, Creative Drawing (3)
One approved elective.

SEQUENCES

Sequences for students in the Engineering Core are available in art history and in art studio, in photography, and in pre-architecture. Sequences must include three art history courses, two of which should be at the 100 or 200 level, and selected in consultation with the departmental advisor. Art history sequences may include one three-hour course in art studio. A pre-architecture sequence is offered by art studio, drawn from ARTS 106, 302, 303; ARTH 101, 102.

DEPARTMENTAL HONORS

 Majors who wish to earn the Bachelor of Arts degree with Honors in Art History must make written application to the department chair no later than the fall semester of their senior year. Departmental honors are awarded upon fulfillment of the following requirements: a grade point average of at least 3.5 in the major and an honors thesis (ARTH 399) that receives a grade of A.

INTEGRATED GRADUATE STUDIES

Qualified undergraduates majoring in art history or art education also may participate in the Integrated Graduate Studies Program. Interested students should note the general requirements and the admission procedure described in this bulletin and may consult the department for further information.

GRADUATE PROGRAMS

Master of Arts in Art History

The master’s program in art history is designed to provide the student with a broad knowledge of the major art historical periods, the scholarly and bibliographical resources, and the methodologies of art history. It also offers an opportunity to investigate art historical problems in some depth. In addition to the regular graduate school application form, applicants to the graduate program in art history are required to submit GRE scores and copies of two term papers which they consider to represent their best work. Applicants for the M.A. should have a BA major or minor concentration in art history or a related humanities field and a minimum G.P.A. of 3.0.

The master’s degree in art history is conducted exclusively under Plan B as described under the School of Graduate Studies in this bulletin. All other requirements of the M.A. program must be fulfilled:
ARTH 495, Methodology of Art History (3)

Eight graduate courses, including one each from four of the following five areas, three of which must be seminars at the 500-level (21):
1. Non-Western
2. Ancient
3. Medieval
4. Renaissance/Baroque
5. Modern and American

A reading knowledge of one foreign language (French, German, or Italian).

Successful performance on the M.A. comprehensive examination.

3 credit hours of Qualifying Paper (ARTH 489)

Total: 30 hours.

Master of Arts in Art History and Museum Studies

The master’s program in art history and museum studies includes the same broad requirements and objectives of the master’s program in art history, with additional study of art museum procedures and two supervised museum internships.

The requirements include:
ARTH 495, Methodology of Art History (3)
ARTH 490, Visual Arts and Museums (3)
ARTH 491A&B, Visual Arts and Museums: Internship (1/3)

Seven graduate courses, including one each from four of the following five areas, three of which must be graduate seminars at the 500 level (21):
1. Non-Western
2. Ancient
3. Medieval
4. Renaissance/Baroque
5. Modern and American

Total 31 hours

Master of Arts in Art Education

The Master of Arts in Art Education is offered in two plans: Plan I for those who are already teacher licensed and who desire advanced studio- and art-related studies; Plan II for those holding the Bachelor of Fine Arts or equivalent degree who desire teaching licensure as visual art specialists. Both programs are offered jointly by Case Western Reserve University and the Cleveland Institute of Art.

The admission procedure includes a formal application, three letters of recommendation, and a college transcript, which are to be submitted to the Art Education office. The Cleveland Institute of Art admission procedure requires a portfolio of art work. Approval by both the University and the Cleveland Institute of Art is required for admission. Information and application forms are available through the office of Graduate Admission.
at Case Western Reserve University and through the department.

Students in this program may follow either of two plans.

Plan I: 36 semester hours of course credit:

18 hours in studio to be taken at the Cleveland Institute of Art at the 300 level or above; and 18 hours in academic courses to be taken at Case Western Reserve University at the 400 level or above, to be selected in consultation with the Director of Art Education; or

30 semester hours of course credit: 18 hours in studio to be taken at the Cleveland Institute of Art at the 300 level or above and 12 hours in academic courses to be taken at Case Western Reserve University at the 400 level or above, to be selected in consultation with the Director of Art Education; AND a thesis based on individual research not less than 6 semester hours of registration.

Plan II: 36 semester hours of course credit:

(Teacher Licensure Track for holders of the Bachelor of Fine Arts degree or equivalent studio background)
EDUC 401, Introduction to Education (3)
EDUC 404, Educational Psychology (3)
ARTS 385, Clinical Field-Based Experience I (1)
ARTS 386, Clinical Field-Based Experience II (1)
ARTS 387, Clinical Field-Based Experience III (1)
ARTS 400, Current Issues in Art Education (3)
ARTS 493, Art Content, Pedagogy, Methodology, and Assessment (3)
ARTS 466 A&B, Student Teaching in Art for Pre-K – 6th Grade and 7th – 12th Grade (4 each)
ARTS 465, Seminar for Art Teachers (4)
ARTS 602, Study in Art Education (3)

Studio electives at the Cleveland Institute of Art at the 300-level or above (6)

Retention and Advanced Standing
(Graduate Level)

Students in art education who expect to meet state teacher licensure requirements must apply for advanced standing prior to the semester in which they register for student teaching. To apply, students must submit to the art education faculty paperwork about grade point average, personal goals, and self-analysis of performance in the program up to the point of evaluation. Art education faculty may (1) accept a student for advanced standing; (2) accept a student with reservation, with a remedial plan; or (3) reject a student and recommend a career change.

A 3.0 cumulative grade point average is required to enter student teaching as well as a total of 300 contact hours of clinical field-based experience as required by the State of Ohio.

A 3.0 grade point average must be maintained in all professional education courses and an overall G.P.A. of 3.0 is required to be recommended by the university’s Director of Teacher Licensure for State Teacher Licensure.

Completion of the Master of Arts degree exists separately from the assurance that State of Ohio Visual Art Teacher Certification will be awarded. The State of Ohio requires a passing score on the National Teacher Examination, fingerprinting with a criminal background check by the Ohio Bureau of Criminal Identification, in addition to the requirements stated above. All M.A. degree candidates are required to present a documented thesis exhibition in the program’s gallery of their art work prior to graduation.

Doctor of Philosophy in Art History

The doctorate in Art History is designed to allow advanced graduate students the opportunity to specialize in designated areas. Admission to the program requires an M.A. in art history, a qualifying exam, or their equivalent, including a reading knowledge of one approved foreign language (French, German, Italian, or Spanish).

Applicants are required to submit GRE scores and two papers written during their matriculation for a master’s degree or a thesis if completed by the time of application.

University requirements for the Ph.D. include a minimum of 36 hours of course credits, but the department may require additional course work as preparation for the general examination or for the dissertation. The minimum credits are to be distributed as follows: ARTH 495, Methodologies of Art History (3); two graduate seminars at the 500 level or above (6); three additional courses at the 400 level or above (9); and a minimum of 18 hours of ARTH 701, Ph.D. Dissertation.

Doctoral students must demonstrate an ability to read two approved languages (other than English) useful in art historical research. German is normally required as one of the two languages for students concentrating in Western art. Both languages must be approved by the department at the time of admission or during the first semester of doctoral study.

Ph.D. students are required to pass a written and oral general examination before being advanced to candidacy. Within two weeks after the written examination, the faculty examining committee will administer the oral examination. A final evaluation will be based on the student’s performance in both the written and oral sections of the general examination.

Doctor of Philosophy in Art History and Museum Studies

The Ph.D. program in art history and museum studies is offered to a limited number of candidates. The program combines the academic requirements of a Ph.D. with practical museum training and is designed to provide experience in connoisseurship, conservation, and art education, as well as a planned program of academic course work and independent research. Admission to the program is made on the basis of academic record, experience, recommendations, and personal interviews. A master’s degree in art history or its equivalent is required for admission as well as GRE scores and a read-
Students in the Museum Studies Program are required to take a minimum of 38 hours of graduate study as follows: ARTH 610, Cleveland Museum of Art Internship (2); two graduate seminars at the 500 level or above (6); four elective courses at the 400 level or above (12); and a minimum of 18 hours of ARTH 701, Ph.D. Dissertation.

During the two-semester internship, the student will be assigned to one or more departments in the Cleveland Museum of Art for supervised study and practice that will be evaluated by a member of the Joint Faculty in Art History. The dissertation subject may be related to some aspect of art museum research; it may take the form of a special collection or exhibition catalogue, but it must satisfy the scholarly standards of the department and the University. Any student who has not taken ARTH 495, Methodologies of Art History or the equivalent, will be required to do so as part of the 12 hours of elective courses. Students also must satisfy all other requirements for the Ph.D. degree in art history.

ART HISTORY (ARTH)

Undergraduate Courses

ARTH 101. Art History I: Pyramids to Pagodas (3)
The first half of a two-semester survey of world art highlighting the major monuments of the ancient Mediterranean, medieval Europe, Mesoamerica, Africa, and Asia. Special emphasis on visual analysis and socio-cultural contexts, and objects in the Cleveland Museum of Art.

ARTH 102. Art History II: Michelangelo to Mapplethorpe (3)
The second half of a two-semester survey of world art highlighting the major monuments of Renaissance and Baroque Europe, America, and Asia. Special emphasis on visual analysis historical and sociocultural contexts and objects in the Cleveland Museum of Art. (ARTH 101 and 102 may be combined, or either can be taken in conjunction with any other 100 or 200 level Art History class to complete a sequence in the Arts portion of the Humanities section of the General Education Requirements in the College of Arts and Sciences or can be used as part of a three course Humanities sequence in the Engineering Core curriculum.)

ARTH 103. Works of Art, Images, and Artifacts (3)
This course is designed to introduce students to the history of art and to the cultural resources of University Circle. It is comprised of slide lectures, videos, presentations by invited curators, and visits to the museums surrounding the University. By examining a variety of objects from many times and places and raising issues that cut across categories, it encourages discussion and helps to develop a critical understanding of visual and material culture.

ARTH 203. The Arts of Asia (3)
A survey of Japanese and Chinese art from the Bronze Age to the 18th century, with particular emphasis on objects in the Cleveland Museum of Art. The relationship of art works to Buddhism and Hinduism is explored along with cultural rituals, ceremonies, and traditions.

ARTH 220. Jewish Tradition in Art and Architecture (3)
Tradition and transformation in Jewish artistic expression over time and across space. Course will begin with the biblical period and continue down to the present day in Israel and America. Examination of how concepts such as "Jewish" and "art" undergo change within the Jewish community over this period. Cross-listed as JDST 220.

ARTH 226. Introduction to Greek and Roman Art (3)
Classical art from the 8th century B.C. to the fourth century A.D.; the major developments in the architecture, sculpture, and painting of ancient Greece, Etruria, and Rome. Cross-listed as CLSC 226.

ARTH 227. Ancient Cities and Sanctuaries (3)
A selection of cities and sanctuaries from the ancient Near East, Egypt, the Aegean, Greece, Etruria, and Rome; their political and religious institutions and the relationship to contemporary art forms. Cross-listed as CLSC 227.

ARTH 228. Ancient Greek Athletics (3)
Exploration of the role of athletics in the ancient, primarily Greek world, and their reflection in the art of the period. Cross-listed as CLSC 228.

ARTH 250. Art in the Age of Discovery (3)
A survey of developments in Renaissance art and architecture in northern Europe and Italy during a new age of science, discovery and exploration, 1400-1600.

ARTH 260. Art in the Age of Grandeur (3)
A survey of European art in the seventeenth and eighteenth centuries, an era of rising nationalism, political aggrandizement, religious expansion and extravagant art patronage.

ARTH 270. American Art and Culture Before 1900 (3)
Survey of the development of American art from colonial times to the present which explores how art has expressed both American values and American anxieties. Painting is emphasized, but the course also considers architecture, the decorative arts, film, literature, and music. Cross-listed as AMST 270.

ARTH 271. American Art and Culture: The Twentieth Century (3)
Survey of the development of American art from 1900 to the present (and the future) which will explore how art has expressed both American values and American anxieties. Painting will be emphasized, but the course will also consider architecture, the decorative arts, film, literature, and music. Cross-listed as AMST 271.

ARTH 280. Modern Art and Modern Science (3)
An examination of the development of painting, sculpture, and architecture from the 19th to the mid 20th century. Special attention is given to the emergence of "modernism" and the influence of science on such movements as Impressionism and Cubism.

ARTH 284. History of Photography (3)
A survey of the history of photography from its inception in 1839 to the present. Emphasis is on the complex relationship between technological innovations and picture-making; the artistic, documentary, and personal uses of photography; and the relationship of photography to other art forms.

ARTH 290. Introduction to the Art of Sub-Saharan Africa (3)
Exploration of the diverse forms and multiple contexts of the visual arts of sub-Saharan Africa. Attention focused on the sculpture of different peoples of West and Central Africa. Ancient arts in terracotta and bronze of Nigeria, Mali, and Chad and rock art of Saharan, Southern, and Eastern Africa will also be explored. Topics such as the styles, aesthetics, meanings, and functions of African art and the training, techniques, and status of the African artist will be discussed.

ARTH 300. Childhood through Art (3)
This course will explore the imagery of children in art from its beginnings in ancient Egyptian sculpture up to the present with photographs by Mapplethorpe and Sally Mann. In order to develop a critical awareness of how children are portrayed and how the viewer is manipulated, students will study specific works of art in the Cleveland Museum of Art as well as examples from contemporary visual culture. Cross-listed as CHST 300.

ARTH 302. Buddhist Art in Asia (3)
The development of Buddhist art from its origins in India along the silk route to China and along the maritime routes to Japan and southeast Asia.

ARTH 303. History of Far Eastern Art (3)
A survey of traditional arts of Asia east of the Indus river, designed to emphasize the creative contributions of the artist with particular attention to the international relations of: the Bronze Age, Buddhist art, Hindu art and the later arts of China, Korea, and Japan. National and regional contributions to the developed styles of South Asia and the Far East will be stressed.

ARTH 305. The Art of India (3)
A survey of Indian art from the Indus valley civilization to the Islamic conquest of India. Stylistic developments of the three-dimensional arts examined through cave sites and other extant materials.

ARTH 306. History of Indian Sculpture (3)
The stylistic development of both Buddhist and Hindu schools of Indian sculpture from the prehistoric period to the 12th century. Sculptural images are studied in terms of Indian mythology and literature.

ARTH 328. Greek Sculpture (3)
Greek sculpture from the Archaic period through the Hellenistic; style, the development of specific types, and the uses of architectural sculpture. Cross-listed as CLSC 328.

ARTH 332. Art and Archaeology of Ancient Italy (3)
The arts of the Italian peninsula from the 8th century B.C. to the 4th century A.D., with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, the decorative arts; supplemented by gallery tours at the Cleveland Museum of Art. Cross-listed as CLSC 332.

ARTH 333. Greek and Roman Painting (3)
Greek vase painting, Etruscan tomb painting and Roman wall painting. The development of monumental painting in antiquity. Cross-listed as CLSC 333.
ARTH 334. Art and Classical Archaeology of Greece (3)
A survey of the art and architecture of Greece from the beginning of the Bronze Age (3000 B.C.) to the Roman conquest (100 B.C.) with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting and the decorative arts, supplemented by gallery tours at the Cleveland Museum of Art. Cross-listed as CLSC 334.

ARTH 340. Issues In Non-Western Art (3)
Various topics in non-western art. Lectures, discussions, and reports.

ARTH 350. Issues In Medieval Art (3)
Various topics in medieval art. Lectures, discussions, and reports.

ARTH 351. Late Gothic Art in Italy (3)
Sculpture of the Pisani; early trends in Pisa, Siena, and Florence; Cimabue and Giottos; Duccio, Simone Martini, and the Lorenzetti; painting in Florence and Siena after the Black Death.

ARTH 352. Italian Art of the 15th Century (3)
The early 15th century in Florence, civic humanism, the sculpture of Ghiberti and Donatello, the painting of Masaccio; the International Style in painting, the art of Uccello, Piero della Francesca, Mantegna, and Botticelli; Carpaccio and the Bellinis in Venice.

ARTH 353. Sixteenth Century Italian Art (3)
The development of the High Renaissance and Manierist styles in Italy and late 16th century trends: painting and sculpture.

ARTH 356. Italian Renaissance and Baroque Sculpture (3)
Italian sculpture from the early 12th century to the later 18th century: The Pisani, Ghiberti, Donatello, Michelangelo, the Manierists and Bernini.

ARTH 360. Renaissance Art in Northern Europe (3)
Painting, sculpture and the graphic arts in the Netherlands, Germany, and France, 1400-1580, highlighting artists such as Jan van Eyck, Albrecht Durer and Pieter Bruegel. The rise of secular subjects and bourgeois patronage is explored.

ARTH 361. Dutch and Flemish 17th Century Painting (3)
The golden age of Dutch and Flemish art with study of major masters (Rubens, Hals, Rembrandt, and Vermeer) and developments in subject matter: landscape, still-life, and genre themes.

ARTH 362. Issues in Renaissance Art (3)
Various topics in Renaissance art. Lectures, discussions and reports.

ARTH 365. Issues in Baroque Art (3)
Various topics in baroque art. Lectures, discussions and reports.

ARTH 367. 17th and 18th Century French Art (3)
A survey of the arts of painting, sculpture and architecture in France from 1600 to 1780. Attention will be given to stylistic developments and to social and political contexts, patronage and art theory.

ARTH 374. Impressionism to Symbolism (3)
Major developments in European painting and sculpture during the latter half of the nineteenth century. Post-impressionism, symbolism, and the arts and crafts movement considered in their socio-cultural contexts. Works of Degas, Manet, Monet, Klimt, Bocklin, Gauguin, etc.

ARTH 379. Issues in 19th Century Art (3)
Various topics in 19th century art, with class lectures, discussions and reports. Consult department for current topic.

ARTH 380. Abstract Expressionism and Its Aftermath (3)
An examination of the development and influences of Abstract Expressionism, including the impact on the Beat Generation and Pop Art.

ARTH 381. Neoclassicism to Realism (3)
The main developments of European art chiefly painting and sculpture from post-impressionism to the present; the nature of abstract art and the interrelationships between the visual arts and new developments in literature, philosophy, and science.

ARTH 382. Visions of Utopia: 20th Century European Art (3)
Major movements in early 20th century European painting and sculpture with utopian goals. Focus on the interrelationships between the visual arts and new developments in literature, philosophy, and science.

ARTH 385. American Avant-Garde: 1900 - 1925 (3)
An examination of the development of avant-garde styles in New York during the early twentieth century. In-depth discussion of the Photo-secession, Stieglitz’s “291” gallery, the Armory Show, Marcel Duchamp’s move to America, and the formation and demise of the New York Dada movement.

ARTH 392. Issues in 20th/21st Century Art (3)
Various topics in 20th/21st century art, with class lectures, discussions, and reports.

ARTH 393. Contemporary Art: Critical Directions (3)
An examination of the directions taken by avant-garde American art and criticism in the aftermath of Abstract Expressionism. Includes the rise and fall of modernism in the 1960s and ’70s, as well as an investigation of Post-modern trends and theories.

ARTH 396. Majors Seminar (3)
A group discussion course designed to focus on methodology and the relationship between art and contemporary society. Required of majors. Offered in alternate years.

ARTH 397. History of Prints and Printmaking (3)
Development of techniques and style and the social function of prints. The great masters: Durer, Rembrandt, Goya, and others. Based on the extensive collections of the Cleveland Museum of Art.

ARTH 398. Independent Study in Art History (1-3)
Individual research and reports on special topics.

ARTH 399. Honors Thesis (3)
Intensive study of a topic or problem leading to the preparation of an honors thesis.

Graduate Courses
ARTH 400. Childhood through Art (3)
(See ARTH 300.)

ARTH 402. Buddhist Art in Asia (3)
(See ARTH 302.)

ARTH 403. History of Far Eastern Art (3)
(See ARTH 303.)

ARTH 405. The Art of India (3)
(See ARTH 305.)

ARTH 406. History of Indian Sculpture (3)
(See ARTH 306.)

ARTH 428. Greek Sculpture (3)
(See ARTH 328.)

ARTH 432. Art and Archaeology of Ancient Italy (3)
(See ARTH 332.)

ARTH 433. Greek and Roman Painting (3)
(See ARTH 333.)

ARTH 434. Art and Classical Archaeology of Greece (3)
(See ARTH 334.)

ARTH 440. Issues in Non-Western Art (3)
(See ARTH 340.)

ARTH 450. Issues in Medieval Art (3)
(See ARTH 350.)

ARTH 451. Late Gothic Art in Italy (3)
(See ARTH 351.)

ARTH 452. Italian Art of the 15th Century (3)
(See ARTH 352.)

ARTH 453. Sixteenth Century Italian Art (3)
(See ARTH 353.)

ARTH 456. Italian Renaissance and Baroque Sculpture (3)
(See ARTH 356.)

ARTH 460. Renaissance Art in Northern Europe (3)
(See ARTH 360.)

ARTH 461. Dutch and Flemish 17th Century Painting (3)
(See ARTH 361.)

ARTH 462. Issues in Renaissance Art (3)
(See ARTH 362.)

ARTH 465. Issues in Baroque Art (3)
Various topics in baroque art. Lectures, discussions and reports.

ARTH 467. 17th and 18th Century French Art (3)
(See ARTH 367.)

ARTH 474. Impressionism to Symbolism (3)
(See ARTH 374.)

ARTH 479. Issues in 19th Century Art (3)
(See ARTH 379.)

ARTH 480. Abstract Expressionism and Its Aftermath (3)
(See ARTH 380.)

ARTH 481. Neoclassicism to Realism (3)
(See ARTH 381.)

ARTH 482. Visions of Utopia: 20th Century European Art (3)
(See ARTH 382.)

ARTH 483. Gender Issues in Feminist Art (3)
(See ARTH 383.)

ARTH 485. American Avant-Garde: 1900 - 1925 (3)
(See ARTH 385.)

ARTH 489. M.A. Qualifying Paper (3)
Individual research and intensive study of a specific topic in art history which culminates in a written M.A. Qualifying Paper. Prereq: 27 credit hours of Art History.
ARTH 490. Visual Arts and Museums (3)
Students who successfully complete this course may be considered for admission into ARTH 491A, a supervised internship in an art museum or gallery situation.

ARTH 491A. Visual Arts and Museums: Internship (1)
Prereq: ARTH 490.

ARTH 491B. Visual Arts and Museums: Internship (3)
Second semester of Internship; includes final project devised in consultation with Director of Museum Studies. Prereq: ARTH 490 and ARTH 491A.

ARTH 492. Issues in 20th/21st Century Art (3)
(See ARTH 392.)

ARTH 493. Contemporary Art: Critical Directions (3)
(See ARTH 393.)

ARTH 494A. Directed Readings in Non-Western Art (1-3)
Directed reading. Prereq: Consent of professor and department chair required before registering.

ARTH 494B. Ancient Art (1-3)

ARTH 494C. Medieval Art (1-3)

ARTH 494D. Renaissance and Baroque Art (1-3)

ARTH 494E. American Art (1-3)

ARTH 494F. Modern Art (1-3)

ARTH 495. Methodologies of Art History (3)
The study of art history as a discipline in its practical and theoretical aspects. Consideration given to research methods, style and historical context, and a critical examination of selected major art historical texts with a view to understanding traditional as well as recent approaches. Special attention is given to art historical writing, employing selected original works in the Cleveland Museum of Art. Required of first-year graduate students in the Ph.D. and Master's programs.

ARTH 497. History of Prints and Printmaking (3)
(See ARTH 397.)

ARTH 512. Seminar in Ancient Art (3)

ARTH 518B. Seminar in Asian Art (3)

ARTH 540. Seminar in Non-Western Art (3)
Topics may include: African Art and The West, Africa: Symbolism and Ritual, The Classic Period in Mesoamerica, Andean Textiles.

ARTH 545B. Seminar in Medieval Art (3)

ARTH 550. Seminar: Issues in Western European Art (3)

ARTH 551. Seminar in Renaissance Art (3)

ARTH 552. Seminar in Baroque Art (3)

ARTH 565. Seminar in American Art (3)

ARTH 570. Seminar: 19th Century Art (3)

ARTH 575. Critical Theory Seminar (3)
In-depth study of controversial revisionist writings which demonstrate the strong impact of structuralist, poststructuralist, semiotic, Marxist, psychoanalytic, film, and gender theories on recent art historical discourse. Discussion of a wide range of current theoretical positions applied to visual and critical analysis of 19th and 20th century art works. Prereq: ARTH 495. ARTH 576. Seminar in Modern Art (3)

ARTH 601. Research in Art History (1-18)
(Credit as arranged.)

ARTH 610. Cleveland Museum of Art Intern (1)
Prereq: ARTH 490.

ARTH 651. Thesis M.A. (1-18)

ARTH 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

ARTH 703. Dissertation Fellowship (1-8)

ART EDUCATION/ART STUDIO (ARTS)

Undergraduate Courses

ARTS 101. Design and Color I (3)
Organizational and structural problems as a basis for the development of style. Studies in line, texture, shape, space, value, color, and two dimensional composition through studio problems.

ARTS 106. Creative Drawing I (3)
Development of graphic fluency in black and white through direct observation of nature and the model. Drawing as a means of enlarging visual sensitivity using a wide range of media and subject matter. Work from model.

ARTS 201. Design and Color II (3)

ARTS 206. Creative Drawing II (3)
Continuation of ARTS 106. Advanced work in graphic representation. Development of visual acuity and a personal drawing style while working in color. Work from the model. Prereq: ARTS 106.

ARTS 210. Enameling and Jewelry I (3)
Techniques in the application of vitreous enamel on copper and of constructed metal jewelry. Technical skill and suitability of design as applied to the medium.

ARTS 212. Weaving, Fibers, and Textiles I (3)
Basic techniques of weaving, macrame, and textile printing. Use of natural and synthetic fibers. Introduction to batik, quilting, and block printing on fabric.

ARTS 214. Ceramics I (3)
The techniques of hand building. Development of sensitivity to design and form. Basic work in stoneware, earthenware, and glazing.

ARTS 216. Painting I (3)
The creative, conceptual, visual, and technical aspects of painting. Style ranging from naturalism to abstraction. Work in acrylic and mixed media.

ARTS 220. Photography Studio I (3)
Camera, film, and darkroom techniques. Development of basic black and white perceptual and photographic skills. Darkroom and photographic field and lab work. 35mm camera required.

ARTS 295. Introduction to Art Education (3)
General history and theories of art education. Development of personal philosophy as basis for teaching art. Topics in professional standards, creativity, aesthetic theory, and art criticism.

ARTS 300. Current Issues in Art Education (3)
Contemporary issues in Art Education; understanding art goals and standards of National Art Education Association and the Ohio State Department of Education for teachers, students and administrators. Special topics: art and technology, multiculturalism, and special populations. Prereq: ARTS 295.

ARTS 302. Architecture and City Design I (3)
The social spatial, and aesthetic elements in architecture; the components of the building: the window, door, roof, enclosing walls, and character of interior and exterior space. Problems related to small, intimate scale and residential structures. Lectures, field trips, studio experiences. Recommended ARTS 101 or ARTS 106 courses prior to enrollment.

ARTS 303. Architecture and City Design II (3)
The social, spatial, and aesthetic elements of the urban setting of architecture, the organizational components of the city, the path, the node, the edge, and the grid. Problems related to large-scale and public buildings and their relationships to the encompassing visual world. Lectures, field trips, studio experiences. Recommended ARTS 101 or ARTS 106 courses prior to enrollment.

ARTS 304. Architecture and City Design III (3)
A study of historic precedents and the social implications of modern and contemporary architecture including analysis and form interpretation as it relates to building and materials technologies. Practical application and synthesis of architectural knowledge through site visits and research of local and regional architecture. Discussions of historic and contemporary architects, engineers and significant architecture and engineering firms. Prereq: ARTS 302 and ARTS 303.

ARTS 310. Enameling and Jewelry II (3)

ARTS 312. Weaving, Fibers, and Textile II (3)
Continuation of ARTS 212. Development of a selected area of weaving or textiles: loom weaving, tapestry, three dimensional work, batik, or fabric printing. Exploration of an area through design and execution of a series of projects. Prereq: ARTS 212.

ARTS 314. Ceramics II (3)
Continuation of ARTS 214. Problematic approach to technical aspects of ceramics; extensive experience in wheel throwing, experimentation with clay and body formulation. Prereq: ARTS 214.

ARTS 316. Painting II (3)

ARTS 320. Photography Studio II (3)
Continuation of ARTS 220. Advanced theory and black and white techniques, historic processes and theory. Development of personal aesthetic encouraged. Field work. 35mm camera required. Prereq: ARTS 220.

ARTS 322. Photography: Color Studio (3)
Personal expression through use of color photography. Introduction to color printing and processing techniques. History of the medium. Field and lab work. 35mm camera required. Prereq: ARTS 220.

ARTS 325. Creative Photography (3)
Creative photography through photography and responding to photographs. The question of self-expression and photographic medium explored in the pursuit of understanding images. Prereq: ARTS 220 and ARTS 320 or ARTS 322.

ARTS 365A. Painting (3)
Advanced painting problems determined in consultation with instructor. Prereq: ARTS 216 and ARTS 316.
Graduate Courses

ARTS 400. Current Issues in Art Education (3)
(See ARTS 300.) Research paper required for graduate students.

ARTS 402. Architecture and City Design I (3)
(See ARTS 302.)

ARTS 403. Architecture and City Design II (3)
(See ARTS 303.)

ARTS 465. Seminar for Art Teachers (4)
For art education majors. Principles and practice in art instruction in grades Pre-K through 12th grade. Organization and management of the art program that incorporates production, art history, appreciation, and criticism into an integrated sequential curriculum. Planning, development, and evaluation of teaching materials, lessons, and units. Prereq: ARTS 295 or ARTS 366A and ARTS 466B. Coreq: ARTS 366A or ARTS 466B.

ARTS 466A. Student Teaching in Art: Pre-K - 6th Grade (4)
(See ARTS 366A.) Prereq: ARTS 385, ARTS 386, ARTS 387, ARTS 400, ARTS 403, and ARTS 602. Coreq: ARTS 465 and ARTS 466B.

ARTS 466B. Student Teaching in Art: 7th - 12th Grade (4)
(See ARTS 366B.) Prereq: ARTS 385, ARTS 386, ARTS 387, ARTS 400, ARTS 403, and ARTS 602. Coreq: ARTS 465 and ARTS 466A.

ARTS 493. Art Content, Pedagogy, Methodology, and Assessment (3)
(See ARTS 393.) Prereq: ARTS 602.

ARTS 494. Teaching Art (3)
Research contrasting theories of art education in relationship to a variety of educational settings in elementary and secondary schools. Developing innovative, interdisciplinary, comprehensive curriculum models for a specific organization. For licensed art teachers only. Prereq: Permit required from Director of Art Education.

ARTS 497. Summer Workshop in Art Education (3)
A current art education issue is covered in depth.

ARTS 602. Study in Art Education (3)
General history and theories of art education. Development of personal philosophy as basis for teaching art. Topics in professional standards, creativity, aesthetic theory, and art criticism. Students must also produce an art education research paper. Clinical/Field experiences are required.

ARTS 605. Final Creative Thesis (1-3)
Students receive individual guidance for an approved self-designed project from program faculty members. A public exhibition or presentation is required. Prereq: Permit required from Director of Art Education.

PROGRAM FACULTY

George W. Ernst, Ph.D. (Carnegie Institute of Technology)
Associate Professor of Electrical Engineering and Computer Science

Randall D. Beer, Ph. D. (Case Western Reserve University)
Professor of Electrical Engineering and Computer Science

Michael S. Branickey, Ph.D. (Massachusetts Institute of Technology)
Associate Professor of Electrical Engineering and Computer Science

Hillel J. Chiel, Ph.D. (Massachusetts Institute of Technology)
Professor of Biology

Grover C. Gilmore, Ph.D. (Johns Hopkins University)
Professor of Psychology

Robert L. Greene, Ph.D. (Yale University)
Professor of Psychology

Gilles Klopman, Ph.D. (University of Brussels, Belgium)
Professor of Chemistry

Behnam Malakooti, Ph.D. (Purdue University)
Professor of Electrical Engineering and Computer Science

Francis L. Merat, Ph.D. (Case Western Reserve University)
Associate Professor of Electrical Engineering and Computer Science

Wyatt S. Newman, Ph.D. (Massachusetts Institute of Technology)
Professor of Electrical Engineering and Computer Science

UNDERGRADUATE PROGRAM

The program in artificial intelligence offers an undergraduate minor. The core of the minor introduces students to the techniques of artificial intelligence programming and the basic theoretical concepts of artificial intelligence, knowledge represen-
tation, and automated reasoning. Within the minor, a student may choose a track pertaining to science and engineering or a track pertaining to artificial intelligence and cognition. Students who take the science and engineering track will have the opportunity to build significant intelligent systems. They will acquire a solid understanding of methods for knowledge representation and automated reasoning. The science and engineering track provides an opportunity for a student to acquire knowledge that is useful in areas such as management and engineering.

The artificial intelligence and cognition track will give students the opportunity to explore the relationships between computational processes and the study of mind and language. Studies of the relationships between these areas have led to developments in robotics, mathematical neuroscience, visual processing systems, parallel processing systems, mathematical and experimental psychology, and linguistics.

A minor consists of five courses. Every student who takes the minor in artificial intelligence must take the two courses, ENGR 131 (Elementary Computer Programming) and EECS 391 (Introduction to Artificial Intelligence). Students who take the artificial intelligence minor must also take one of two minor tracks:

The Technology Track requires 3 of the following courses:
- BIOL 373 Introduction to Neurobiology
- BIOL 374 Neurobiology of Behavior
- BIOL 477 Dynamics of Adaptive Behavior (cross listed as EECS 477)
- BIOL 478 Computational Neuroscience (cross listed as EECS 478)
- BIOL 479 Seminar in Computational Neuroscience (cross listed as EECS 479)
- ENGL 301 Linguistic Analysis of Modern English
- PHIL 201 Introduction to Logic
- PHIL 306 Mathematical Logic
- PSCL 101 General Psychology I
- PSCL 352 Physiological Psychology
- PSCL 353 Psychology of Learning
- PSCL 355 Sensation and Perception
- PSCL 357 Cognitive Psychology
- PSCL 370 Human Intelligence
- PSCL 402 Cognition and Information Processing

400- and 500-level courses require the approval of the minor advisor.

The Cognitive Science Track requires 3 of the following courses:
- BIOL 373 Introduction to Neurobiology
- BIOL 374 Neurobiology of Behavior
- BIOL 477 Dynamics of Adaptive Behavior (cross listed as EECS 477)
- BIOL 478 Computational Neuroscience (cross listed as EECS 478)
- BIOL 479 Seminar in Computational Neuroscience (cross listed as EECS 479)
- ENGL 301 Linguistic Analysis of Modern English
- PHIL 201 Introduction to Logic
- PHIL 306 Mathematical Logic
- PSCL 101 General Psychology I
- PSCL 352 Physiological Psychology
- PSCL 353 Psychology of Learning
- PSCL 355 Sensation and Perception
- PSCL 357 Cognitive Psychology
- PSCL 370 Human Intelligence
- PSCL 402 Cognition and Information Processing

Asian Studies

211 Mather House
Phone 216-368-2623
Elisabeth Koll, Director
(exk21@po.cwru.edu)

ADVISORY COMMITTEE

Elisabeth Koll, Ph.D. (Oxford University)
Associate Professor, History
Director, Asian Studies Program

Chinese socioeconomic history, especially late Imperial and Republican China; Chinese business history; history of industrialization and technological development in East Asia; the history of the railway in China

William E. Deal, Ph.D. (Harvard University)
Severance Associate Professor of the History of Religion and Chair
Buddhism, Japanese and Chinese religions, ethics, methodology of religion, religion and culture

Linda C. Ehrlich, Ph.D. (University of Hawaii/East-West Center)
Associate Professor, Japanese and Comparative Literature
Cinema and art, emphasis on Asian (Japanese) cinema; traditional Asian theater; Japanese poetry; literature and film; cinema of Spain

Melvyn C. Goldstein, Ph.D. (University of Washington)
John Reynolds Harkness Professor of Anthropology and Chair
Director, Center for Research on Tibet
Social anthropology; cross-cultural aging; cultural ecology; development; Tibet, China, Mongolia, Himalayas

Takao Hagiwara, Ph.D. (University of British Columbia)
Associate Professor, Japanese and Comparative Literature
Japanese literature, especially modern prose and poetry; classical and modern Japanese literature; pre-modern Japanese sensibilities and (post)modernism

Takao Hagiwara, Ph.D. (University of British Columbia)
Associate Professor, Japanese and Comparative Literature
Japanese literature, especially modern prose and poetry; classical and modern Japanese literature; pre-modern Japanese sensibilities and (post)modernism

Charlotte Ikels, Ph.D. (University of Hawaii)
Professor, Anthropology
Urban life, aging, intergenerational relations, health care, comparative biomedical ethics; China, Hong Kong, U.S.

UNDERGRADUATE PROGRAMS

Asian Studies has become an increasingly important area of study in North American colleges and universities. This is due in part to a growing acknowledgment that Asian cultures are of significance both regionally and globally. The Asian Studies Program offers students the opportunity to explore these cultures from a multidisciplinary perspective so that they are able to understand the social, cultural, political, and other forces that shape and have shaped these nations.

The Asian Studies Program brings together faculty with research and teaching interests in the histories and cultures
of Asia, and provides students with a curriculum that offers several different approaches to the study of Asia. The Asian Studies Program is interdisciplinary, drawing faculty and courses from such departments as Anthropology, Art History and Art, Economics, Modern Languages and Literatures, History, Philosophy, Political Science, and Religion. A current list of approved courses is available from a Program advisor. Several Asian Studies courses contribute to the completion of the Arts and Sciences General Education Requirements.

The undergraduate program in Asian Studies offers a major, minor, and sequence. Students are encouraged to take courses in different disciplines in order to obtain broad exposure to the languages, literature, art, culture, religious traditions, and political, economic, and social institutions of Asian countries. Asian Studies also offers an honors program to qualified majors.

In addition to course offerings, the Asian Studies Program sponsors extracurricular activities that enhance the formal study of Asia and give students additional opportunities for exploring and understanding the importance of Asia in the global community. Extracurricular activities include sponsorship of lectures, films, and the administration of a Website devoted to Asia. The Program also encourages students to study abroad in an Asian country and to utilize local Asian resources at the Cleveland Museum of Art and other area institutions.

Major (for B.A.)

The major in Asian Studies consists of two tracks. Students choose one of the two tracks. Track 1 requires a minimum of 37 credit hours and includes an Asian language requirement. Track 2, which does not require study of an Asian language, can only be taken as a second major. Both tracks require ASIA 133 and ASIA 134, and additional hours chosen from a list of approved courses available from a Program advisor. Students prepare a program of study, indicating specific course selections to meet the requirements for the chosen track. A Program advisor must approve a student’s program of study.

Track 1 (first major) - 37 semester hours total
• ASIA 133 and ASIA 134 (cross-listed as: HSTY 133 and HSTY 134)
• at least 16 hours in an Asian language
• 3 hours in Anthropology (Asia-related)
• 3 hours in Political Science or Economics (Asia-related)
• 3 hours in Religion (Asia-related)
• 6 additional hours (Asia-related) selected in consultation with a Program advisor

Track 2 (can only be taken as a second major) - 36 semester hours total
• ASIA 133 and ASIA 134 (cross-listed as: HSTY 133 and HSTY 134)
• 6 hours in Anthropology (Asia-related - suggested: ANTH 352 and ANTH 353)
• 6 hours in Religion (Asia-related - suggested: RLGN 204 and RLGN 217)
• 3 hours in Comparative Literature (Asia-related)
• 3 hours in Political Science or Economics (Asia-related)
• 12 additional hours (Asia-related) selected in consultation with a Program advisor

Minor

The minor in Asian Studies consists of 18 semester hours of courses, including ASIA 133 or ASIA 134. The remaining 15 credit hours are selected in consultation with a Program advisor. Only one year (8 credits) of language study (Japanese or Chinese) counts toward the minor.

18 semester hours total
• ASIA 133 or ASIA 134 (cross-listed as: HSTY 133 or HSTY 134)
• 15 additional hours (Asia-related) selected in consultation with a Program advisor

• only one year (8 hours) of Asian language study counts toward the minor

Sequence (Engineering Core)

The requirements for an Asian Studies sequence are satisfied with the completion of ASIA 133 or ASIA 134 and six additional semester hours of Asia-related courses chosen in consultation with a Program advisor.

9 semester hours total
• ASIA 133 or ASIA 134 (cross-listed as: HSTY 133 or HSTY 134)
• 6 additional hours (Asia-related) selected in consultation with a Program advisor

Asian Studies Honors

Asian Studies Honors is a semester-long program for Asian Studies majors, normally taken during the senior year, involving the research and writing of an Honors Thesis. Honors Program requirements include the completion of ASIA 133 and ASIA 134, at least two semesters of study of an Asian language and two further content courses in Asian Studies, and maintenance of GPAs of at least 3.0 overall and 3.2 in Asian Studies courses. A participating student enrolls in Asia 398: Honors Thesis, and writes a thesis under the direction of a faculty member designated as the thesis director, in association with a second reader, who must be a member of the Asian Studies Program. A third reader, who need not be a member of the Asian Studies Program, is optional. Each student must maintain regular contact with the supervising faculty member in the various stages of the research and writing of the thesis. Detailed guidelines and deadlines for the course are available from the director of the Asian Studies Program.

ASIAN STUDIES (ASIA)

Undergraduate Courses

ASIA 133. Introduction to Chinese History and Civilization (3)
(See HSTY 133.) Cross-listed as HSTY 133.
Department of Astronomy
567 Sears Library Building
Phone 216-368-3728; Fax 216-368-5406
R. Earle Luck, Chair
http://burro.astr.case.edu/dept

FACILITIES
The Department of Astronomy operates the Kitt Peak Station of the Warner & Swasey Observatory near Tucson, Arizona, home of the Burrell Schmidt telescope. This telescope is used for surveys and imaging with large format CCDs. The 0.9m reflector located at the Nassau Station near Chardon, Ohio is remote control capable and equipped for direct imaging. A 9.5-inch refractor permanently mounted on the roof of the A.W. Smith Building is available for use by students. The department also houses a research and instruction computer laboratory including the Astronomy/Physics Beowulf supercomputing cluster.

FACULTY
R. Earle Luck, Ph.D. (University of Texas, Austin)
Worcester R. and Cornelia B. Warner Professor and Chair
Director of the Warner and Swasey Observatory
J. Christopher Mihos, Ph.D. (University of Michigan)
Associate Professor

Heather L. Morrison, Ph. D. (Australian National University)
Associate Professor

Secondary Faculty
Lawrence M. Krauss, Ph.D. (Massachusetts Institute of Technology)
Ambrose Swasey Professor and Chair, Department of Physics
John E. Ruhl, Ph.D. (Princeton University)
Professor, Department of Physics
Glenn Starkman, Ph.D. (Stanford University)
Professor, Department of Physics

UNDERGRADUATE PROGRAMS
Two degrees in astronomy are offered, the Bachelor of Science degree and the Bachelor of Arts degree. The primary difference between the two degrees is that the B.A. degree allows somewhat more flexibility in choice of courses. Both the B.A. and B.S. degrees provide excellent preparation for graduate studies. There are also two minor programs in astronomy.

A broad and substantial background in physics and mathematics with introductory exposure to astronomy is emphasized in the astronomy curriculum. A faculty actively engaged in research provides first-rate instruction and opportunity for undergraduate involvement in research.

A bachelor’s degree in astronomy is designed to prepare for graduate study in astronomy, but the holder of this undergraduate degree who seeks employment can fill the same jobs as physics and computer science majors.

GRADUATE PROGRAMS
The department offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in astronomy. Current research provides opportunities in optical observational astronomy and theoretical studies of galaxy formation and evolution. Prospective graduate students must submit scores on the Graduate Record Examination including the advanced physics test. Further information on the department’s graduate programs, and details concerning financial aid, are available through the departmental office and/or website.

ASTRONOMY (ASTR)

Undergraduate Courses

ASTR 151. Doing Astronomy (1)
This course is intended to introduce students to how astronomy is done. The course will focus on the astronomical research process, the scientific community, and on career paths in astronomy. Course activities will include readings and class discussions focusing on various topics in modern astronomy, including ongoing research activity in the department. Prereq: Permission of department.

ASTR 188. On Being a Scientist (1)
This course is intended to convey the excitement of doing science. Classes will focus on the question “What makes a good Scientist?” using weekly discussion of articles chosen from the “Science Times” and journals such as Science and Nature. It will build vital oral communication skills via a discussion of the broader context and implications of the science discussed. The course will be offered as part of WISer, the CWRU Women in Science and Engineering Roundtable, to help build a supportive community of science students to enhance women’s participation and retention in science. Male students are welcome to register. Cross-listed as ANTH 188, BIOL 188, GEO 188, PHYS 188, PSCL 188, SOCI 188, and WMST 188.

ASTR 201. The Sun and its Planets (3)
An overview of the solar system: the planets and other objects that orbit about the sun and the sun itself as the dominant mass and the most important source of energy in the solar system. Concepts and the development of our knowledge will be emphasized. Not available for credit to astronomy majors.

ASTR 202. Stars, Galaxies, and the Universe (3)
Stellar structure, energy sources, and evolution, including red giants, white dwarfs, supernovae, pulsars, and black holes. Stellar populations in the Milky Way and external galaxies. The universe and its evolution. Not available to astronomy majors.

ASTR 203. Archaeoastronomy: Calendars, Barrows, and Megaliths (3)
To acquaint the student with the regular cycles of the Sun, Moon, planets, and stars. To show how ancient civilizations (and some not so ancient) have used those cycles to formulate calendars which are evidenced primarily by artifacts and ruins scattered over the entire Earth.

ASTR 204. Einstein’s Universe (3)
This course is intended to introduce the non-scientist to the concepts of modern cosmology—the structure and evolution of the universe. No mathematical background beyond simple algebra is needed.

ASTR 205. The Scale of the Universe (3)
The solar system, stars, and galaxies. Our place in the Universe. Cosmology and the evolution of the Universe. The use of physical laws to study the Universe. The scientific method—predictions and tests of scientific theory.

ASTR 221. Stars and Planets (3)
Stellar structure and energy production. Formation and evolution of stars. Supernovae, neutron stars, and black holes. Star clusters. Planetary systems and the detection
<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>(Credit Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 121</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 123</td>
<td>(4)</td>
</tr>
<tr>
<td>PHYS 121</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 150</td>
<td>3</td>
</tr>
<tr>
<td>PHED 101</td>
<td>0</td>
</tr>
<tr>
<td>Social Science I</td>
<td>3</td>
</tr>
<tr>
<td>Arts &amp; Humanities I</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>MATH 122</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 124</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122</td>
<td>4</td>
</tr>
<tr>
<td>PHED 102</td>
<td>0</td>
</tr>
<tr>
<td>Social Science II</td>
<td>3</td>
</tr>
<tr>
<td>Arts &amp; Humanities II</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>(Credit Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ASTR 221</td>
<td>3</td>
</tr>
<tr>
<td>MATH 223</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 227</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 221</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 131</td>
<td>3</td>
</tr>
<tr>
<td>Arts &amp; Humanities III</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>ASTR 222</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 228</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 250</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310</td>
<td>3</td>
</tr>
<tr>
<td>Arts &amp; Humanities IV</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>(Credit Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ASTR 311</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 313</td>
<td>(3)</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>ASTR 328</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 324</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 326</td>
<td>3</td>
</tr>
<tr>
<td>Technical Elective</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>(Credit Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ASTR 306</td>
<td>3</td>
</tr>
<tr>
<td>ASTR 309</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 331</td>
<td>3</td>
</tr>
<tr>
<td>Social Science III</td>
<td>3</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>ASTR 310</td>
<td>1</td>
</tr>
<tr>
<td>Science &amp; Society</td>
<td>3</td>
</tr>
<tr>
<td>Cultural Diversity</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Hours In Core and Departmental Requirements: 104

Open Electives to be added as appropriate to bring the total number of hours to the minimum of 120 needed for graduation with a B.A.

Nine hours of Mathematics and Natural Science (Physics) double counted toward General Education Requirement.

Astronomy Hours: 17
Physics Hours: 29
Math/Stat Hours: 17
Technical Electives Hours: 9

Technical Electives are additional courses in astronomy, chemistry, mathematics, statistics, physics, or geology which satisfy interests of the student but also fall within the science/mathematics objectives of the major. For a complete list of approved technical electives see advisor.

Minors in Astronomy
For non-physical science majors: ASTR 221, 222; PHYS 115, 116, and 1 of the following: (ASTR 306, 311, 323, 328).
For physical science majors: ASTR 221, 222, and 3 of the following: (ASTR 306, 311, 323, 328).

Approved Technical Electives - B. A. In Astronomy (This is not an exhaustive list):
ASTR 203 Archaeoastronomy
CHEM 107 Properties and Structure of Matter I
CHEM 108 Properties and Structure of Matter II
PHYS 204 Advanced Instrumentation Lab
PHYS 316 Introduction to Nuclear and Particle Physics
PHYS 325 E&M II
PHYS 332 QM II

a. 300 level Astronomy Courses: 3 of the following 4 are required: (ASTR 306, 311, 323, 328)
### BACHELOR OF SCIENCE IN ASTRONOMY DEGREE

#### Freshman Year  
**Fall**  
MATH 121 Calculus for Science & Engineering I ................................. (4-0-4) or  
MATH 123 Calculus I ........................................................................ (4-0-4)  
PHYS 121 General Physics I - Mechanics ........................................ (4-0-4)  
ENGL 150 Expository Writing ...................................................... (3-0-3)  
PHED 101 Physical Education Activities ..................................... (0-3-0)  
Arts & Humanities I ..................................................................... (3-0-3)  
Social Science I ............................................................................ (3-0-3)  
Total: ......................................................................................... 17-3-17

**Spring**  
MATH 122 Calculus for Science & Engineering II .......................... (4-0-4) or  
MATH 124 Calculus II ..................................................................... (4-0-4)  
PHYS 122 General Physics II: Electricity  
& Magnetism ................................................................................. (4-0-4)  
PHED 102 Physical Education Activities ..................................... (0-3-0)  
Arts & Humanities II ................................................................... (3-0-3)  
Social Science II ........................................................................... (3-0-3)  
Total: ......................................................................................... 14-3-14

#### Sophomore Year  
**Fall**  
ASTR 221 Stars and Planets .............................................................. (3-0-3)  
MATH 223 Calculus for Science & Engineering III ................. (3-0-3) or  
MATH 227 Calculus III .................................................................... (3-0-3)  
PHYS 203 Laboratory Physics ....................................................... (2-4-4)  
PHYS 221 General Physics III: Modern Physics .................. (3-0-3)  
ENGR 131 Elementary Computer Programming ..................... (3-0-3)  
Total: ......................................................................................... 14-4-16

**Spring**  
ASTR 222 Galaxies and Cosmology .................................................. (3-0-3)  
MATH 224 Elementary Differential Equations ............................ (3-0-3) or  
MATH 228 Differential Equations .................................................. (3-0-3)  
PHYS 204 Advanced Instrumentation Lab ................................. (1-4-4)  
PHYS 250 Mathematical Physics & Computing ....................... (3-0-3)  
PHYS 310 Classical Mechanics .................................................... (3-0-3)  
Total: ......................................................................................... 13-4-16

Approved Technical Electives - B. S. In Astronomy (This is not  
an exhaustive list)  
ASTR 203 Archaeoastronomy  
GEOL 345 Planetary Materials  
MATH 201 Introduction to Linear Algebra  
MATH 345 Introduction to Applied Mathematics  
PHYS 316 Introduction to Nuclear and Particle Physics  
PHYS 349 Methods of Mathematical Physics I  
PHYS 350 Methods of Mathematical Physics II

#### Junior Year  
**Fall**  
ASTR 311 Stellar Physics ................................................................. (3-0-3)  
PHYS 313 Thermodynamics & Statistical Mechanics ............ (3-0-3)  
Technical Elective .......................................................................... (3-0-3)  
Arts & Humanities III ................................................................. (3-0-3)  
Science & Society .......................................................................... (3-0-3)  
Total: ........................................................................................... 15-0-15

**Spring**  
ASTR 328 Cosmology and the Structure  
of the Universe ............................................................................. (3-0-3)  
PHYS 324 Electricity & Magnetism I ............................................. (3-0-3)  
PHYS 326 Physical Optics ............................................................... (3-0-3)  
Arts & Humanities IV ................................................................. (3-0-3)  
Technical Elective .......................................................................... (3-0-3)  
Total: ........................................................................................... 15-0-15

#### Senior Year  
**Fall**  
ASTR 306 Astronomical Techniques ................................................. (3-0-3)  
ASTR 309 Senior Seminar I ............................................................ (1-0-1)  
PHYS 325 Electricity & Magnetism II ............................................ (3-0-3)  
PHYS 331 Quantum Mechanics I ................................................. (3-0-3)  
Social Science III .......................................................................... (3-0-3)  
Cultural Diversity ........................................................................... (3-0-3)  
Total: ............................................................................................ 16-0-16

**Spring**  
ASTR 310 Senior Seminar II ............................................................ (1-0-1)  
ASTR 323 The Local Universe ......................................................... (3-0-3)  
PHYS 332 Quantum Mechanics II ............................................... (3-0-3)  
Technical Elective .......................................................................... (3-0-3)  
Technical Elective .......................................................................... (3-0-3)  
Total: ............................................................................................ 16-0-16

**Total Hours Required for Graduation:** 122

Nine hours of Mathematics and Natural Science (Physics) double  
counted toward General Education Requirement.

**Astronomy Hours:** 20  
**Physics Hours:** 43  
**Math/Stat Hours:** 17  
**Technical Electives Hours:** 12

Technical Electives are additional courses in astronomy, chemistry,  
mathematics, statistics, physics, or geology which satisfy interests  
of the student but also fall within the science/mathematics  
objectives of the major. For a complete list of approved technical  
electives see advisor.

- a. Selected students may be invited to take PHYS 123, 124, 223 in place of  
  ASTR 306, 311, 323, or 328.
- b. Courses taught every other year only.
of extrasolar planets. The application of physical laws
to the study of the universe. Prereq: MATH 122 or
MATH 126.

ASTR 222. Galaxies and Cosmology (3)
The Milky Way Galaxy. Structure, dynamics, and
evolution of galaxies. Galaxy clusters and large scale
structure of the Universe. Physical cosmology and the
Big Bang. Evolution of the Universe. Prereq: ASTR
221 or consent of department.

ASTR 306. Astronomical Techniques (3)
Emphasis will be on acquisition of direct imaging and/or
spectroscopic data at the 0.9 meter telescope and its
subsequent reduction. Principles of optics applied to
astronomical telescopes and instrumentation. Modern
detector technology. Computational techniques will
also be explored through projects emphasizing model-
ing of data, dynamical simulations of star clusters
emphasizing modeling of data, dynamical simulations
of star clusters and galaxies, or astronomical database
mining. Prereq: ASTR 221 and ASTR 222.

ASTR 309. Astrophysics Seminar I (1)
Selected topics in astronomy not covered ordinarily in
courses. Presentation of talks by the students.

ASTR 310. Astrophysics Seminar II (1)
Selected topics in astronomy not covered ordinarily in
courses. Presentation of talks by students.

ASTR 311. Stellar Physics (3)
Radiative transfer, atomic and molecular opacities, and
the observable properties of stars. Stellar interiors, nu-
clear processes, and energy generation. The evolution
of stars of varying mass and production of the elements
within supernova explosions. Prereq: ASTR 222.

ASTR 323. The Local Universe (3)
The Milky Way Galaxy. Galaxy populations. Quantita-
tive structure and dynamics of galaxies. The interstellar
media of galaxies. Dark matter and stellar populations.
The Local Group and Virgo cluster. Prereq: ASTR 222.

ASTR 328. Cosmology and the Structure of the
Universe (3)
Distances to galaxies. The content of the distant uni-
verse. Large scale structure and galaxy clusters. Physical
cosmology. Structure and galaxy formation and
evolution. Testing cosmological models. Cross-listed as
PHYS 328.

ASTR 360. Undergraduate Research (1-3)
Supervised research on topics of interest. Can be used
as a thesis course if desired. Students may register more
than once for a maximum of 9 credits overall (1-3
credits each semester). Prereq: Consent of department.

ASTR 396. Special Topics in Astronomy (1-3)
Open to astronomy majors only.

ASTR 409. Nucleosynthesis and Chemical Evolu-
tion (3)
Formation of the elements by stellar nucleosynthesis,
especially within supernovae. The subsequent dispersal
of this material into the interstellar medium and its
incorporation into stars. The observable elemental
content of stars and the relation of that content to the
history and dynamics of the Galaxy. Prereq: Consent of
department.

ASTR 411. Stellar Physics (3)
(See ASTR 311.)

ASTR 423. The Local Universe (3)
(See ASTR 323.)

ASTR 427. Dynamical Astronomy (3)
Gravitational dynamics of stars, star clusters, and
galaxies. Dynamical evolution of gravitational systems.

Dynamical equilibria, stability, and perturbation
theory. Analytic and computational techniques. Prereq:
Consent of department.

ASTR 428. Cosmology and the Structure of the
Universe (3)
(See ASTR 328.) Cross-listed as PHYS 428.

ASTR 497. Special Topics in Astronomy (1-3)
Prereq: Consent of department.

ASTR 601. Research (1-18)
Original research under the guidance of the staff.

ASTR 651. Thesis M.S. (1-18)
(Credit as arranged.)

ASTR 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

ASTR 703. Dissertation Fellowship (1-8)

ASTR 820. Hands-On Astronomy For Secondary
School Teachers (2)
This course is designed to train secondary school teach-
ers in the use of Hands-On Astronomy curriculum
materials and resources. Programs included are the
Hands-On Universe Project of Lawrence Berkeley
National Laboratory and the Hands-On Astrophysics
Project of the American Association of Variable Star
Observers. Resources to be demonstrated and training
provided for include the network of Hands-On Uni-
verse telescopes and specifically, the CWRU 0.9 meter
Robotic Telescope.

Department of
Biochemistry

School of Medicine
Phone 216-368-3344; Fax 216-368-3419
Michael Weiss, Chair

The Department of Biochemistry offers undergraduate programs leading to the Bachelor of Arts or Bachelor of Science in Biochemistry and graduate programs leading to the Master of Science, Doctor of Philosophy, the combined Bachelor of Arts-Doctor of Philosophy and combined Doctor of Medicine-Doctor of Philoso-
phy.

In addition, many interdisciplinary and interdepartmental programs are available with other departments in the School of Medicine and in Case Western Reserve University that provide other possible avenues of study for those interested in pursuing a career in biochemistry. Research interests within the department include a broad spectrum of modern bio-
chemical topics. Departmental facilities include major special equipment and well
equipped laboratories needed for research in modern biochemistry. Additional in-
formation about either the undergraduate or graduate programs can be obtained by
contacting the departmental office.

FACULTY

(See School of Medicine.)

UNDERGRADUATE PROGRAMS

The two undergraduate major programs are based on the Arts and Sciences Gen-
eral Education Requirements, but they differ in their requirements of fundamen-
tal mathematical and physical sciences. Either degree is excellent for students
planning to undertake graduate work in biochemistry or in related areas of the
biomedical sciences. Both the B.A. and the B.S. programs, shown on the fol-
lowing pages, permit students to follow many options after graduation. Gradu-
ates are well prepared to pursue further studies in the biological sciences, for a
career in medicine, for employment in the chemical or pharmaceutical industry, or
as research assistants in academic research laboratories. The B.A., has a reduced
emphasis on the quantitative aspects of sci-
ence and the availability of a considerable
amount of elective time permits a student
to concentrate on biochemistry even more
intensively than the curriculum requires,
or to pursue other subjects in science or
the liberal arts. The B.S. degree is for the
student who has a particularly strong in-
terest in the quantitative physical sciences.
A small number of additional courses will
qualify biochemistry students for a double
major in chemistry and for associate or
full membership in the American Chemi-
cal Society.

Undergraduate research is strongly en-
couraged for all biochemistry majors. As
many as nine hours of Research in Bio-
chemistry (BIOC 391) may be credited
toward the requirements for graduation.

Major

(leading to the Bachelor of Arts degree)

Students enroll in the curriculum for the
Bachelor of Arts degree in biochemistry,
and are required to complete the fol-
lowing courses: BIOC 307, 308, 312 or
### Freshman Year

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>MATH 125 Mathematics I</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>CHEM 105 Principles of Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>or</td>
<td>CHEM 111 Principles of Chemistry for Engineers</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>ENGL 150 Expository Writing</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>PHED 100 Physical Education Activities</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>MATH 126 Mathematics II</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>CHEM 106 Principles of Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td>or</td>
<td>ENGR 145 Chemistry of Materials</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>CHEM 113 Principles of Chemistry Laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>BIOL 214 Genes and Evolution</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>PHED 100 Physical Education Activities</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>CHEM 223 Introductory Organic Chemistry I</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>CHEM 233 Organic Chemistry Laboratory I</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>PHYS 115 Introductory Physics I</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>BIOL 215 Cells and Proteins</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>CHEM 224 Introductory Organic Chemistry II</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>CHEM 234 Organic Chemistry Laboratory II</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>PHYS 116 Introductory Physics II</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>CHEM 301 Physical Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>BIOC 307 General Biochemistry</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>BIOL 326 Genetics</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>BIOC 308 Molecular Biology: Genes &amp; Genetic Engineering</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>Approved Biochemistry elective</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Term</th>
<th>Course</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>BIOC 371 Undergraduate Seminar</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>Approved Biochemistry Elective</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td>(9)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>BIOC 372 Undergraduate Seminar</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>Approved Biochemistry Elective</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td>(11)</td>
</tr>
</tbody>
</table>

**Total Hours Required for Graduation:** 120

- Selected students may be invited to take CHEM 323, 324.
- One of the approved electives in Biochemistry must be either BIOC 312 or 334.

**Note:** Up to nine credit hours of undergraduate research, BIOC 391, may be counted as electives toward graduation. Students should consult their academic advisors about the elective parts of the curriculum.
BACHELOR OF SCIENCE DEGREE
Major in Biochemistry

Freshman Year (Class-Lab-Credit Hours)

Fall
CHEM 105 Principles of Chemistry I .......................................(3-0-3)
or
CHEM 111 ........................................................................(4-0-4)
ECES 131 Elementary Computer Programming .....................(2-2-3)
MATH 121 Calculus for Science and Engineering I ..............(4-0-4)
ENGL 150 Expository Writing ..............................................(3-0-3)
PHED 100 Physical Education Activities .................................(0-3-0)
GER Course .......................................................................(3-0-3)
Total............................................................(15-5-16) or (16-5-17)

Spring
CHEM 106 Principles of Chemistry II .....................................(3-0-3)
or
ENGR 145 ........................................................................(4-0-4)
CHEM 113 Principles of Chemistry Laboratory ....................(1-3-2)
MATH 122 Calculus for Science and Engineering II ............(4-0-4)
PHYS 121 General Physics I, Mechanics ................................(3-1-4)a
PHED 100 Physical Education Activities .................................(0-3-0)
BIOL 214 Genes and Evolution ..............................................(4-0-4)
Total............................................................(15-7-17) or (16-7-18)

Sophomore Year

Fall
BIOL 215 Cells and Proteins ................................................(4-0-4)b
CHEM 223 Introductory Organic Chemistry I ......................(3-0-3)c
CHEM 321 Laboratory Methods and Techniques I ............(1-6-3)
MATH 222 Calculus for Science and Engineering III ..........(3-0-3)
PHYS 122 General Physics II, Electricity and Magnetism ......(3-1-4)
Total.............................................................(14-7-17)

Spring
CHEM 224 Introductory Organic Chemistry II .....................(3-0-3)c
CHEM 322 Laboratory Methods and Techniques II ............(1-6-3)
MATH 224 Elementary Differential Equations .....................(3-0-3)
GER Course .....................................................................(3-0-3)
GER Course .....................................................................(3-0-3)
Total.............................................................(13-6-15)

Junior Year (Class-Lab-Credit Hours)

Fall
BIOC 307 General Biochemistry .........................................(4-0-4)
BIOL 326 Genetics ................................................................(3-0-3)b
CHEM 301 Physical Chemistry I ........................................(3-0-3)
GER Course .....................................................................(3-0-3)
GER Course .....................................................................(3-0-3)
Total.............................................................(16-0-16)

Spring
BIOC 308 Molecular Biology: Genes and Genetic Engineering ........................................(4-0-4)
PHYS 221 General Physics III, Modern Physics .....................(3-0-3)
CHEM 302 Physical Chemistry II .......................................(3-0-3)
Approved Biochemistry elective ........................................(3-0-3)
GER Course .....................................................................(3-0-3)
Total.............................................................(16-0-16)

Senior Year

Fall
BIOC 334 Structural Biology of Proteins, Enzymes, and Nucleic Acids ........................................(3-0-3)
BIOC 371 Undergraduate Seminar ......................................(1-0-1)
GER Course .....................................................................(3-0-3)
GER Course .....................................................................(3-0-3)
Electives .........................................................................(3-0-3)
Total.............................................................(16-0-16)

Spring
BIOC 312 Proteins and Enzymes .........................................(3-0-3)
BIOC 372 Undergraduate Seminar ......................................(1-0-1)
Statistics/Data Analysis Elective (PHYS 250, ECES 251, STAT 312, 313, or equivalent) .................(3-0-3)
Electives .........................................................................(9-0-9)
Total.............................................................(16-0-16)

Total Hours Required for Graduation: 129c

a. Selected students may be invited to take PHYS 123, 124, Physics and Frontiers, I, II (Honors), in place of PHYS 121, 122.
b. Selected students may be invited to take CHEM 323, 324, Organic Chemistry, in place of CHEM 223 and 224.
c. Students may elect to take CHEM 223, 224 and 304 (7) instead of CHEM 312, 322 (6). In this case the total number of credit hours required for graduation will be 130.

NOTE: Up to nine credit hours of undergraduate research, BIOC 391, may be counted as electives toward graduation. Students should consult their academic advisors about the elective parts of the curriculum.
334, 371, 372, and approved Technical Electives in Biochemistry, 2 courses (6 cr); BIOL 214, 215, 326; CHEM 105, 106 (or CHEM 111 + ENGR 145), 113, 223, 224 (or 323,324), 233, 234, 301; MATH 125, 126 (or 121, 122); PHYS 115, 116 (or 121,122), including laboratory.

Major

(leading to the Bachelor of Science degree)

Students enroll in the curriculum for the Bachelor of Science degree in Biochemistry, and are required to complete the following courses: BIOC 307, 308, 312, 334, 371, 372 and approved Technical Elective in Biochemistry, 1 course (3 cr); BIOL 214, 215, 326; CHEM 105, 106 (or CHEM 111 and ENGR 145), 113, 223, 224 (or 323,324), 301, 302 (or 335, 336), 321, 322 (or 233, 234, and 304); ECES 131;MATH 121, 122, 223, 224 (or 123, 124, 227, 228); PHYS 121, 122 (or 123,124), including laboratory, 221 (or 223); Statistics/Data Analysis Elective(PHYS 250, ECES 251, STAT 312, 313, or equivalent),

Honors Program

Biochemistry majors who have excellent academic records may be admitted to the department’s Undergraduate Honors Program. To graduate with departmental honors in biochemistry, a student must satisfy the following requirements:

1. A combined grade point average of at least 3.300 in biochemistry, biology, and chemistry, and an overall grade point average of 3.000
2. A minimum of 6 credit hours of undergraduate research (BIOC 391) in one laboratory
3. A research report approved by the Undergraduate Education Committee of the department on the basis of the quality of the research, the written report, and an oral presentation. An acceptable report:
   a. Should follow a standard journal format
   b. Should demonstrate the student’s understanding of the research area, experimental techniques, goals and implications of the project
   c. Should show that the student has advanced his/her knowledge of the applicable techniques and the underlying scientific concepts.

The research advisor is asked to write a letter recommending the student for honors.

Minor

Students may obtain credit for a minor in biochemistry by completing one year of freshman chemistry (including laboratory), one year of organic chemistry (including laboratory), two semesters of approved biology courses, and three semesters of didactic courses in biochemistry. A recommended sequence of courses would include:

CHEM 105, 106 (or CHEM 111 + ENGR 145)
CHEM 113 laboratory
CHEM 223, 224 (or 323, 324), 233, 234
BIOL 214, 215
BIOC 307, 308, and either 312 or 334.

The sequences may be followed after consultation with the Department of Biochemistry and with the other departments involved.

GRADUATE PROGRAMS

(See School of Medicine.)

BIOCHEMISTRY (BIOC)

Undergraduate Courses
BIOC 307. General Biochemistry (4)
Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. One semester of biology is recommended. Prereq: CHEM 223 or CHEM 224.

BIOC 308. Molecular Biology: Genes and Genetic Engineering (4)
An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of development. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Prereq: BIOL 215 or BIOC 307. Cross-listed as BIOC 308.

BIOC 312. Proteins and Enzymes (3)
Aspects of protein and nuclear acid function and interactions are discussed, including binding properties, protein-nucleic acid interactions, kinetics and mechanism of enzymes, and macromolecular machines. Prereq: BIOC 307 and CHEM 301 and CHEM 302.

BIOC 334. Structural Biology (3)
Introduces basic chemical properties of proteins and discusses the physical forces that determine protein structure. Topics include: the elucidation of protein structure by NMR and by X-ray crystallographic methods; the acquisition of protein structures from data bases; and simple modeling experiments based on protein structures. Prereq: BIOC 307 or BIOL 215. Cross-listed as BIOC 334.

BIOC 371. Undergraduate Biochemistry Seminar (1)
Discussion of current topics in biochemical research using readings from the scientific literature. Prereq: BIOC 307 and BIOC 308.

BIOC 372. Undergraduate Biochemistry Seminar (1)
Discussion of current topics in biochemical research using readings from the scientific literature. Prereq: BIOC 307 and BIOC 308.

BIOC 391. Research Project (1-9)
(Credit as arranged.) Offered on a pass/fail basis only. Maximum 9 hours total credit.

Graduate Courses

(See School of Medicine.)

Department of Biology

DeGrace Hall
Phone 216-368-3558; Fax 216-368-4672
Joseph F. Koonce, Chair

The Department of Biology offers courses leading to the degrees of Bachelor of Science in biology, Bachelor of Arts, Master of Science, and Doctor of Philosophy. Cooperative programs between the Department of Biology and the Case Western Reserve University School of Medicine, the Cleveland Museum of Natural History, the Cleveland Botanical Gardens, the Cleveland Metroparks Zoo, the Cleveland Institute of Art and other departments in Case Western Reserve University significantly extend the range of resources available to biology students. Undergraduate students are encouraged to conduct individual supervised research
projects with faculty in the Biology Department and with faculty in cooperating departments. A supervised research project is required of all students in the B.S. program.

**CAREER OPPORTUNITIES**

The undergraduate programs in biology provide excellent preparation for graduate or professional school programs and for careers in industry and governmental agencies. Students are well prepared for medical, dental, or veterinary schools, or to enter the many specialized graduate programs in the biological sciences. Increasingly, career opportunities are opening up in the developing fields of biotechnology both in industry and government. Elective sequences of courses in areas of biotechnology within the B.A. and B.S. degrees in biology are an excellent preparation for such careers.

**FACULTY**

**Professor and Chair, Professor of Electrical Engineering and Computer Science**

Aquatic ecology; systems ecology

Morris Burke, Ph.D. (University of New South Wales, Australia)

Professor, Professor of Physiology and Biophysics

Muscle physiology, protein chemistry

Arnold I. Caplan, Ph.D. (Johns Hopkins University)

Professor, Professor of Physiology and Biophysics, Professor of General Medical Sciences (Oncology), Director - Skeletal Research Center

Developmental biology and biochemistry; molecular and cellular aspects of muscle, cartilage, and bone development

Hillel J. Chiel, Ph.D. (Massachusetts Institute of Technology)

Professor, Associate Professor of Neurosciences Neurobiology and animal behavior; cellular dynamics of neuronal computation

Christopher A. Cullis, Ph.D. (University of East Anglia, United Kingdom)

Professor, Francis Hobart Herrick Professor of Biology

Plant molecular biology and genetics; modifications of the information content of plant cells

Nancy Dilullo, Ph.D. (Pennsylvania State University)

Instructor

Cell biology and immunology; basic mechanisms of immune responses and their impact on heart function.

Paul B. Drewa, Ph.D. (Louisiana State University)

Assistant Professor

Ecology; effects of fire and other disturbances on plant populations and community structure

Stephen E. Haynesworth, Ph.D. (Case Western Reserve University)

Associate Professor, Assistant Professor of Orthopaedics, Assistant Professor of General Medical Sciences (Oncology); Associate Dean, College of Arts & Sciences

Developmental and aging biology

Jennifer O. Liang, Ph.D. (Washington University)

Assistant Professor

Molecular biology and genetics; the role of signaling molecules in vertebrate embryonic development

Roy E. Ritzmann, Ph.D. (University of Virginia)

Professor, Professor of Neurosciences

Neurobiology and behavior; physiology

Martin J. Rosenberg, Ph.D. (State University of New York, Stony Brook)

Senior Instructor and Executive Officer

Herpetology; vertebrate biology; human anatomy and physiology

Charles E. Rozek, Ph.D. (Wayne State University)

Associate Professor

Molecular genetics; developmental biology

Norman B. Rushforth, Ph.D. (Cornell University)

Professor, Professor of Adolescent Health, Associate Professor of Epidemiology and Biostatistics

Epidemiology, animal behavior; population biology

Robin Snyder, Ph.D. (University of California, Santa Barbara)

Assistant Professor

Theoretical ecology and epidemiology

Andrew K. Swanson, Ph.D. (Simon Fraser University)

Assistant Professor

Lower plants; ecophysiology; global climate change

Joanne Westin, Ph.D. (Cornell University)

Senior Instructor

Neurobiology and behavior; physiology

Mark A. Willis, Ph.D. (University of California, Riverside)

Associate Professor

Neurobiology and behavior; sensorimotor control of insect flight; animal behavior

Debra E. Wood, Ph.D. (Georgia State University)

Assistant Professor

Neurobiology; neural and mechanical correlates of motor pattern generation; animal behavior

James E. Zull, Ph.D. (University of Wisconsin, Madison)

Professor, Professor of Biochemistry, Director, University Center for Innovation in Teaching and Education (UCITE)

Human learning, brain function in education

**Secondary Faculty**

Randall D. Beer, Ph.D. (Case Western Reserve University)

Professor, Professor of Computer Engineering and Science

Computational neurosciences

Peter L. McCall, Ph.D. (Yale University)

Professor, Professor of Geological Sciences

Paleoecology

Ramani S. Pilla, Ph.D. (Pennsylvania State University)

Assistant Professor, Assistant Professor of Statistics

Bioinformatics; mixture models; neural networks; scientific/statistical computation

**Adjunct Faculty**

Richard F. Drushel, Ph.D. (Case Western Reserve University)

Adjunct Assistant Professor

Kinematic Modeling and Neural Control

Joe B. Keiper, Ph.D. (Kent State University)

Adjunct Assistant Professor (Cleveland Museum of Natural History)

Biodiversity and population ecology of aquatic insects; forensic entomology; wetlands ecology and conservation

Ana B. Locci, Ph.D. (Case Western Reserve University)

Adjunct Assistant Professor

Aquatic ecology and population biology
BACHELOR OF ARTS DEGREE

Major in Biology – Suggested Sequence of Courses

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 125 Mathematics I</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 105 Principles of Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry Laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities</td>
<td>(0)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 214 Genes and Evolution</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 106 Principles of Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 126 Mathematics II</td>
<td>(4)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities</td>
<td>(0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 215 Cells and Proteins</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 223 Introductory Organic Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 233 Organic Chemistry Laboratory I</td>
<td>(2)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 216 Organisms and Ecosystems</td>
<td>(4)</td>
</tr>
<tr>
<td>Approved BIOL elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Approved BIOL elective</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td>PHYS 115 Introductory Physics I</td>
<td>(4)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective or course in selected minor field</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Approved BIOL elective</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td>PHYS 116 Introductory Physics II</td>
<td>(4)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective or course in selected minor field</td>
<td>(3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Approved BIOL elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Electives or courses in selected minor field</td>
<td>(12)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Approved BIOL elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Electives or courses in selected minor field</td>
<td>(12)</td>
</tr>
</tbody>
</table>
include one elective from two of the following major areas: cell & molecular biology, organismal biology, or population biology/ecology. At least 15 hours of the selected electives and laboratories must be at the 300 level or higher. Students are required to complete two years of chemistry - Principles of Chemistry I, II, and laboratory (CHEM 105, 106, & 113) and Organic Chemistry I, II, and Laboratory I (CHEM 223, 224, & 233 or 323, 324, & 233), one year of calculus (MATH 125, 126) and one year of Introductory Physics I, II (PHYS 115, 116).

Teacher Licensure Option

Students may become eligible for teacher licensure in the field of Life Sciences (Adolescents and Young Adults) by completing content area requirements as well as 35 semester hours in education courses offered through Case Western Reserve and John Carroll University (see Education [EDUC and EDJC]) that includes student teaching. Students interested in pursuing this option should consult Professor Martin Rosenberg.

Subject Area Requirements (56-61 credit hours): BIOL 214, 215, 216; one of BIOL 301, 313, or 344; one of BIOL 223, 305, 311, or 336; one of BIOL 308, 326, or 343; one of BIOL 358, 373, 374, or 380; CHEM 105, 106, 113, 223, 224, 233; MATH 125, 126; PHYS 115, 116; one of GEOL 101, 110, 115, or 117.

B.S. Program in Biology

The B.S. program also includes the three-semester core lecture courses beginning with BIOL 214, Genes and Evolution, and continuing with BIOL 215, Cells and Proteins and BIOL 216, Organisms and Ecosystems. The elective requirement

<table>
<thead>
<tr>
<th>BACHELOR OF SCIENCE IN BIOLOGY DEGREE</th>
<th>Suggested Sequence of Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freshman Year</strong></td>
<td><strong>Credit Hours</strong></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 125 Mathematics I</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 105 Principles of Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry I</td>
<td>(2)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities</td>
<td>(0)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 214 Genes and Evolution</td>
<td>(4)</td>
</tr>
<tr>
<td>MATH 126 Mathematics II</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 106 Principles of Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
<tr>
<td>PHED 102 Physical Education Activities</td>
<td>(0)</td>
</tr>
<tr>
<td><strong>Sophomore Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 215 Cells and Proteins</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 223 (or 323) Introductory Organic Chem I</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 233 Organic Chemistry Laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td>PHYS 115 Introductory Physics I</td>
<td>(4)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 216 Organisms and Ecosystems</td>
<td>(4)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 224 (or 324) Introductory Organic Chem II</td>
<td>(3)</td>
</tr>
<tr>
<td>PHYS 116 Introductory Physics II</td>
<td>(4)</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Junior Year</strong></td>
<td><strong>Credit Hours</strong></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 301 Introductory Physical Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL 301 Biotechnology Laboratory OR</td>
<td></td>
</tr>
<tr>
<td>BIOL 326 Genetics OR</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 304 Discrete Mathematics OR</td>
<td></td>
</tr>
<tr>
<td>MATH 201 Linear Algebra OR</td>
<td></td>
</tr>
<tr>
<td>An approved mathematics or statistics course</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL Elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 300 Dynamics of Biological Systems OR</td>
<td></td>
</tr>
<tr>
<td>BIOL 303 Principles of Chemical Biology OR</td>
<td></td>
</tr>
<tr>
<td>BIOL 315 Quantitative Biology Lab</td>
<td>(3-4)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL Elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Senior Year</strong></td>
<td><strong>Credit Hours</strong></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 388 Undergraduate Research</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL laboratory OR</td>
<td>(2)</td>
</tr>
<tr>
<td>GER Course</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL Elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>BIOL 390 Undergraduate Research</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL 395 Undergraduate Research Discussions</td>
<td>(1)</td>
</tr>
<tr>
<td>BIOL Electives</td>
<td>(6)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>
must include one elective from two of the following major areas: cell & molecular biology, organismal biology, or population biology/ecology. In addition, students must complete a course in genetics (BIOL 301, Biotechnology Laboratory; Genes and Genetic Engineering or BIOL 326, Genetics); a quantitative biology laboratory (BIOL 300, Dynamics of Biological Systems, or BIOL 303, Principles of Chemical Biology, or BIOL 315, Quantitative Biology Laboratory); one additional laboratory course (except BIOL 346) and one upper-level advanced lecture course (300- or 400-level). B.S. students must undertake an undergraduate research project, completing BIOL 388, Undergraduate Research; BIOL 390, Advanced Undergraduate Research (continuation of BIOL 388 project); and BIOL 395, Undergraduate Research Discussions. At least 11 hours of the selected electives and lab must be at the 300 level or higher.

Additional requirements for the B.S. degree consist of: Mathematics: one year of calculus - MATH 125 & 126 (or 121 & 122, but former preferred); MATH 201, Linear Algebra or MATH 304, Discrete Mathematics or an approved mathematics or statistics course; Computer Science: ENGR 131, Computer Programming (or other approved computer programming course); Chemistry: Principles of Chemistry I & II and laboratory (CHEM 105, 106, & 113); Organic Chemistry I & II and laboratory (CHEM 223, 224, & 233; or 323, 324, & 233); Physical Chemistry I (CHEM 301); and Physics: Introductory Physics I & II (PHYS 115 & 116).

All biology majors are required to meet with their departmental advisor at least once each semester to discuss their academic program and receive their registration PINs, and must have their drop-add cards signed by their advisors. In addition to formal courses, departmental seminars in recent advances in biology are held every Thursday afternoon at 4:15 p.m.

Concentrations in Areas of the Biological Sciences

Students are encouraged to utilize their elective courses in the biology major to take advantage of concentrations in various specialized areas in the biological sciences. These concentrations have been developed between the Biology Department, the basic science departments of the School of Medicine, and other departments. Currently, concentrations have been developed in the following areas: biotechnology and genetic engineering; computational biology; developmental biology; genetics; molecular & cell biology; neurobiology and animal behavior; population biology, ecology and environmental science.

Integrated Graduate Studies Program in Biology

The Biology Department participates in the Integrated Graduate Studies Programs for both B.A./M.S. and B.S./M.S. degrees. These programs are intended for gifted and highly-motivated students for the B.A. and B.S. degrees whose objective is a degree at the master’s level. By more closely integrating undergraduate and graduate studies, qualified students begin a program of graduate study in their senior year leading to the simultaneous completion of requirements for both the master’s and bachelor’s degrees, each within its specified framework. Students desiring to pursue this dual degree program will normally apply during the sophomore year. Students should contact the department for specific details of the program and application deadlines.

Minor in Biology

A minor in biology is available to students. The minor requires a minimum of 16 credit hours in biology consisting of any two of the three core courses (BIOL 214, 215, 216) plus electives to total 16 hours of biology courses. Suitable minor sequences are available for students majoring in the humanities and arts, social and behavioral sciences, health sciences, mathematics, chemistry, physics, astronomy, and geological sciences.

Honors Program in Biology

To receive a bachelor’s degree with honors in biology, the student must meet the following criteria:

1. Maintain a 3.2 grade-point average, with a 3.5 in the major
2. Write a senior honors thesis with the approval of the faculty supervisor
3. Submit the thesis for review by an ad hoc Honors Committee
4. Successfully defend the thesis at an oral examination

Co-op Program in Biology

The Co-op (Cooperative Education) program offers full-time undergraduate students in good academic standing the opportunity to engage in full-time, paid employment consistent with their major fields of study. Typically students participate in the co-op program for one or two seven-month periods, such as summer-fall and/or spring-summer, beginning after their sophomore or junior year. Although participation in this program extends the time required to achieve a bachelor’s degree, students often benefit from higher starting salaries and greater lifetime earnings that can result from the experience acquired in co-op assignments. Co-op employment opportunities may exist at local companies engaged in biotechnology research, pharmaceuticals, or other areas involving the life sciences. Students interested in this program should contact the department office.

GRADUATE PROGRAMS

Master of Science

The Department of Biology offers both thesis and non-thesis Master of Science degree programs. Both programs require a minimum of 30 semester hours of courses at the 300 level or higher. A minimum of 18 semester hours of formal course work is required for the thesis degree, and a minimum of 24 semester hours of formal course work is required for the non-thesis degree. The remaining credits may be research credits (BIOL 601 and 651). Further information is available in the Biology Department Office.

Doctor of Philosophy

Students who are planning to enter the doctoral program in biology should
obtain information from the department office. The Doctor of Philosophy degree in biology is granted upon the completion of original research under the guidance of a faculty member in the Department of Biology.

RESEARCH
The mission of the Department of Biology at Case Western Reserve University is to promote research programs of national and international prominence and to provide strong undergraduate and graduate educational programs that emphasize integrative approaches to biological problems. Faculty research interests involve three theme areas: Neurobiology and Neuromechanical Systems, Development and Tissue Engineering, and Great Lakes Studies. Collectively, these concentrations provide opportunities for training in Developmental Biology, Genetics and Biotechnology, Biochemistry, Neurobiology and Robotics, Neurophysiology and Behavior, Ecology, Environmental Biology, and Evolutionary Biology. These programs provide educational and research programs that support preparation for careers in health sciences and research in biological sciences and add preparation in professional development for careers that involve skills in computational biology.

Some of the research being conducted within each theme area includes:

Neurobiology and Neuromechanical Systems: Electrophysiological studies of invertebrate animals; neural control of movement, pattern generation and integration of sensory information; cellular dynamics of neuronal computation; the dynamics of small artificial neural networks; the structural basis of actomyosin-based motility in muscle and non-muscle cells at the molecular level; the mechanisms by which cellular DNA can rapidly change in response to external stimuli; sensorimotor control of pheromone-guided flight in insects; the dynamics of motor control in neuronal networks that generate behavior.

Development and Tissue Engineering: Isolation of mesenchymal stem cells; the cellular and molecular mechanisms that influence and regulate human mesenchymal stem cell development into various cell types; the role of human mesenchymal stem cells in blood vessel formation; control of developmental lineage progression by means of potent growth factors; factors that control morphogenesis; the mechanism by which secreted signaling molecules affect cell fate in the vertebrate embryo; investigation of the mechanisms regulating gene expression, especially transcription and processing of messenger RNA; the role of plant hormones and their second messengers in growth control and cell differentiation, using genetic and molecular techniques;

Great Lakes Studies: Modeling of aquatic ecosystems; adaptive management of fisheries ecosystems, particularly in relation to Lake Erie; internalized management of resource ecosystems; epidemiological studies of large human populations; theoretical ecology; species coexistence mechanisms arising from environmental heterogeneity; disease dynamics.

BIOLOGY (BIOL)
Undergraduate Courses

BIOL 101. Introduction to Biotechnology (3)
Principles of genetic engineering and other aspects of biotechnology and their applications in science and society. Biological molecules and how they are derived from the genetic information in DNA. Theory and practice of recombinant DNA techniques; function and use of antibodies and vaccines. Applications will include biopharmaceuticals, the construction and uses of transgenic animals and plants, diagnosis and therapy of human diseases, the Human Genome Project, forensic science, and bioremediation. Patents and ethical aspects will be discussed. Assumes some high school biology but has no prerequisites. Fulfills a science requirement of the Arts and Sciences General Education Requirements but does not count toward biology major.

BIOL 103. Biological Issues (3)
This course will focus on controversial biological issues. The goal is to present basic biological and scientific knowledge about specific areas of controversy which students must confront in society. We also seek to develop an appreciation for the requirements and limits of scientific investigation, so that students can evaluate claims which may appear in the popular press or media. Biological topics will be selected by the class each term, but some obvious possibilities are: fetal tissue research, human cloning, brain and behavior. No science background is assumed.

BIOL 114. Principles of Biology (3)
A basic biology course designed for the non-major. Topics include: molecules of life, cell structure, respiration and photosynthesis, molecular genetics and gene technology, heredity and human genetics, population genetics and evolution, diversity of life, and function of ecosystems. Course includes some applications of biological principles to agricultural, medical, and environmental concerns.

BIOL 119. Concepts for a Molecular View of Biology I (3)
Introduction to the principles of inorganic and organic chemistry essential to the study of biochemistry, molecular biology, and pharmacology. Topics include: atomic theory, the periodic table, chemical bonds, molecular geometry, ideal gas laws, equilibrium and reaction rates, acids and bases, nuclear chemistry, and nomenclature and reactions of organic compounds (including alkyl, aroyl, alcohol, carbonyl, and amino compounds). Problems involving numeric computation are emphasized.

BIOL 121. Concepts for a Molecular View of Biology II (3)
The second semester of a two-course sequence in elementary inorganic, organic, and biochemistry. Topics include: carbohydrates, lipids, proteins, enzyme kinetics, metabolic pathways, and DNA and RNA, methods of molecular biology, and nutrition. Applications to human physiology and medicine emphasized. Prereq: BIOL 119.

BIOL 148. Human Physiology for Health Science Students (3)
This course addresses the normal physiology of humans and how the various organ systems are integrated to maintain a homeostatic state. The systems covered include: nervous system, cardiovascular system, respiratory system, gastrointestinal system, excretory system, and reproductive systems. Three lectures per week. This course does not count toward the biology major. Prereq: BIOL 114 and BIOL 546. Coreq: BIOL 119 and BIOL 121.

BIOL 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

BIOL 214. Genes and Evolution (4)
First in a series of three courses required of the Biology major. Topics include: biological molecules (with a focus on DNA and RNA and the structure of cell systems (with a focus on the nucleus and chromosome); cell cycle, mitosis and meiosis; molecular genetics, viruses and gene technology; classical and microbial genetics; population genetics and evolution, diversity resulting from evolution. Laboratory and discussion sessions offered in alternate weeks. Prereq: CHEM 105.

BIOL 215. Cells and Proteins (4)
Second in a series of three courses required of the Biology major. Topics include: biological molecules (focus on proteins, carbohydrates, and lipids); cell structure (focus on plasma membrane, endomembrane system and organelles of energy metabolism); protein synthesis, targeting and trafficking of proteins; cell function, including binding of antibodies to antigens, enzymes to substrates, and oxygen to hemoglobin. Transduction of neural and hormonal signals; cellular controls involved in development, cell cycle, and cancer; cellular energetics, respiration and photosynthesis. Laboratory and discussion sessions offered in alternate weeks. Prereq: CHEM 105 and CHEM 106; BIOL 214 or consent.

BIOL 216. Organisms and Ecosystems (4)
Third in a series of three courses required of the Biology major. Topics include: homeostasis, including endocrine and autonomic controls; function of neurons and nervous systems; function of organ
systems involved in circulation, excretion, osmoregulation, gas exchange, feeding, digestion, and temperature regulation; reproduction and development; behavior, population dynamics, community ecology, and function of ecosystems. Laboratory and discussion sessions offered in alternate weeks. Prereq: CHEM 105 and BIOL 214 or consent.

BIOL 223. Vertebrate Biology (3)
A survey of vertebrates from jawless fishes to mammals. Functional morphology, physiology, behavior and ecology as they relate to the groups’ relationships with their environment. Evolution of organ systems. Two lectures and one laboratory per week. The laboratory will involve a study of the detailed anatomy of the shark and cat used as representative vertebrates. Students are expected to spend at least three hours of unscheduled laboratory each week. This course fulfills a laboratory requirement for the biology major, and is offered in the spring semester of even-numbered years. Prereq: BIOL 214.

BIOL 225. Evolution (3)
(See PHIL 225.) Cross-listed as PHIL 225.

BIOL 300. Dynamics of Biological Systems: A Quantitative Introduction to Biology (3)
This course will introduce students to dynamic biological phenomena, from the molecular to the population level, and models of these dynamical phenomena. It will describe a biological system, discuss how to model its dynamics, and experimentally evaluate the resulting models. Topics will include molecular dynamics of biological molecules, kinetics of cell metabolism and the cell cycle, biophysics of excitability, scaling laws for biological systems, biomechanics, and population dynamics. Mathematical tools for the analysis of dynamic biological processes will also be presented. Students will manipulate and analyze simulations of biological processes, and learn to formulate and analyze their own models. Cross-listed as EMBE 300.

BIOL 301. Biotechnology Laboratory: Genes and Genetic Engineering (3)
Laboratory training in recombinant DNA techniques. Basic microbiology, growth, and manipulation of bacteriophage, bacteria and yeast. Students isolate and characterize DNA, construct recombinant DNA molecules, and reintroduce them into eukaryotic cells (yeast, plant, animal) to assess their viability and function. Two laboratories per week. Prereq: BIOL 215.

BIOL 302. Human Learning and the Brain (3)
This course focuses on the question, “How does my brain learn and how can its learning best be facilitated?” Each student is required to develop a comprehensive theory about personal learning. These theories will take the form of a major paper which will be expanded and modified throughout the semester. Readings and class discussions will focus on the following five topics: major structures of the brain and their role in learning, neuronal wiring of the brain and how learning changes it, the emotional brain and its essential role in learning, language and the brain, and the role of images in learning. Students will be expected to incorporate information on these topics into their personal theory of learning. Final grades will be determined by the quality and comprehensiveness of the learning theories which students develop, as well as evidence of student progress and involvement during the semester. Prereq: BIOL 114 or BIOL 214 or PSCL 101.

BIOL 305. Herpetology (4)
Structure, function, and identification of amphibians and reptiles; emphasis on North American herpetofauna. Evolution, anatomy, zoogeography, and systematics of the major families of amphibians and reptiles. Physiological ecology, behavior, reproductive and population biology, field survey techniques, and behavioral observations of live animals. Three lectures and one session on special topics per week. Several weekend field trips. The course is offered in the spring semester of odd-numbered years. Prereq: BIOL 214.

BIOL 307. Evolutionary Biology of the Vertebrates (3)
Important events in the evolution of invertebrate life, as well as structure, function, and phylogeny of major invertebrate groups.

BIOL 308. Molecular Biology: Genes and Genetic Engineering (4)
An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of development. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Prereq: BIOL 215 or BIOL 307. Cross-listed as BIOL 308.

BIOL 313. Genetics Laboratory (2)
This laboratory exposes students to the methods used to study the genetics of a wide range of organisms. Some of the topics covered are: gene mapping in diploids, tetrad analysis, mutation, complementation, and mitotic recombination. Emphasis is placed on the relationship between the genotype and the biochemical events which determine the phenotype. One laboratory per week. Prereq: BIOL 326 (or concur).

BIOL 315. Quantitative Biology Laboratory (3)
Application of personal computers to biological research. Emphasis on the use of structured programming and flowcharting. Use of statistical techniques, analysis of experimental design, modeling strategies. The use of diverse software packages such as spreadsheets, word processing, statistical packages. Continuous interaction with the WWW. Weekly lectures and problem sets posted in the WWW home page. One lecture and one lab per week. Prereq: BIOL 216.

BIOL 316. Fundamental Immunology (3)
Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, antigen processing and presentation, cell-cell interactions, cell-mediated immunity, cytokines, and basic molecular biology of B and T lymphocytes. Lectures emphasize experimental findings leading to the concepts of modern immunology. Prereq: BIOL 215.

BIOL 325. Cell Biology (3)
This course will emphasize an understanding of the structure and function of eukaryotic cells from a molecular viewpoint. We will explore cell activities by answering the questions what do cells do and how do they do it. The answers to these questions will be developed using experimental evidence from the literature and explanations from the text. An important part of this course will be appreciation of the experimental evidence which supports our current understanding of cell function. To achieve this aim, students will read papers from the primary literature to supplement the text. Topics will include cell structure, protein structure and function, internal organization of the eukaryotic cell, membrane structure and function, protein sorting, organelle biogenesis, and cytoskeleton structure and function. The course will also cover the life cycles of cells, their interactions and finally use the immune response as a model of cell behavior. Prereq: BIOL 214 and BIOL 215 or consent of department.

BIOL 326. Genetics (3)
Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics. Prereq: BIOL 214.

BIOL 328. Plant Genomics and Proteomics (3)
The development of molecular tools has impacted agriculture as much as human health. The application of new techniques to improve food crops, including the development of genetically modified crops, has also become controversial. This course covers the nature of the plant genome and the role of sequenced-based methods in the identification of the genes. The application of the whole suite of modern molecular tools to understand plant growth and development, with specific examples relating to economically important responses to biotic and abiotic stresses, is included. The impact of the enormous amounts of data generated by these methods and their storage and analysis (bioinformatics) is also considered. Finally, the impact on both the developed and developing world of the generation and release of genetically modified food crops will be covered. Prereq: BIOL 326 or equivalent.

BIOL 334. Structural Biology (3)
(See BIOC 334.) Cross-listed as BIOC 334.

BIOL 336. Aquatic Biology (3)
Physical, chemical, and biological dynamics of lake ecosystems. Factors governing the distribution, abundance, and diversity of freshwater organisms. Prereq: BIOL 216.

BIOL 339. Aquatic Biology Laboratory (2)
The physical, chemical, and biological limnology of freshwater ecosystems will be investigated. Emphasis will be on identification of the organisms inhabiting these systems and their ecological interactions with each other. This course will combine both field and laboratory analysis to characterize and compare the major components of these ponds. Students will have the opportunity to design and conduct individual projects. Prereq or Coreq: BIOL 336.

BIOL 340. Human Physiology (3)
This course will provide functional correlates to the students’ previous knowledge of human anatomy. Building upon the basic principles covered in BIOL 216 and 346, the physiology of organs and organ systems of humans, including the musculoskeletal, nervous, cardiovascular, lymphatic, immune, respiratory, digestive, excretory, reproductive, and endocrine systems, will be studied at an advanced level. The contribution of each system to homeostasis will be emphasized. The course is offered in the spring semester of odd-numbered years. Prereq: BIOL 216 and BIOL 346.

BIOL 343. Microbiology (3)
An introduction to the physiology, genetics, biochemistry, and diversity of microorganisms. The subject will be approached both as a basic biological science that studies the molecular and biochemical processes of cells and viruses, and as an applied science that examines the involvement of microorganisms in human disease as well as in workings of ecosystems, plant symbioses, and industrial processes. The course is divided into
four major areas: bacteria, viruses, medical microbiology, and environmental and applied microbiology. Prereq: BIOL 215.

BIOL 344. Laboratory for Microbiology (2) Practical microbiology, with an emphasis on bacteria as encountered in a variety of situations. Sterile techniques, principles of identification, staining and microscopy, growth and nutritional characteristics, genetics, enumeration methods, epidemiology, immunological techniques (including ELISA and T cell identification), antibiotics and antibiotic resistance, chemical diagnostic tests, sampling the human environment, and commercial applications. One lab per week. Prereq: BIOL 343 (or concur).

BIOL 346. Human Anatomy (3) Gross anatomy of the human body. Two lectures and one laboratory demonstration per week. Prereq: BIOL 214 or BIOL 114 and enrollment in B.S.N. program.

BIOL 348. Human Anatomy and Physiology (4-5) The anatomy and physiology of the human body. Enrollment is restricted to students majoring in nutrition. Four lectures and one laboratory per week.

BIOL 350. Introduction to Ecosystem Analysis and Environmental Science (3) Reviews major ecological theories and principles through analysis of contemporary environmental problems. Exploration of difficulties in applying scientific information to public policy formation and the role of computer models in linking theory and practice in managing the environment. Two lectures and one laboratory per week. Prereq: BIOL 214.

BIOL 351. Principles of Ecology (4) This course will focus on spatial and temporal relationships involving organisms and the environment at individual, population, and community levels. An underlying theme will be Darwinian evolution through natural selection with an emphasis on organism adaptations to biotic and abiotic environments. Case studies and models will illustrate ecological principles, and there will be some emphasis on the applicability of these principles to ecosystem conservation. Laboratory will complement lecture material and involve hypothesis-driven investigations in field and greenhouse settings at Squire Valleevue Farm. Students taking the graduate level course will prepare a grant proposal in which hypotheses are well-rooted in some aspect of ecological theory. Prereq: BIOL 216 or consent of instructor.

BIOL 352. Introduction to Ecology and Field Biology (3) This course will be an introduction to the field-based study of the interactions that determine the abundance and distribution of organisms. There will be a heavy emphasis on experimentation and data collection in the field as we investigate a diversity of terrestrial and aquatic habitats on the Squire Valleevue Farm property. Students will have the opportunity to practice important ecological sampling techniques as they study the relationships between individuals, populations, and communities and the environments they live in. This course satisfies an upper-level laboratory requirement for biology majors. Offered summer semester only. Prereq: BIOL 216 or consent of department.

BIOL 358. Animal Behavior (3) Ultimately the success or failure (i.e., life or death) of any individual animal is determined by its behavior. The ability to locate and capture food, avoid being food, acquiring and defending territory, and successfully passing your genes to the next generation, are all dependent on complex interactions between an animal’s design, environment and behavior. This course will be an integrative approach emphasizing experimental studies of animal behavior, including neural and hormonal mechanisms, genetic and developmental mechanisms and ecological and evolutionary approaches. We will learn to critique examples of current scientific papers, and learn how to conduct observations and experiments with real animals. We will feature guest appearances by the Curator of Research from the Cleveland MetroParks Zoo and visits to working animal behavior research labs here at Case. Group discussions and writing will be emphasized. Prereq: BIOL 114 for non-majors, BIOL 214 for majors.


BIOL 363. Experimental Developmental Biology (3) Laboratory will teach concepts and techniques in developmental biology using wildtype, mutant, and transgenic fluorescent zebrafish. Emphasis will be on the mechanisms that underlie development and how these mechanisms are explored using molecular, cellular, and genetic approaches. Term research paper required. Students taking the graduate level course will prepare a grant proposal. One laboratory per week. Limit: 10 students. Prereq: BIOL 216, BIOL 362, and consent of department.

BIOL 367. Topics in Evolutionary Biology (3) (See ANTH 367.) Cross-listed as ANTH 367.


BIOL 374. Neurobiology of Behavior (3) In this course students will be shown how a neurobiologist interested in animal behavior makes use of the fundamental mechanisms underlying the nervous system. The first half of the course emphasizes the fundamental principles underlying the analysis of molecules and network properties as well as an understanding of how drugs interact with the nervous system. The second half of the course emphasizes understanding neural mechanisms and the impact of drugs on those mechanisms. The first half of the course emphasizes the fundamental principles underlying the analysis of molecules and network properties as well as an understanding of how drugs interact with the nervous system. The second half of the course emphasizes understanding neural mechanisms and the impact of drugs on those mechanisms. The first half of the course emphasizes the fundamental principles underlying the analysis of molecules and network properties as well as an understanding of how drugs interact with the nervous system.

BIOL 375. Autonomous Robotics (3) Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechanical construction with LEGO, characteristics of sensors, motors and batteries, and control strategies for autonomous robots. In the second half of the course, students design, build and program their own complete robots that participate in a public competition. All work is performed in groups. Biologically-inspired approaches to the design and control of autonomous robots are emphasized throughout. Prereq: Consent of department. Cross-listed as EECS 375.

BIOL 376. Neurobiology Laboratory (3) Introduction to the basic laboratory techniques of neurobiology. Intracellular and extracellular recording techniques, forms of synaptic plasticity, patch clamping, immunohistochemistry and confocal microscopy. During the latter weeks of the course students will be given the opportunity to conduct an independent project. One laboratory and one discussion session per week. Prereq: BIOL 216.

BIOL 378. Computational Neuroscience (3) Computer simulation of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week.

BIOL 379. Neuroscience of Communication and Communication Disorders (3) (See COSI 305.) Cross-listed as COSI 305.

BIOL 382. Drugs, Brain, and Behavior (3) This course is concerned with the mechanisms underlying neurochemical signaling and the impact of drugs on those mechanisms. The first half of the course emphasizes the fundamental principles underlying the analysis of molecules and network properties as well as an understanding of how drugs interact with the nervous system. The second half of the course emphasizes understanding neural substrates of disorders of the nervous system, and the mechanisms underlying the therapeutic effects of drugs at the cellular and behavioral levels. This course will consist of lectures designed to give the student necessary background for understanding these basic principles and class discussion. The class discussion will include viewing video examples of behavioral effects of disorders of the nervous system, and analysis of research papers. The goal of the class discussions is to enhance the critical thinking skills of the student and expose the student to contemporary research techniques. Prereq: BIOL 215 and BIOL 216 or permission of department.

BIOL 386. Seminar in Behavior: The Epidemiology of Violence (1-3)

BIOL 387. Seminar in Population Biology (1-3) Discussion of major themes in population biology, evolution, and ecology, based on critiquing scientific papers. One discussion per week.

BIOL 388. Undergraduate Research (1-3) Guided laboratory research under the sponsorship of a biology faculty member. May be carried out within the biology department or in associated departments. May be taken only one semester during the student’s academic career. Appropriate forms must be secured in the biology department office. A written report must be approved by the biology sponsor and submitted to the chairman of the biology department before credit is granted.

BIOL 389. Selected Topics (1-3) Individual library research projects under the guidance of a biology sponsor. A major paper must be submitted and approved before credit is awarded.
BIOL 390. Advanced Undergraduate Research (1-3)
Offered on a credit only basis. Students may carry out research in biology or related departments, but a biology sponsor is required. Does not count toward the 30 hours required for a major in biology, but may be counted toward the total number of hours required for graduation. A written report must be submitted to the chairman’s office and approved before credit is granted.

BIOL 394. Seminar in Evolutionary Biology (3)
(See PHIL 394.) Cross-listed as PHIL 394.

BIOL 395. Research Discussions (1)
This is a seminar course which provides a forum within which students performing undergraduate research, or who have done so previously, can present and discuss their projects. Discussions will cover all aspects of the students' research projects: background material, experimental design and methods, results and their analysis and conclusions. At the beginning of the semester, each student will briefly outline his or her project and distribute a few key papers to provide background reading for all participants. After this introductory phase, each student will make a presentation of his/her own research. Graded as pass/fail, based upon attendance and participation. Prereq: BIOL 388. Prereq or Coreq: BIOL 390.

BIOL 396. Undergraduate Research in Evolutionary Biology (3)
(See ANTH 396.) Cross-listed as ANTH 396.

Graduate Courses

BIOL 401. Biotechnology Laboratory: Genes and Genetic Engineering (5)
Laboratory training in recombinant DNA techniques. Basic microbiology, growth, and manipulation of bacteriophage, bacteria, and yeast. Students isolate and characterize DNA, construct recombinant DNA molecules, and reintroduce them into eukaryotic cells (yeast, plant, animal) to assess their viability and function.

BIOL 402. Principles of Neural Science (3)
(See NEUR 402.) Cross-listed as NEUR 402.

BIOL 407. General Biochemistry (4)
(See BIOC 407.) Cross-listed as BIOC 407.

BIOL 408. Molecular Biology: Genes and Genetic Engineering (4)
An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of development. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Prereq: BIOL 215 or BIOC 307. Cross-listed as BIOC 408.

BIOL 415. Quantitative Biology Laboratory (3)
Application of personal computers to biological research. Emphasis on the use of structured programming and flow charting. Use of statistical techniques, analysis of experimental design, modeling strategies. The use of diverse software packages such as spreadsheets, word processing, statistical packages. Continuous interaction with the WWW. Weekly lectures and problem sets posted in the WWW home page. During the last 6 weeks of the course the student will have a final project that consists of data analysis and interpretation. Report required for the final project. One lecture and one lab per week.

BIOL 416. Fundamental Immunology (3)
Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, antigen processing and presentation, cell-cell interactions, cell-mediated immunity, cytokines, and basic molecular biology of B and T lymphocytes. Lectures emphasize experimental findings leading to the concepts of modern immunology. A term paper is required. Prereq: BIOL 215. Cross-listed as PATH 416.

BIOL 417. Cytokines: Function, Structure, and Signaling (3)
(See PATH 417.) Cross-listed as CLBY 417 and PATH 417.

BIOL 426. Genetics (3)
Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, quantitative genetics.

BIOL 427. Neural Development (3)
Topics include cell commitment, regulation of proliferation and differentiation, cell death and trophic factors, pathfinding by the growing nerve fiber, synapse formation, relationships between center and periphery in development and the role of activity. Cross-listed as NEUR 427.

BIOL 428. Plant Genomics and Proteomics (3)
(See BIOL 328.)

BIOL 431. Statistical Methods I (3)
(See EPBI 431.) Cross-listed as EPBI 431.

BIOL 432. Statistical Methods II (3)
(See EPBI 432.) Cross-listed as EPBI 432 and MHPH 432.

BIOL 434. Structural Biology (3)
(See BIOC 434.) Cross-listed as BIOC 434.

BIOL 436. Advanced Aquatic Biology (3)
Physical, chemical, and biological dynamics of lake ecosystems. Factors governing the distribution, abundance, and diversity of freshwater organisms.

BIOL 443. Advanced Microbiology (3)
The physiology, genetics, biochemistry, and diversity of microorganisms. The subject will be approached both as a basic biological science that studies the molecular and biochemical processes of cells and viruses, and as an applied science that examines the involvement of microorganisms in human disease as well as in the workings of ecosystems, plant symbioses, and industrial processes. The course is divided into four major areas: bacteria, viruses, medical microbiology, and environmental and applied microbiology. Prereq: BIOL 215.

BIOL 448. Human Anatomy and Physiology (4-5)
(See BIOL 348.)

(See BIOL 351.)

BIOL 457. Proteins and Nucleic Acids (3)
(See PHOL 456.) Cross-listed as PHOL 456.

BIOL 458. Animal Behavior (3)
(See BIOL 358.)

BIOL 462. Advanced Principles of Developmental Biology (3)
Same as BIOL 362 except the required term paper is an NIH-format research proposal. Prereq: BIOL 216. Cross-listed as ANAT 462.

BIOL 463. Experimental Developmental Biology (3)
(See BIOL 363.)

BIOL 465. Endocrinology (3)
Hormonal regulation of physiological processes of development, growth, metabolism, excretion, digestion, and reproduction and the neural control of hormone secretion in vertebrates. Effects of hormones at the cellular and organismic levels.

BIOL 473. Introduction to Neurobiology (3)
How nervous systems control behavior. Biophysical, biochemical, and molecular biological properties of nerve cells, their organization into circuitry, and their function within networks. Emphasis on quantitative methods for modeling neurons and networks, and on critical analysis of the contemporary technical literature in the neurosciences. Term paper required. Two lectures per week. Prereq: Consent of department. Cross-listed as NEUR 473.

BIOL 474. Neurobiology of Behavior (3)
(See BIOL 374.) Cross-listed as NEUR 474.

BIOL 475. Autonomous Robotics (3)
Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechanical construction with LEGO, characteristics of sensors, motors and batteries, and control strategies for autonomous robots. In the second half of the course, students design, build and program their own complete robots that participate in a public competition. All work is performed in groups. Biologically-inspired approaches to the design and control of autonomous robots are emphasized throughout. Lab reports and a term paper required. Prereq: Consent of department. Cross-listed as EECS 475.

BIOL 476. Neurobiology Laboratory (3)
Introduction to the basic laboratory techniques of neurobiology. Intracellular and extracellular recording techniques, forms of synaptic plasticity, patch clamping, immunohistochemistry, and confocal microscopy. During the latter weeks of the course students will be given the opportunity to conduct an independent project. One laboratory per week. Prereq: BIOL 216. Cross-listed as NEUR 476.

BIOL 477. The Dynamics of Adaptive Behavior (3)
(See EECS 477.) Cross-listed as EECS 477.

BIOL 478. Computational Neuroscience (3)
Computer simulation of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as EECS 478.

BIOL 479. Seminar in Computational Neuroscience (3)
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and
other current topics. Cross-listed as EBME 479, E ECS 479, and NEUR 479.

BIOL 480. Physiology of Organ Systems (3)
This course presents an advanced introduction to the fundamental physiological principles governing the major organ systems in mammals. The function of the nervous, endocrine, digestive, muscle, circulatory, respiratory, and urinary systems are discussed. At the conclusion of the semester, integrative aspects of the major organ systems will be illustrated through consideration of exercise and high altitude physiology. Cross-listed as PHOL 480.

BIOL 482. Drugs, Brain, and Behavior (3)
(See BIOL 382.) Cross-listed as NEUR 482.

BIOL 491. Contemporary Biology and Biotechnologies for Innovation I (3)
The first half of a two-semester sequence providing an understanding of biology as a basis for successfully launching new high-tech ventures. The course will examine physical limitations to present technologies and the use of biology to identify potential opportunities for new venture creation. The course will provide experience in using biology in both identification of incremental improvements and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) biotechnology-based venture creation and will illustrate characteristics for success. Prereq: Consent of department.

BIOL 492. Contemporary Biology and Biotechnologies for Innovation II (3)
Continuation of BIOL 491 with an emphasis on current and prospective opportunities for Biotechnology Entrepreneurship. Longer term opportunities for Biotechnology Entrepreneurship in emerging areas including (but not limited to) applications of DNA sequence information in medicine and agriculture; energy and the environment; biologically-inspired robots. Prereq: BIOL 491 or consent of department.

BIOL 494. Seminar in Evolutionary Biology (3)
(See PHIL 494.) Cross-listed as PHIL 494.

BIOL 531. Seminar in Experimental Ecology (1-3)

BIOL 536. Seminar in Great Lakes Issues (1-3)
Selected topics related to Great Lakes basin studies: research problems, scientific processes, classic research papers, current events, policy issues, and legislative initiatives. Course content will vary depending on interests of students and faculty. Cross-listed as GEOL 536.

BIOL 541. Seminar in Genetics (1)

BIOL 550. Neomechanics Seminar (3)
(See EBME 550.) Cross-listed as EBME 550.

BIOL 550A. Seminar in Experimental Biology: Plant Science (1-3)

BIOL 550C. Seminar in Experimental Biology (1-3)

BIOL 552. Seminar in Developmental Biology (1-3)
Topics pertaining to the field of development, such as regeneration and induction, which address both vertebrate and invertebrate forms.

BIOL 569. Advanced Seminar in Developmental Biology (1-3)
Participants prepare and present seminars on subjects of contemporary interest and importance in developmental biology.

BIOL 599. Advanced Independent Study for Graduate Students (1-3)
Independent study of advanced topics in biology under the supervision of a biology faculty member. Registration requires submission of a proposal for a project or study and approval of the department.

BIOL 601. Research (1-9)

BIOL 651. Thesis M.S. (1-9)

BIOL 701. Dissertation Ph.D. (1-9)

BIOL 703. Dissertation Fellowship (1-8)

BIOL 801. Biotechnology Workshop (2)
The course will cover the topics of DNA structure and isolation, restriction enzyme digest, the fractionation of DNA by gel electrophoresis, Southern blotting, hybridization and the nature of restriction fragment length polymorphisms, the cloning of DNA in various vectors and the identification of recombinant molecules, the use of the polymerase chain reaction to amplify DNA and its use in DNA fingerprinting. The ethical issues arising from the implementation of recombinant DNA technology and the advances in the human genome project will also form part of the course. The laboratory exercises include DNA extraction from pea seeds, digestion with restriction enzymes and gel electrophoresis followed by Southern blotting and hybridization. A fragment of bacteriophage lambda will be cloned in a plasmid vector and recombinant molecules isolated. A fingerprint of the participants’ own DNA will be developed using the polymerase chain reaction. Prereq: Co-registration Biote Institute.

BIOL 802. Terrestrial and Aquatic Ecology for High School Teachers (2)
A 2-week summer ecology course to take place at the University Farm in Hunting Valley, OH. It is designed for teachers of grades 6-12 in both public and private schools who have an interest in current ecological problems. Participants will learn field sampling techniques and identification of a diversity of living organisms, both plant and animal. They will study the distribution and abundance of terrestrial and aquatic organisms. Field work in the varied habitats of CWRU University Farm will be an integral part of the program. Data will be analyzed and interpreted using personal computers. Participants will receive supplies, field guides, and detailed laboratory exercises that are designed specifically for the classroom. The course will be offered during the last two weeks of June and is limited to 12 participants.

BIOL 803. Autonomous Robotics for High School Science Teachers (2)
A 2-week, 10-day summer course in designing, building, and programming computer-controlled robots which are able to function autonomously in complex, real-world environments. LEGO Technics components are used for structures and gear trains. Various mechanical and photodetection sensors provide sensory feedback. A microcontroller board programmed in C is used for sensory integration and behavioral control. Participants work in groups of two per workstation. Detailed written documentation and laboratory exercises will be provided. Topics include: mechanical design with LEGO, sensors and feedback control, C programming, multi-tasking control strategies, and an end-of-course robot competition. Eligibility: high school (grades 9-12) science teachers; those in the biological sciences preferred. Limit 10. Prereq: Consent of department.

Department of Chemistry

Millis Science Center
Phone 216-368-5914; Fax 216-368-3006
Lawrence M. Sayre, Chair

The Department of Chemistry is the largest department and central focus of a wide array of departments representing the chemical sciences at the University. It consists of 22 faculty members, approximately 15 postdoctoral associates, more than 80 graduate students, and more than 100 undergraduate students majoring in chemistry. The department offers programs leading to both undergraduate degrees (Bachelor of Arts and Bachelor of Science) and graduate degrees (Master of Science and Doctor of Philosophy).

The general focus of chemistry is on (i) understanding the basic properties of matter, and (ii) employing this knowledge in the design, synthesis, and characterization of substances with novel and useful properties. The various degree programs strive to develop all aspects of the student’s chemical knowledge via a broad range of lecture and laboratory courses. Chemical research is an integral part of the department’s activities; nearly $4 million of federal and private research support flows into the department each year. The facilities for carrying out first-rate research are outstanding and are available to both graduate and undergraduate students. Undergraduates are encouraged to participate in research projects with individual faculty members as a method of expanding their chemical training, and to more fully develop their comprehension of what is involved in the chemical research enterprise. These research programs typically involve interchange and collaboration across all levels of experience and may also involve faculty from other departments and institutions.

Chemistry is often referred to as the central science because of the key role it plays in a number of areas of interdisciplinary studies. Correspondingly, an important aspect of a degree in chemistry is the broad range of employment opportunities it affords. Chemists can direct their
talents to specialized problems of applied research, or they can choose to delve into fundamental investigations. They cover the spectrum of chemical specialties from microbiochemistry to the study of lunar materials. A chemical degree also provides a valuable preparation for various other related professions, such as medicine, dentistry, and law.

The American Chemical Society, with its more than 100,000 members, is the major professional society in the United States for practicing chemists. Both undergraduate and graduate students may become affiliated with the society.

FACULTY

Lawrence M. Sayre, Ph.D. (University of California, Berkeley)
Frank Hovorka Professor and Chair of the Department of Chemistry
Bioorganic and bioinorganic chemistry; redox coenzyme mechanisms; protein oxidation/modification; neurotoxicology

Alfred B. Anderson, Ph.D. (Johns Hopkins University)
Professor
Pure and applied theoretical chemistry: surface science, catalysis, Inorganic chemistry, and properties of materials

Mary D. Barkley, Ph.D. (University of California, San Diego)
Professor
Time-resolved fluorescence spectroscopy; biophysical chemistry; HIV reverse transcriptase; HCV RNA polymerase

Clemens Burda, Ph.D. (University of Basel, Switzerland)
Assistant Professor
Physical chemistry of nanostructures; molecular electronics; femtosecond laser spectroscopy

James D. Burgess, Ph.D. (Virginia Commonwealth University)
Assistant Professor
Physical Chemistry of platinum-based anticancer drug; electrode-supported bilayer membranes; electron transfer enzymes

Robert C. Dunbar, Ph.D. (Stanford University)
Professor
Gas phase ions and ion-neutral interactions: ion-molecular reaction kinetics, computational chemistry

Philip P. Garner, Ph.D. (University of Pittsburgh)
Professor
Synthetic organic chemistry

Thomas G. Gray, Ph.D. (Harvard University)
Assistant Professor
Inorganic chemistry, metalloclusters as nanorods, biomineralization scaffolds, and luminescence imaging agents

Zhong-Wu Guo, Ph.D. (Polish Academy of Sciences)
Associate Professor
Carbohydrate chemistry, oligosaccharide and glycophosphate synthesis

Malcolm E. Kenney, Ph.D. (Cornell University)
Hewlett Professor of Chemistry
Photodynamic therapy; porphyrin-like compounds; organosilicon compounds; fuel gas desulfurization

Gilles Klopman, Ph.D. (University of Brussels, Belgium)
Professor
In vivo cell bioenergetics (concerted 17O/31P nmr spectroscopy and imaging); instrumental analytical chemistry

Irene Lee, Ph.D. (Penn State University)
Assistant Professor
Biochemistry; enzymology

Gheorghe D. Mateescu, Ph.D. (Case Western Reserve University)
Professor
Inorganic chemistry; multidentate transition metal chelates; models for copper protein active sites; redox behavior of metal complexes and oxometalate species

M. Cather Simpson, Ph.D. (University of Wisconsin-Madison)
Professor
Inorganic chemistry; organometallic reaction mechanisms; catalyzed oxidations

Robert G. Salomon, Ph.D. (University of Wisconsin, Madison)
Professor
Organic chemistry; synthesis; bioinorganic, homogeneous catalysis

Daniel A. Scherson, Ph.D. (University of California, Davis)
Charles F. Mabery Professor of Research in Chemistry
Electrochemistry; electrode kinetics; electrocatalysis; in-situ spectroscopic methods in electrochemistry

Fred L. Urbach, Ph.D. (Michigan State University)
Professor
Inorganic chemistry; multidentate transition metal chelates; models for copper protein active sites; redox behavior of metal complexes and oxometalate species

Michael G. Zagorski, Ph.D. (Case Western Reserve University)
Associate Professor
Organic chemistry; nuclear magnetic resonance; structure of peptides

Associated Faculty

Vernon E. Anderson, Ph.D. (University of Wisconsin-Madison)
Professor of Biochemistry and Chemistry
Enzyme reactions and mechanisms, isotope ratio mass spectrometry

Paul Carey, Ph.D. (University of Sussex, UK)
Professor of Biochemistry and Chemistry
Raman spectroscopy; proteins and protein-ligand interactions

John J. Mieyal, Ph.D. (Case Western Reserve University)
Professor of Pharmacology and Chemistry
Hemoprotein chemistry, oxygen transport and activation; drug metabolism and related activity of cytochrome P 450
Witold K. Surewicz, Ph.D (University of Lodz, Poland)
Professor of Physiology & Biophysics and Chemistry
Protein aggregation and the pathogenesis of aging-related diseases; prion protein; protein folding and protein-membrane interactions

UNDERGRADUATE PROGRAMS

The Department of Chemistry offers two basic curricula for undergraduate chemistry majors, leading to either a Bachelor of Science degree or a Bachelor of Arts degree. Both the BA and BS degree programs are under revision. The Chemistry Department should be consulted for current degree information.

BACHELOR OF SCIENCE IN CHEMISTRY DEGREE

The degree requirements are under revision; see Department for current information
(Recommended sequence for the required science and math courses)

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 105, Principles of Chemistry I ..................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 113, Principles of Chemistry Laboratory ..........(1-3-2)</td>
<td></td>
</tr>
<tr>
<td>MATH 121, Calculus for Science and Engineering I ......(4-0-4)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 106, Principles of Chemistry II ................ (3-0-3)</td>
<td></td>
</tr>
<tr>
<td>ENGR 131, Elementary Computer Programminga ...........(2-2-3)</td>
<td></td>
</tr>
<tr>
<td>MATH 122, Calculus for Science and Engineering II ......(4-0-4)</td>
<td></td>
</tr>
<tr>
<td>PHYS 121, General Physics I. Mechanics b ..................(4-0-4)</td>
<td></td>
</tr>
<tr>
<td><strong>Sophomore Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 323, Organic Chemistry I ...............(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 321, Laboratory Methods &amp; Techniques I..........(1-6-3)</td>
<td></td>
</tr>
<tr>
<td>MATH 223, Calculus for Science &amp; Engineering III .....(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>PHYS 122, General Physics II. Electricity &amp; Magnetism..(4-0-4)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 324, Organic Chemistry II ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 322, Laboratory Methods &amp; Techniques II .......(1-6-3)</td>
<td></td>
</tr>
<tr>
<td>MATH 235, Elementary Differential Equations ..........(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>or STAT 312, Statistics for Engineering and Science ..(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>PHYS 221, General Physics III. Modern .................(3-0-3)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 335, Physical Chemistry I ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 331, Laboratory Methods &amp; Techniques III ......(1-6-3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 311, Inorganic Chemistry I .....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 336, Physical Chemistry II ...................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>CHEM 332, Laboratory Methods &amp; Techniques IV ..........(1-6-3)</td>
<td></td>
</tr>
<tr>
<td>Chemistry or approved elective ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td><strong>Senior Year</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>Chemistry electivec ..................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Chemistry or approved elective ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical elective .....................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical elective .....................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>Chemistry or approved elective ....................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Biochemistry Requirementd .........................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>Technical elective .....................................(3-0-3)</td>
<td></td>
</tr>
<tr>
<td>a. This is being replaced by a Chemistry laboratory.</td>
<td></td>
</tr>
<tr>
<td>b. Selected students may be invited to take PHYS 123, 124, 223 (Honors).</td>
<td></td>
</tr>
<tr>
<td>c. See Department for details.</td>
<td></td>
</tr>
<tr>
<td>d. May be satisfied by CHEM 328, Introductory Biochemistry; CHEM 329, Chemical Aspects of Living Systems; or BIOC 307, General Biochemistry.</td>
<td></td>
</tr>
</tbody>
</table>

Bachelor of Science Program

The Bachelor of Science degree program is designed for students who plan professional careers in chemistry and leads to certification by the American Chemical Society. The required science, math and computing courses for the B.S. curriculum are shown on the following page. The B.S. curriculum provides a rigorous background in chemistry yet has considerable flexibility in the senior year in the choice of electives. During the senior year, the B.S. major is expected to go a step beyond basic preparation in an area of chemistry of particular interest to him or her. Research is strongly encouraged. As many as nine hours of research (CHEM 397) may be credited toward the degree. B.S. majors who plan to go on to graduate study may elect to take advanced courses in inorganic chemistry (CHEM 412, 413); organic chemistry (CHEM 421, 422, 435); chemical thermodynamics (CHEM 407); quantum mechanics (CHEM 446); instrumental analytical chemistry (CHEM 410), or other graduate offerings. Interdisciplinary strengths can be achieved by selecting technical electives to follow designed “tracks” in biological chemistry, environmental chemistry, material science or polymer science.

Bachelor of Arts Program

The B.A. program is intended for students who plan careers in medicine or other health or science-related fields for which a baccalaureate degree in chemistry provides appropriate pre-professional training. B.A. majors may supplement
their chemical training by electing additional chemistry courses or may utilize the curriculum flexibility in the Department of Chemistry to develop an interdisciplinary program of their choice. Many B.A. majors participate in undergraduate research within the Department of Chemistry (CHEM 397) or in other science departments including those in the medical school.

Honors Program

Chemistry majors who have excellent academic records may participate in the Honors in Chemistry program. To graduate with honors in chemistry, a student must satisfy the following requirements:

1. A combined grade-point average of 3.30 in chemistry, physics, and mathematics and an overall grade point average of 3.00.
2. A minimum of six semester hours of CHEM 397, or, with departmental approval, chemical research done under another course number.
3. A thesis approved by the Undergraduate Committee of the department on the basis of the level of research, the quality of the manuscript, and the chemical content.

Minor

Students may complete a minor in chemistry, defined as one year of freshman chemistry (including laboratory); two additional three-hour lecture courses; and two additional laboratory or approved courses. A recommended sequence would include: CHEM 105, 106, Principles of Chemistry I, II (3,3), and CHEM 113, Principles of Chemistry Laboratory (2); CHEM 223, 224, Introductory Organic Chemistry I, II (3,3), or CHEM 323, 324, Organic Chemistry I, II (3,3), and CHEM 233, 234, Introductory Organic Chemistry Laboratory I, II (2,2). Other sequences may be followed after consultation with the Department of Chemistry.

Teacher Licensure

Two options are available within the B.A. chemistry major for students to become eligible for licensure as teachers in secondary schools (Adolescents to Young Adults) qualified to teach chemistry or to teach physical sciences (both physics and chemistry). Students interested in either option should contact Professor John Stuehr. In addition to content (subject area) requirements, a 35 semester hour sequence in professional education is required comprising courses taken at Case Western Reserve University and at John Carroll University, culminating in student teaching. (See EDUCATION [EDUC & EDJC]).

The Subject Area Requirements for the two options are as follows

---

**BACHELOR OF ARTS DEGREE IN CHEMISTRY**

(Recommended sequence for the required science and math courses)

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Class-Lab-Credit Hours</th>
<th>Junior Year</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td><strong>Fall</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 105, Principles of Chemistry I</td>
<td>(3)</td>
<td>CHEM 301, Introductory Physical Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 113, Principles of Chemistry Laboratory</td>
<td>(2)</td>
<td>CHEM 304, Chemical Measurements Lab</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 125, Mathematics I</td>
<td>(4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td></td>
<td><strong>Spring</strong></td>
<td></td>
</tr>
<tr>
<td>CHEM 106, Principles of Chemistry II</td>
<td>(3)</td>
<td>CHEM 302, Introductory Physical Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td>MATH 126, Mathematics II</td>
<td>(4)</td>
<td>CHEM 305, Introductory Physical Chemistry Laboratory</td>
<td>(3)</td>
</tr>
</tbody>
</table>

| Sophomore Year | | | |
| **Fall** | | **Fall** | |
| CHEM 223, Introductory Organic Chemistry I | (3) | Electives | |
| or | | | |
| CHEM 323, Organic Chemistry I | (3) | | |
| CHEM 233, Organic Chemistry Laboratory I | (2) | | |
| PHYS 115, Introductory Physics I | (4) | | |
| **Spring** | | **Spring** | |
| CHEM 224, Introductory Organic Chemistry II | (3) | Electives | |
| or | | | |
| CHEM 324, Organic Chemistry II | (3) | | |
| CHEM 234, Organic Chemistry Laboratory II | (2) | | |
| PHYS 116, Introductory Physics II | (4) | | |
Chemistry Licensure (currently pending approval by the Ohio Department of Education)
ASTR 201 or BIOL 114 or GEOL 101; CHEM 105, 106, 113; PHYS 115, 116 or 121; MATH 121, 122 or 125, 126*; CHEM 223, 224 or 323, 324*; CHEM 233, 234, 301, 302, 304, 305, 311, 328, 397.

*Students with demonstrated aptitude may, upon consultation with their advisor, elect to enroll in the higher numbered MATH, PHYS, or CHEM sequences.

Dual Field Physical Science Licensure**
ASTR 201 or BIOL 101 or GEOL 110; PHYS 121, 122, 196, 221; CHEM 105, 106, 113, 223, 224, or 323,324*; 233, 234, PHYS 331; ENGR 131; MATH 125, 126; CHEM 301, 302, 304, 305; PHYS 310, 324; PHYS 315 or 316.

**Course requirements for students majoring in physics and seeking physical science teacher licensure are listed for the Department of Physics.

GRADUATE PROGRAMS

Master of Science Program
The Master of Science degree in chemistry may be obtained by completing a program including the preparation of a master’s thesis or a program involving only course work. Both programs require a minimum of 27 semester credit hours, of which up to 6 semester credit hours may be for the master’s thesis. Course work for the master’s degree may be taken on a part-time basis. Thesis research can be undertaken only by full-time graduate students. Only the master’s degree without thesis can be earned entirely on a part-time basis.

Master’s Program in Science Entrepreneurship
In conjunction with four other departments in the College of Arts and Sciences (Biology, Mathematics, Physics, Statistics), the Chemistry Department offers an M.S. degree with specialization in Chemistry Entrepreneurship. This is a 27-credit-hour program that includes 18 hours of formal course work. The first year involves taking a two-semester science innovation sequence and a two-semester entrepreneurship sequence in the Weatherhead School of Management. During the two-year curriculum, the student will also take two technical electives, one of which must be in chemistry. The program capstone features a 9-credit-hour M.S. thesis based on the industrial internship of the student or on creation of a new venture. A seminar program provides continual exposure to scientists, technologists, and entrepreneurs.

Doctor of Philosophy Program
The Doctor of Philosophy degree in chemistry is granted to those students who have shown an extensive knowledge of advanced chemistry and the ability to do original research. The program usually requires four years of full-time study after the bachelor’s degree. Besides advanced courses, the program consists of cumulative and oral examinations, seminars and colloquia, and, most importantly, original research. At least twelve months must be spent in residence on campus while fulfilling the Ph.D. thesis research requirement.

Full-time graduate students who maintain satisfactory academic performance while pursuing the Ph.D. degree in chemistry normally receive a stipend for teaching and/or research which includes full tuition and a monthly amount sufficient to cover living expenses.

FACILITIES

Facilities for experimental and theoretical research are modern and extensive. They include diverse major instruments for use by faculty and students, as well as specialized equipment serving individual research groups. The major instrument facility centers on 200, 300, and 400 MHz NMR spectrometers, a Varian Inova 600 MHz NMR, a Kratos MS-25 RFA GC mass spectrometer, and an electron-spin resonance spectrometer.

Other departmental instrumentation includes equipment for ion cyclotron resonance spectrometry, laser Raman spectroscopy, x-ray diffraction, stopped-flow kinetics measurements, nanosecond and picosecond lasers, spectropolarimetry and circular dichroism, protein structure elucidation, ellipsometry, electrochemical measurements, and low-energy diffraction and Auger studies of surfaces. Access to very high field NMR instrumentation is available on campus at the Cleveland Center for Structural Biology (CCSB). Many faculty in the chemistry department are actively involved with the CCSB, which is equipped with a numerous 500-900 MHz NMR spectrometers. The Frank Hovorka Information Center and associated laboratories represents an array of advanced computational and graphics capabilities, including several Silicon Graphics Indigo computers and two SUN workstations. Many of the department’s analytical instruments are networked with these workstations together with computers in individual faculty research areas. The Chemistry Department’s computers are part of the campus-wide fiber optic communications network operated by Information Technology Services, and most buildings now offer wireless access. In addition to the full complement of software, Internet, and library database services offered by the University, connections to off-site databases, such as SciFinder and Ohio Supercomputer Center, are available to departmental users. A large number of laboratory microcomputers are in operation throughout the department.

RESEARCH

The Department of Chemistry is noted for the diversity of its research efforts. These range from synthetic studies of important bioactive substances, including antibiotics and DNA-binding substances, to a detailed understanding of the surface properties of materials used in batteries and electrolytic cells. Studies are being performed with molecules as simple as oxygen and as complicated as those which describe the active centers of enzymes or the protein core of insoluble aggregates which deposit in neurodegenerative disease. Multidisciplinary approaches are being applied to understanding energy
transfer in proteins. Efforts are being made to understand the basic chemical properties leading to reactive modifiers generated from physiological lipids. Other research is aimed at developing new drugs for photodynamic therapy and at understanding biological activity through artificial intelligence approaches. The influence of metal ions in modifying reactivity is a common interest of several members of the faculty, as is the development of organometallic compounds for synthesis and catalysis. Experimental and theoretical studies of gas phase molecules are providing a fundamental understanding of unimolecular reaction dynamics and ionization processes important in atmospheric chemistry. Chemical surfaces are being studied. Of particular importance are studies designed to characterize the electrode-electrolyte interfaces important in electrocatalysis and the electrochemical properties of new semiconductors. These efforts are complemented by theoretical studies on the interfacial structure and bonding in composite materials.

The department uses some of the foremost equipment available in high-resolution nuclear magnetic resonance spectroscopy and in tunable laser spectroscopy. Work on various aspects of chemistry as studied by these techniques is recognized throughout the world.

THE GRADUATE PROGRAM

The Chemistry of Life Processes offers the student the opportunity of pursuing a course of study that cuts across traditional disciplines. The three traditional areas of chemistry -- inorganic, organic, and physical -- are all represented in their biological aspects. Through strong ties with the biomedical community within the University surroundings, faculty who carry out research in biochemical areas have coordinated a program of integrated course work, seminar offerings, and research experience. Although the student receives a Ph.D. degree in chemistry, participants in this program gain a broader, interdisciplinary background that provides distinct advantages when embarking upon a career in teaching/research, industry, or at government laboratories.

Case Western Reserve University ranks among the leading universities internationally in its strengths in electrochemistry and has brought these strengths together under one coordinated structure, the Yeager Center for Electrochemical Studies (YCES). The interdisciplinary nature of electrochemistry involves the interaction of electrochemists in the chemistry and chemical engineering departments with metallurgists, surface physicists, inorganic and organic chemists, polymer membrane chemists, and electrical engineers. Such interactions, lacking on most campuses, are promoted at Case Western Reserve University through YCES. Graduate students in the chemistry department have the opportunity to specialize in the area of electrochemistry with one of the most extensive course and research programs in the United States.

COLLOQUIA AND SEMINARS

The department sponsors a rich program of colloquia and seminars on recent advances in chemical research. Most notable among these is the Frontiers in Chemistry Lecture Series, in which scientists of international distinction lecture on major discoveries and developments in chemistry. In addition, a weekly colloquium series provides lectures by invited speakers in a variety of fields of chemical investigation. Both of these programs are addressed to the general audience of faculty, students, and other chemical scientists in the University and the Cleveland area, and are a vital means to a broad, current knowledge. Numerous other seminars and meetings are held on a more specialized and informal level. Most individual research groups conduct weekly discussions to evaluate their progress.

CHEMISTRY (CHEM)

Undergraduate Courses

CHEM 101. The Wide, Wild World of Chemistry (3)
This is designed to give the non-science major an introduction to chemistry and its role in society. Chemical concepts will be presented in a non-mathematical way focusing on their implication for current scientific inquiry. Topics include forensics, explosives, green chemistry, nuclear energy, batteries, chemistry in the kitchen, and scientific ethics.

CHEM 105. Principles of Chemistry I (3)
Atomic structure; thermochemistry; periodicity, bonding and molecular structure; intermolecular forces; properties of solids; liquids, gases and solutions. Prereq: One year of high school chemistry.

CHEM 106. Principles of Chemistry II (3)
Thermodynamics, chemical equilibrium; acid/base chemistry; oxidation and reduction; kinetics; spectroscopy; introduction to nuclear, organic, inorganic, and polymer chemistry. Prereq: CHEM 105 or equivalent.

CHEM 111. Principles of Chemistry for Engineers (4)
A first course in University Chemistry emphasizing chemistry of materials for engineering students. Atomic theory and quantitative relationships; gas laws and kinetic theory; solutions, acid-base properties and pH; thermodynamics and equilibrium; kinetics, catalysis, and mechanisms; molecular structure and bonding. Prereq: One year of high school chemistry or permission of department.

CHEM 113. Principles of Chemistry Laboratory (2)
A one semester laboratory based on quantitative chemical measurements. Experiments include analysis, synthesis and characterization, thermochemistry and chemical kinetics. Computer analysis of data is a key part of all experiments. Coreq: CHEM 105, CHEM 106, CHEM 111, or ENGR 145.

CHEM 223. Introductory Organic Chemistry I (3)
Introductory course for engineering students and science majors. Develops themes of structure and bonding along with elementary reaction mechanisms. Includes extensive treatment of hydrocarbons, alky halides, alcohols, and ethers as well as an introduction to spectroscopy. Prereq: CHEM 106 or CHEM 111.

CHEM 224. Introductory Organic Chemistry II (3)
Continues and extends themes of structure and bonding from CHEM 223 and continues spectroscopy and more complex reaction mechanisms. Includes extensive treatment of aromatic rings, carbonyl compounds, amines, and selected special topics. Prereq: CHEM 223 or CHEM 323.

CHEM 233. Introductory Organic Chemistry Laboratory I (2)
An introductory organic laboratory course emphasizing microscale operations. Synthesis and purification of organic compounds, isolation of natural products, and systematic identification of organic compounds by physical and chemical methods. Prereq: CHEM 113 and CHEM 106 or equivalent. Coreq: CHEM 223 or CHEM 323.

CHEM 234. Introductory Organic Chemistry Laboratory II (2)
A continuation of CHEM 233, involving multi-step organic synthesis, peptide synthesis, product purification and analysis using sophisticated analytical techniques such as chromatography and magnetic resonance spectroscopy. Prereq: CHEM 233.

CHEM 290. Chemical Laboratory Methods for Engineers (3)
Techniques of chemical synthesis, analysis, and characterization. Uses students' backgrounds in general and organic chemistry, but requires no background in chemical laboratory operations. Coreq: CHEM 223 or CHEM 323.

CHEM 301. Introductory Physical Chemistry I (3)
First of a two-semester sequence covering principles and applications of physical chemistry, intended for chemistry and chemical engineering majors and other students having primary interest in biochemical,
biological or life-science areas. States and properties of matter. Thermodynamics and its application to chemical and biochemical systems. Chemical equilibrium. Electrochemistry. Prereq: CHEM 106 or equivalent and a year each of physics and calculus, preferably including partial derivatives.


CHEM 304. Chemical Measurements Laboratory (3) A one-semester laboratory course involving quantitative chemical measurements, error analysis and advanced concepts in ion equilibria. Electrogammetric and volumetric analysis; separation techniques; metal complexation. Basic chemical instrumentation. Prereq: CHEM 233 and CHEM 234, or CHEM 321 and CHEM 322. Coreq: CHEM 301.

CHEM 305. Introductory Physical Chemistry Laboratory (3) A one-semester laboratory course in the principles and quantitative characterization of chemical and biomedically important systems. Experiments such as phase equilibria, calorimetry, chemical equilibrium, kinetics, electrochemistry, spectroscopy and the use of computers to analyze data. Prereq: CHEM 304 and CHEM 301 or CHEM 335. Coreq: CHEM 302 or CHEM 336.

CHEM 311. Inorganic Chemistry I (3) Fundamentals of inorganic chemistry. Topics include molecular structure, molecular shape and symmetry, structure of solids, d-metal complexes, oxidation and reduction, and acids and bases. Prereq: CHEM 301 or CHEM 335 (may be taken concurrently).

CHEM 312. Inorganic Chemistry II (3) Continuation of CHEM 311. Fundamentals of inorganic chemistry. Topics include electronic spectra of complexes, structures and properties of solids, organometallic compounds, and descriptive chemistry of representative elements. Prereq: CHEM 311.

CHEM 321. Laboratory Methods and Techniques I (3) CHEM 321 and 322 are the first two semesters of an integrated laboratory course. Experimental approach to chemical problems. Introduction to analytical methods. Chemical measurements, synthesis, and characterization. Prereq: CHEM 113. Coreq: CHEM 223 or CHEM 323.

CHEM 322. Laboratory Methods and Techniques II (3) Continuation of CHEM 321 with specific focus on chemical synthesis and qualitative analysis of organic compounds. Prereq: CHEM 321. Coreq: CHEM 224 or CHEM 324.

CHEM 323. Organic Chemistry I (3) An enriched course for the sufficiently able and interested student who wishes a deeper and broader appreciation of theory and practice of organic chemistry. Focuses on relationships between molecular structure and chemical reactivity, and stresses the development of sophisticated problem-solving skills in the context of organic reaction mechanisms and multi-step synthesis. Homolytic and heterolytic substitution, elimination, oxidation and reduction reactions; topics in stereochemistry and spectroscopy. Recommended for chemistry, biochemistry, and related majors. Prereq: CHEM 106 or equivalent and consent of department.

CHEM 324. Organic Chemistry II (3) Continuation of CHEM 323. Introduces the chemistry of carbonyl, aromatic and amino functional groups, and develops the concepts of conjugation and resonance, molecular orbital theory and pericyclic reactions. Prereq: CHEM 223 or CHEM 323 and consent of department.

CHEM 325. Physical Methods for Determining Organic Structure (3) Structure determination of organic compounds using mass spectrometry and modern instrumental techniques such as infrared, ultraviolet, visible, and nuclear magnetic resonance spectroscopy. Prereq: Two semesters of organic chemistry.


CHEM 331. Laboratory Methods and Techniques III (3) Synthesis, separation techniques, physical properties, and analysis. Advanced techniques of chemical synthesis, leading the student to the preparation of interesting inorganic and organometallic compounds. Prereq: CHEM 322.

CHEM 332. Laboratory Methods and Techniques IV (3) Modern techniques of physical measurement, including thermochrometry, kinetics, spectroscopy, and electrochemistry. Prereq: CHEM 331. Coreq: CHEM 336.

CHEM 335. Physical Chemistry I (3) First of a two-semester sequence of physical chemistry for chemistry majors and others with career goals in the physical sciences or engineering. States of matter. Kinetic theory of gases. Transport phenomena. Chemical thermodynamics and its application to chemical systems. Equilibrium. Ionic solutions and electrochemistry. Introduction to chemical kinetics. Prereq: CHEM 106 or equivalent plus a year each of physics and calculus, including partial derivatives.


CHEM 395. Chemistry Colloquium Series (1) Course content provided by Thursday chemistry department colloquia (or Frontiers in Chemistry lectures). Discussion sessions review previous lectures and lay foundation for forthcoming lectures.

CHEM 397. Undergraduate Research (1-6) Independent research project within a research group in the chemistry department; arrangements should be made with the faculty member selected. Open to all chemistry majors and other qualified students; required for honors in chemistry. A written report is required each semester. Prereq: Consent of department.

Graduate Courses


CHEM 407. Chemical Thermodynamics (3) Thermodynamics and statistical thermodynamics and their application to chemical problems. Prereq: Two semesters of undergraduate physical chemistry.

CHEM 410. Instrumental Analytical Chemistry (3) Principles and applications of analytical instrumentation including optical spectroscopy (UV-Vis, IR, Raman), photoelectron and ion bombardment spectrometry, NMR and magnetic resonance imaging. Prereq: Two semesters of undergraduate physical chemistry.

CHEM 412. Advanced Inorganic Chemistry I (3) Chemistry of inorganic systems. Spectroscopy, magnetism, and stereochemistry of transition metal compounds. Prereq: One semester of undergraduate inorganic chemistry and two semesters of physical chemistry.

CHEM 413. Advanced Inorganic Chemistry II (3) Topics in mechanisms of inorganic reactions including ligand substitution, electron transfer, stereochemical interconversions, and catalytic pathways; supramolecular inorganic complexes and molecular devices. Prereq: CHEM 412 or equivalent.

CHEM 414. Organometallic Reactions and Structures (3) Bonding, structure, and mechanistic aspects of organometallic chemistry and the relevance of organometallic species to chemical catalysis. Prereq: One semester of undergraduate inorganic chemistry.

CHEM 415. Chemical Applications of Group Theory (3) Treatment of structure, bonding and spectroscopy in chemical systems based on a presentation of relationships and the theory of point and space groups. Prereq: CHEM 412 or permission of department.


Structure determination of organic compounds using mass spectrometry and modern instrumental techniques such as infrared, ultraviolet, visible, and nuclear magnetic resonance spectroscopy. Prereq: Two semesters of organic chemistry.

CHEM 428.Introductory Biochemistry (3)

CHEM 429. Chemical Aspects of Living Systems (3)

CHEM 430. Advanced Methods in Structural Biology I (3)
(See BIOC 430.) Cross-listed as BIOC 430.

CHEM 435. Synthetic Methods in Organic Chemistry (3)
Systematic consideration of reactions involving functional group transformations and carbon-carbon bond formations used in modern organic synthesis. Prereq: Two semesters of undergraduate organic chemistry.

CHEM 436. Complex Molecular Synthesis (3)
An advanced organic chemistry course providing students with an in-depth examination of the art of total synthesis focused on natural products. Topics will be selected from: Problem analysis and strategy, the logic of biosynthesis and biomimetic synthesis, and recent synthetic milestones. Prereq: CHEM 421 or consent of department.

CHEM 445. Electrochemistry I (3)
Electrochemical properties and processes of electrode/electrolyte interfaces. Fundamental background for work in corrosion, electrodeposition, industrial electrolysis, electro-organic synthesis, batteries, fuel cells, and photovoltaic/photocatalytic energy conversion. Prereq: One undergraduate course in physical chemistry and a working knowledge of thermodynamics.

CHEM 446. Quantum Mechanics I (3)
Introduction of quantization, measurement and the Schrödinger equation; angular momentum and states of molecules. Perturbation theory, spectroscopy and chemical bonding. Variational theory and calculations of molecular properties. Prereq: Two semesters of undergraduate physical chemistry.

CHEM 447. Quantum Mechanics II (3)
Continuation of CHEM 446. Ab initio and semi-empirical methods, configuration interactions, time dependent phenomena, and introduction to band theory of solids. Prereq: CHEM 446.

CHEM 448. Statistical Mechanics (3)
A systematic development of equilibrium statistical mechanics; the properties of the gaseous, liquid, and solid states of matter. Introduction to nonequilibrium statistical mechanics. Prereq: CHEM 407 and CHEM 446 or consent of department.

CHEM 450. Molecular Spectroscopy (3)
Translation, rotation, vibration, and electronic transitions of molecules. Prereq: CHEM 446.

CHEM 470. Macromolecular Synthesis (3)
Organic chemistry of macromolecules; mechanism of polyreactions; preparation of addition, condensation, and biopolymers, and the chemical reactions of polymers. Prereq: CHEM 224 or CHEM 324 and EMAC 270. Cross-listed as EMAC 470.

CHEM 491. Modern Chemistry for Innovation I (3)
The first half of a two-semester sequence providing an understanding of chemistry as a basis for successfully launching new high-tech ventures. The course will examine physical limitations to present technologies and the use of chemistry to identify potential opportunities for new venture creation. The course will provide experience in using chemistry for both identification of incremental improvements and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) venture creation and will illustrate characteristics for success. Admission to this course requires consent of the department. Prereq: Consent of department.

CHEM 492. Modern Chemistry for Innovation II (3)
Continuation of CHEM 491, with an emphasis on current and prospective opportunities for Chemistry Entrepreneurship. Longer term opportunities for Chemistry Entrepreneurship in emerging areas, including (but not be limited to) biomaterials, pharmacogenomics, biocatalysis, and drug discovery. Prereq: CHEM 491.

CHEM 501. Special Topics in Inorganic Chemistry (1-6)
(Credit as arranged.) Lectures on advanced topics in inorganic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 502. Special Topics in Inorganic Chemistry (1-6)
(Credit as arranged.) Lectures on advanced topics in inorganic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 503. Special Topics in Organic Chemistry (1-6)
(Credit as arranged.) Lectures on advanced topics in organic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 504. Special Topics in Organic Chemistry (1-6)
(Credit as arranged.) Lectures on advanced topics in organic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 505. Special Topics in Physical Chemistry (1-6)
(Credit as arranged.) Lectures on advanced topics in physical chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 506. Special Topics in Physical Chemistry (1-6)
(Credit as arranged.) Lectures on advanced topics in physical chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 507. Special Readings in Chemistry (1-6)
Detailed study of a special topic in chemistry under the guidance of a faculty member.

CHEM 508. Special Readings in Chemistry (1-6)
Detailed study of a special topic in chemistry under the guidance of a faculty member.

CHEM 509. Special Topics in Analytical Chemistry (1-6)

CHEM 511. Electrochemistry II (3)
Selected topics from electrocatalysis, semiconductor electrochemistry and photoelectrochemistry, and electrochemical impedance methods, as well as battery and fuel cell systems. Prereq: CHEM 445 or permission of department.

CHEM 523. Advanced NMR Spectroscopy in Structural Biology (3)
(See PHOL 523.) Cross-listed as PHOL 523.

CHEM 601. Research (1-18)
(Credit as arranged.) Special research in an area of chemistry under the guidance of a faculty member.

CHEM 605. Chemistry Colloquium Series (1)
Course content provided by Thursday chemistry department colloquia (or Frontiers in Chemistry lectures). Discussion sessions review previous lectures and lay foundation for forthcoming lectures.

CHEM 651. Thesis M.S. (1-18)
(Credit as arranged.)

CHEM 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

CHEM 703. Dissertation Fellowship (1-8)

Childhood Studies
210 Mather Memorial Building
Phone 216-368-2278
Fax 216-368-5334
Jill E. Korbin, Director

The Childhood Studies Minor is an educational opportunity for undergraduate students interested in a wide array of issues concerning children and the experience of childhood. This multi-disciplinary minor focuses on the life stages of infancy through adolescence, and includes interests in parenting, child development, gender, the life course, and the place of children in society and culture.
The Childhood Studies Minor is situated in the College of Arts and Sciences. Children and childhood are a focus of research and teaching throughout the University: including the School of Medicine, the Mandel School of Applied Social Sciences, the School of Law, the School of Dentistry, and the Frances Payne Bolton School of Nursing. Close connections with the Rainbow Babies and Children's Hospital and other Cleveland institutions enhance the educational opportunities for students at the university. The Schubert Center for Child Development, sponsors research, lectures, and programs on children and also provides opportunities for student involvement.

FACULTY
Jill E. Korbin, Ph.D.
Professor of Anthropology
Co-Director, Childhood Studies Minor
Co-Director, Schubert Center on Child Development
Richard Settersten, Ph.D.
Associate Professor of Sociology
Co-Director, Childhood Studies Minor
Co-Director, Schubert Center on Child Development
Jennifer Neils, Ph.D.
Ruth Coulter Heede Professor of Art History
Sandra Russ, Ph.D.
Professor of Psychology
Elizabeth Short, Ph.D.
Associate Professor of Psychology

THE MINOR IN CHILDHOOD STUDIES
The undergraduate minor in Childhood Studies is built on a foundation in the social sciences. It also is suited to students with interests in children in the natural sciences, the humanities, and the arts. The Minor requires at least 15 hours of course work in at least two different departments. The following courses are accepted toward the minor:

ANTH 306 Anthropology of Childhood and the Family - Child-rearing patterns and the family as an institution, using evidence from Western and non-Western cultures. Human universals and cultural variation, the experience of childhood and recent changes in the American family. Prerequisite: ANTH 102.

ANTH 309 Family Violence and Child Abuse - The prevalence and causes of intra-familial violence. Spouse abuse, child abuse, adolescent abuse, sexual abuse, parent abuse, and sibling violence. Major theoretical positions on the occurrence of these behaviors in light of information from both Western and non-Western cultures. Prerequisite: ANTH 102.

CHST 300 Childhood Through Art - This course will explore the imagery of children in art from its beginnings in ancient Egyptian sculpture up to the present with photographs by Mapplethorpe and Sally Mann. I order to develop a critical awareness of how children are portrayed and how the viewer is manipulated, students will study specific works of art in the Cleveland Museum of Art as well as examples from contemporary visual culture. (Cross Listed as ARTH 300.)

CHST 399 Independent Study


NTRN 328 Child Development and Health - Growth and development of the child from prenatal through adolescence, including individuality, maturation, and biological needs.

PSCL 230 Child Psychology - Basic facts and principles of psychological development from the prenatal period through adolescence. Prerequisite PSCL 101.

PSCL 329 Adolescence. Over the course of the past decade, the importance of adolescence as a separate field of study has grown in psychology and in other social sciences. This course will focus upon psychological perspectives of physical, cognitive, and social development during adolescence.

PSCL 344 Developmental Psychopathology - This course will focus on the interplay of biological, psychological, familial, and social determinants of disorders, ranging from autism to delinquency and bulimia. Prerequisites: PSCL 230 or PSCL 321.

PSCL 393 Experimental Child Psychology - The development of behavior from birth to adolescence. Growth of basic processes such as perception, learning, memory, intelligence, and language in the light of current theoretical models. Prerequisite: PSCL 101.

SOCI 320 Delinquency and Juvenile Justice - The primary focus of this course is on acquainting the student with the nature and the extent of juvenile delinquency. Accordingly, theoretical approaches to delinquency causation and the prevention, control, and treatment of delinquent behavior in society are addressed. Important aspects of juvenile justice procedures, policy and practice are examined, and the early history of the juvenile justice system and the many changes occurring over the years are discussed.

SOCI 361 The Life Course – Individual experiences and transitions over the life course are considered as the result of societal, cultural, psychological, biological, and historical influences. Developmental issues of childhood, adolescence, young adulthood, middle years and late life are discussed in the context of social expectations, challenges, and opportunities. Emphasis is placed on theoretical readings.

Students may include a maximum of 4 credit hours in practicum experience selected from the following courses:

PSCL 231 Practicum in Child Psychology – Practicum experience at a day care center.

PSCL 335A Seminar and Practicum in Preschool and Daycare - Supervised field placement and attendance at staff conferences in various child and adolescent settings.
The Department of Classics offers courses in the Greek and Latin languages and literatures, in ancient history, and in various other aspects of the culture and life of ancient Greece and Rome. In general, the purpose of the department is to provide the means by which students may acquaint themselves with the character and achievements of the ancient classical civilization of the Mediterranean world, which was the cultural progenitor of the modern West. A knowledge of classical antiquity constitutes the backbone of the liberal education. It also provides an excellent basis for further professional training of today's student, no matter in what field he or she may ultimately earn a livelihood. Such knowledge is also a valuable source of enrichment for the student's leisure. A major in classics, or even a minor may be, as it often has been, profitably combined with programs aimed toward law, medicine, management, diplomatic service, banking, journalism, librarianship, politics, religious, philosophic, literary, or historical studies, careers in the fine arts (visual or performing), museum or archival work.

The classics major leading to the Bachelor of Arts degree requires 36 hours of departmental offerings. In addition, each student completing the classics major will be strongly advised to choose a related minor selected in consultation with and approved by the departmental advisor. Courses from the Department of Classics (36 hours): Eight courses (24 hours) in either Greek or Latin or a combination of both, provided that at least three courses are included from the most advanced level in one of the languages. Four classics courses, of which at least two must be numbered above 300. Recommended additional courses outside the Department of Classics (12 to 18 hours): We strongly advocate the addition of four to six courses in a closely related field to be selected by the student in consultation with the departmental advisor. Examples of closely related fields are anthropology, art history, philosophy, comparative literature, history, theater, and English. A second major or a minor in one of these fields will normally satisfy this recommendation.

Minor

The minor programs in the Department of Classics are designed to acquaint the student with aspects of the ancient civilization of Greece and Rome by means of a coherent sequence of 15 to 18 hours of course work. In order that the knowledge acquired may have the potential for depth and provide access to primary materials, some study of one or both of the classical languages is recommended. The student may choose one of three basic patterns:

Latin Concentration

Nine hours from courses in Latin above the 102 level, plus six hours from: CLSC 112 Classical Civilization: Rome (3) CLSC 201 The Ancient World (3) CLSC 304 Ancient Rome: Republic and Empire (3) CLSC 395 Directed Readings (1-3)

Greek Concentration

Twelve hours in the Greek language, plus three hours from: CLSC 111 Classical Civilization: Greece (3) CLSC 201 The Ancient World (3) CLSC 301 Ancient Philosophy (3) CLSC 302 Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)

Classics Concentration

(Requires consultation with departmental advisor)

Any two Latin or any two Greek courses, CLSC 111 or CLSC 112, or CLSC 201. Three courses from: CLSC 226 Introduction to Greek and Roman Art (3) CLSC 228 Theater History I (3) CLSC 301 Ancient Philosophy (3) CLSC 302 Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)
CLSC 304 Ancient Rome: Republic and Empire (3)
CLSC 305 Selected Topics in Philosophy (3)
CLSC 312 Women in the Ancient World
CLSC 314 Love Poetry from Sappho to Shakespeare

Courses in Greek and Roman art at the 300 level

Any of these minor programs may be varied to suit the needs of the individual student, subject to the availability of other courses, after consultation with the department chair and with the approval of the student’s major advisor. A student may, with the consent of his or her major advisor, design and propose a more radically different minor in classics suited to his or her particular needs, with the approval of the department and such other curricular authorities as may be required.

Sequences (Engineering Core Curriculum)

All sequences should include CLSC 111, 112, and any other CLSC course above the 100 level in either Greek or Roman culture. Students should consult with the chair on the development of an acceptable sequence. The following are sample programs:

Emphasis on Greece
CLSC 111 Classical Civilization: Greece (3)
CLSC 112 Classical Civilization: Rome (3)
CLSC 203 Heroes, Myth and Performance in Greek Literature (3)
or
CLSC 302 Ancient Greece: Archaic, Classical, and Hellenistic periods (3)

Emphasis on Rome
CLSC 111 Classical Civilization: Greece (3)
CLSC 112 Classical Civilization: Rome (3)
CLSC 204 Classical Literature II (3)
or
CLSC 304 Ancient Rome: Republic and Empire (3)

DEPARTMENTAL HONORS

A student desiring to earn the Bachelor of Arts degree with departmental honors in classics must make written applica-
tion to the department chair no later than May 1 of the junior year. Permission to enter the Honors Program will be granted to majors who have earned an overall grade point average of 3.0 and an average of 3.25 in departmental offerings. Each candidate for honors must enroll in CLSC 381 in each semester of the senior year for a total of six hours credit and must pass a departmental examination on the work completed. A wide range of projects is available, and every attempt is made to suit the project to the interests and individual strengths of the candidate. Some projects require the completion of a thesis as the culmination of study; others employ different demonstrations of competence.

CLASSICS (CLCS)

Undergraduate Courses
CLSC 111. Classical Civilization: Greek (3)
The enduring significance of the Greeks studied through their history, literature, art, and philosophy. Lectures and discussion.
CLSC 112. Classical Civilization: Rome (3)
The enduring significance of the Romans studied through their history, literature, art, and philosophy. Lectures and discussion.
CLSC 201. The Ancient World (3)
Ancient history from the origins of civilization in Mesopotamia to the dissolution of the Roman Empire in the West. Cross-listed as HSTY 200.
CLSC 202. Classical Mythology (3)
The myths of Classical Greece and Rome, their interpretation and influence.
CLSC 203. Heroes, Myth, and Performance in Greek Literature (3)
This course constitutes the first half of a sequence on Classical literature. As such, it examines the major works of Greek literature and seeks to place them within their immediate historical, literary and cultural context. It traces the evolution of heroes to citizens and analyzes oral and live performances while interpreting myth from a literary and socio-political standpoint. Constant themes are war and community, wandering, tyranny and democracy, and the literary manifestations of men’s and women’s roles within the household and the city. Cross-listed as WLIT 203.
CLSC 204. Heroes and Hustlers in Latin Literature (3)
This course constitutes the second half of a sequence on Classical literature. Its main themes are heroism vs. self-promotion, love vs. lust, and the struggle between democracy and tyranny. These topics are traced in a variety of literary genres from the period of the Roman republic well into the empire. Parallels with modern life and politics will be drawn. Cross-listed as WLIT 204.
CLSC 210. Byzantine World 300-1453 (3)
Development of the Byzantine empire from the emperor Constantine’s conversion to Christianity and founding of the eastern capital at Constantinople to the fall of Constantinople to Turkish forces in 1453. Cross-listed as HSTY 210.
CLSC 226. Introduction to Greek and Roman Art (3)
(See ARTH 226.) Cross-listed as ARTH 226.
CLSC 227. Ancient Cities and Sanctuaries (3)
(See ARTH 227.) Cross-listed as ARTH 227.
CLSC 228. Ancient Greek Athletics (3)
(See ARTH 228.) Cross-listed as ARTH 228.
CLSC 295A. Greek and Latin Elements in English: The Basic Course (1.5)
A self-paced, computer-assisted course in the classical foundations of modern English in which the student learns the basic principles on which roots, prefixes, and suffixes combine to give precise meanings to composite words.
CLSC 295B. Greek and Latin Elements in English: Biomedical Terminology (1.5)
(See CLSC 295A.) Advanced section that is oriented especially toward scientific and medical terminology. Prereq: Previous or concurrent registration in CLSC 295A.
CLSC 301. Ancient Philosophy (3)
Western philosophy from the early Greeks to the Skeptics. Emphasis on the pre-Socratics, Plato, and Aristotle. Prereq: PHIL 101 and consent of department. Cross-listed as PHIL 301.
CLSC 302. Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)
The rise of Hellenic thought and institutions from the eighth to the third centuries B.C., the rise of the polis, the evolution of democracy at Athens, the crises of the Persian and Peloponnesian Wars, fifth century historiography, the growth of individualism, and the revival of monarchy in the Hellenistic period. Cross-listed as HSTY 302.
CLSC 304. Ancient Rome: Republic and Empire (3)
Growth and development of the Roman state from the unification of Italy in the early third century B.C. to the establishment of the oriental despotism under Diocletian and Constantine. The growth of empire in the Roman Empire, the uncertain steps toward an eastern hegemony, the crisis of the Hellenistic period, and the increasing dominance of the military over the civilian population. Cross-listed as HSTY 304.
CLSC 312. Women in the Ancient World (3)
The course offers a chronological survey of women’s lives in Greece, Hellenistic Egypt, and Rome. It focuses on reading primary sources as well as scholarly interpretations of the ancient record with a view to defining the construction of gender and sexuality according to the Graeco-Roman model. Additionally, the course aims to demonstrate how the various methodological approaches applied to the source material regarding women’s lives have yielded significant insights into our own perception of the categories of sex and gender. Specific topics include matriarchy and patriarchy; the antagonism between male and female in myth; the legal, social, economic, and political status of women; the ancient family; women’s role in religion and cult; ancient theories of medicine regarding women; pederasty and homosexuality. Cross-listed as WMST 312.
CLSC 314. Love Poetry from Sappho to Shakespeare (3)
Introduction to the love poetry of ancient Greece and Rome and its impact on the later European tradition.
in such poets as Petrarca, Chaucer, and Shakespeare. Readings will focus especially on questions of generic convention, audience expectation, and the social setting of love poetry in the different ages under consideration. No knowledge of the original languages required. Cross-listed as WLT 314.

CLSC 328. Greek Sculpture (3) 
(See ARTH 328.) Cross-listed as ARTH 328.

CLSC 332. Art and Architecture of Ancient Italy (3) 
(See ARTH 332.) Cross-listed as ARTH 332.

CLSC 333. Greek and Roman Painting (3) 
(See ARTH 333.) Cross-listed as ARTH 333.

CLSC 334. Art and Archaeology of Greece (3) 
(See ARTH 334.) Cross-listed as ARTH 334.

CLSC 381. Special Studies (1-6) 
Subject matter varies according to need. Prereq: 18 hours in the department of Classics and permission of the department.

CLSC 395. Directed Readings (1-3) 
Readings in English on a topic of interest to the student and acceptable to the instructor. Designed and completed under the supervision of the instructor with whom the student wishes to work. Prereq: Consent of department.

Graduate Course

CLSC 481. Special Studies (1-6) 
Subject matter varies according to need. Prereq: Consent of department.

GREEK (GREK)

Undergraduate Courses

GREK 101. Elementary Greek I (3) 
Beginning course in Greek language, covering gram-
mar (forms and syntax) and the reading of elementary
selections from ancient sources. Makes a start toward
reading Greek authors. (Both GREK 101 and 102
must be completed to obtain credit.)

GREK 102. Elementary Greek II (3) 
Beginning course in Greek language, covering gram-
mar (forms and syntax) and the reading of elementary
selections from ancient sources. Makes a start toward
reading Greek authors. (Both GREK 101 and 102
must be completed to obtain credit.) Prereq: GREK 101 or equivalent.

GREK 201. Greek Prose Authors (3) 
Readings from authors such as Plato, Lysias,
Xenophon, and Herodotus. Prereq: GREK 102 or equivalent.

GREK 202. Introduction to Greek Poetry (3) 
Primarily readings from Homer, Hesiod, and Theocri-
tus. Selections from Greek lyric may be introduced
at the instructor's discretion. Prereq: GREK 201 or equivalent.

GREK 305. Readings in Ancient Philosophy: Plato (3) 
Reading and interpretation of selected dialogues by
Plato or other philosophical works. Prereq: GREK 202.

GREK 306. Tragedy (3) 
Reading and interpretation of selected plays of Aeschy-

GREK 307. History (3) 
Extensive reading in Thucydides' History of the
Peloponnesian War, especially Books VI and VII, the

GREK 308. Comedy (3) 
Origin, ambiance, and development of Greek Old
Comedy and persisting characteristics of the genre.
Translation of selected plays from Greek into English. 
Prereq: GREK 202.

GREK 311. Homer (3) 
Reading and translation of extensive selections from
the Odyssey. Introduction to epic meter, to Homeric
Greek, and to the poet's style. Consideration of evi-
dences of oral composition and discussion of the heroic
tradition. Prereq: GREK 202 or equivalent.

GREK 380. Advanced Topics in Greek Literature (3) 
Study and discussion of important authors, works, and
topics not covered regularly. Content will reflect par-
ticular interests of students and faculty and timeliness
of the topics. Prereq: GREK 202 or equivalent.

GREK 395. Directed Readings (1-3) 
Readings in Greek of authors selected to serve the
individual interests and needs of undergraduate stu-
dents. Each program planned and completed under
the supervision of the instructor with whom the student
wishes to work. Prereq: Consent of department.

HEBREW (HBRW)

Undergraduate Courses

HBRW 101. Elementary Modern Hebrew I (4)
(Credit for HBRW 101 only upon completion of
HBRW 102.) For students with no knowledge of He-
brew. Introduces skills for speaking and writing. One
hour of assigned lab work required.

HBRW 102. Elementary Modern Hebrew II (4)
Continuation of HBRW 101. Students must attend
the Language Resource Center in addition to class
meetings. Prereq: HBRW 101 or equivalent.

HBRW 201. Intermediate Modern Hebrew I (4) 
Intensive review of grammar and conversational skills
through readings, discussions, and other activities that
explore contemporary Israeli life and Hebrew culture.
Prereq: HBRW 102 or equivalent as determined by
department.

HBRW 202. Intermediate Modern Hebrew II (4)
Continuation of HBRW 201. Exploration of contem-
porary Israeli life and Hebrew culture. Students must
attend the Language Resource Center in addition to
class meetings. Prereq: HBRW 201 or equivalent.

HBRW 301. Advanced Hebrew I (3) 
Conversation and advanced grammar and writing.
Short readings and introduction to contemporary Is-
raeli culture. Creative writing practice. Prereq: HBRW
202 or equivalent.

HBRW 302. Advanced Hebrew II (3) 
Advanced reading and composition. Emphasis on
contemporary culture of Israel. Creative writing com-
ponent. Prereq: HBRW 301 or equivalent.

HBRW 399. Independent Study (1-3) 
For students who have progressed beyond available
course offerings. Prereq: Consent of department.

LATIN (LATN)

Undergraduate Courses

LATN 101. Elementary Latin I (3) 
An introduction to the elements of Latin; pronuncia-
tion, forms, syntax, vocabulary, and reading. (Both
LATN 101 and 102 must be completed to obtain credit.)

LATN 102. Elementary Latin II (3) 
An introduction to the elements of Latin; pronuncia-
tion, forms, syntax, vocabulary, and reading. (Both
LATN 101 and 102 must be completed to obtain credit.) Prereq: LATN 101 or equivalent.

LATN 201. Latin Prose Authors (3) 
Reading and discussion of such prose authors as
Cicero, Caesar, Livy or Pliny. Prereq: LATN 102 or equivalent.

LATN 202. Vergil (3)
Primarily readings from The Aeneid; selections from
Vergil's other works may be introduced at instructor's
discretion. Prereq: LATN 201 or equivalent.

LATN 305. Literature of the Republic (3) 
A reading course in prose and poetry of the Roman
Republic. Extensive selections from Cicero and Catul-
lus, and one comedy of Terence. Prereq: LATN 202 or equivalent.

LATN 306. Survey of Latin Literature (3) 
Reading and discussion of selections from the various
genres of Latin literature of the Roman Republic and
Empire such as historical narrative, lyric and elegiac
poetry, comic drama, forensic rhetoric, philosophi-
cal dialogue, didactic literature, letters, and epigrams.
Prereq: LATN 202 or equivalent.

LATN 307. Livy (3) 
Readings in Books I and XXI, with other selections
from this major Augustan historian. Prereq: LATN
202.

LATN 308. Horace: Odes and Epodes (3) 
Readings and discussion of extensive selections from
the poetry of Horace; consideration of Horace as
exemplifying the spirit of the Augustan Age. Prereq: 
LATN 202.

LATN 309. Medieval Latin (3) 
Reading and interpretation of Latin texts from the
Middle Ages. Material selected according to the needs

LATN 351. Latin Didactic Literature (3) 
Readings from didactic poetry such as Lucretius and
Vergil's Georgics. Parodies like Ovid's Ars Amatoria or
prose treatises may also be introduced. Prereq: LATN
202.

LATN 352. History (3) 
Works of the Roman historian Cornelius Tacitus;
his Annals 1-VI dealing with his portrait of Emperor
Tiberius and the Empire after the death of Augustus. 
Prereq: LATN 202.

LATN 353. Epic (3) 
Extensive readings in Latin epic poetry, including
Catullus, Vergil's Aeneid, Lucan, Statius or other
"silver" epics. Particular attention to the artistic and
literary qualities of the works and to the development

LATN 354. Drama (3) 
Reading of at least one play each by Plautus and Ter-
ence. Attention to the history of Latin and Greek New
Comedy, and the contrasting styles of the two authors.
Prereq: LATN 202.
LATN 356. Elegiac Poetry (3)
Translation and interpretation of selected elegies by Catullus, Tibullus, Propertius, and Ovid. Prereq: LATN 202.

LATN 380. Advanced Topics in Latin Literature (3)
Study and discussion of important authors, works, and topics not covered regularly. Content will reflect particular interests of students and faculty and timeliness of topics. Prereq: LATN 202.

LATN 395. Directed Readings (1-3)
Directed readings in Latin of authors selected to serve the individual interests and needs of undergraduate students. Each program planned and completed under the supervision of the instructor with whom the student wishes to work. Prereq: Consent of department.

College Scholars Program
Jonathan Sadovsky, Director
www.cwru.edu/artsci/scholars/

FACULTY COMMITTEE

Jonathan Sadovsky, Ph.D. (The Johns Hopkins University)
Associate Professor, History; Director
African history; comparative history; cultural anthropology; medical history
Mary D. Barkley, Ph.D. (University of California, San Diego)
Professor, Chemistry
Laser fluorescence spectroscopy; biophysical chemistry
Atwood D. Gaines, Ph.D. (University of California, Berkeley), M.P.H. (University of California, Berkeley, School of Public Health)
Professor, Anthropology; Professor of Nursing, Frances Payne Bolton School of Nursing; Professor of Psychiatry and Professor of Biomedical Ethics, School of Medicine
Medical and psychiatric anthropology; religion; aging; cultural studies of science; bioethics; social identity; United States, the Mediterranean.

Communication and the larger society, and development of a sense of the relationship between service and leadership. College scholars collaborate with faculty in the design, operation, and evaluation of the curriculum. The program takes up the equivalent of one course for each of six semesters.

COLLEGE SCHOLARS (ARSC)

Undergraduate Courses
ARSC 201. Introduction to College Scholars I (3)
First course for students already admitted to the College Scholars Program. Principles and practice of leadership, learning styles, ethical decision making, group dynamics, and communication skills.

ARSC 202. Introduction to College Scholars II (3)
Continuation of ARSC 201. Emphasis on leadership, learning styles, ethical decision making, group dynamics, and communication skills. Prereq: ARSC 201.

ARSC 301. College Scholars Colloquia I (3)
Students in the second year of the College Scholars Program, in conjunction with CSP faculty, select topics for interdisciplinary study, construct curricula, and invite visiting speakers. Prereq: ARSC 201 and ARSC 202.

ARSC 302. College Scholars Colloquia II (3)
Continuation of ARSC 301. Multidisciplinary study of selected topics. Prereq: ARSC 202.

ARSC 397. CSP Senior Project I (3)
Year-long independent study project under the guidance of CSP faculty. In the first semester, pre-proposals are approved and funded and work commences. In the second semester, work is completed and at year end a public presentation of results is made. Prereq: ARSC 201 and ARSC 202.

ARSC 398. CSP Senior Project II (3)
Year-long independent study project under the guidance of CSP faculty. In the first semester, pre-proposals are approved and funded and work commences. In the second semester, work is completed and at year end, a public presentation of results is made. Prereq: ARSC 397.

The communication studies track provides a theoretical and practical grounding in the gamut of human communication (e.g., media, public speaking, writing, and persuasion). The communication studies track is being phased out of the curriculum of the Department of Communication Sciences and will be discontinued as an option for a major/minor beginning in the fall 2006. Starting with the fall 2004 semester, the communication studies track will not be available to first year students.

FACULTY

Angela Hein Ciccia, Ph.D. (Case Western Reserve University)
Instructor
Neuroscience of communication and communication disorders in adolescents/adults, with focus on traumatic brain injury.

F. Joseph Routman, M.A. (Case Western Reserve University)
Senior Instructor
Public communication, Multicultural Issues In communication
Mary M. Step, Ph.D. (Kent State University)
*Interface of Interpersonal and mediated communication, health communication, media effects*

**Lecturers**

Barbara Hugenberg, Ph.D. (Bowling Green State University)
*Organizational communication and corporate cultures, rhetorical strategies and social influence.*

Gwen Hullman, Ph.D. (Kent State University)
*Interpersonal Communication, Nonverbal Communication*

Norman Wain, B.A. (Brooklyn College)
*Mass Communication Associate Faculty*

**Adjunct Faculty**

Barbara Ekelman, Ph.D. (Case Western Reserve University)
*Clinical Instructor, Case Western Reserve University School of Medicine*
*Pediatric Speech Language Pathology*

Barbara Lewis, Ph.D. (Case Western Reserve University)
*Assistant Professor, Pediatrics, Case Western Reserve University School of Medicine*
*Familiality and genetic bases of speech/language disorders*

Gail S. Murray, Ph.D. (Case Western Reserve University)
*Assistant Professor, Dept. of Otolaryngology, Case Western Reserve University School of Medicine*
*Pediatric audiology; audiologic assessment of special populations; cochlear implants*

Laura Brady, M.A., CCC-A (Kent State University)
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center Audiology*

Laurie E. Burman, M.A., CCC-A (The University of Connecticut)
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center Audiology*

Michelle Burnett, M.A., CCC-SLP (Michigan State University)
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center Speech-Language Pathology*

Bernard P. Henri, Ph.D. (Northwestern University)
*Adjunct Professor*
*Fluency disorders; professional issues in speech-language pathology; health care management*

Douglas Hicks, Ph.D. (Vanderbilt University)
*Adjunct Professor, primary appointment Cleveland Clinic Foundation*
*Voice Disorders*

Karen Kantzes, M.A., CCC-A (Ohio State University)
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center Audiology*

Dell-Ann Lewis, M.A., CCC-SLP (Cleveland State University)
*Adjunct Instructor, primary appointment Strongsville City Schools Speech-language pathology*

Mary Marks, M.A., CCC-SLP (Cleveland State University)
*Adjunct Instructor, Veteran's Affairs Medical Center Speech-Language Pathology*

Kay McNeal, M.S., CCC-SLP (Purdue University)
*Adjunct Instructor and Coordinator of Clinical Education, Case Western Reserve University Speech-Language Pathology, Cleveland Hearing & Speech Center*

Darlene Moenter, Ph.D. (Ohio State University)
*Adjunct Assistant Professor Auditory potentials*

Jean Nisenboum, M.A. (Miami University)
*Adjunct Instructor*
*Dysphagia, Diagnostics of Speech Language Pathology, and Communication and Aging.*

Cara Padin, M.S., CCC-SLP (Vanderbilt University)
*Adjunct Instructor, primary appointment Southwest General Hospital Speech-Language Pathology Shirley Prok*
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center American Sign Language*

Richard H. Nodar, Ph.D., F.A.S.H.A. (Purdue University)
*Adjunct Professor*
*Auditory evoked potentials; tinnitus; cochlear implants; hearing aids and hearing problems in the aging population*

Paul Ruggieri, M.D. (University of Medicine and Dentistry of New Jersey)
*Adjunct Professor*

Erica Snelson, M.A., CCC-SLP (Kent State University)
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center Speech-Language Pathology*

Brigid Whitford, M.A., CCC-A (Kent State University)
*Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center Audiology*

**UNDERGRADUATE PROGRAMS**

**Major**

The major in communication sciences leads to the Bachelor of Arts degree. Undergraduate students majoring in communication sciences choose a concentration in one of two tracks: communication disorders or communication studies.

**The Communication Disorders Track**

The Department offers a track in communication disorders for undergraduate students intending to pursue graduate degrees in speech-language pathology, audiology, behavioral science, or a variety of other health professions. A master’s degree is the entry-level degree for clinical practice in speech-language pathology. This track requires 36 hours of course work in normal processes of speech, language and hearing; sign language; psychology; and communication disorders. Throughout the course of study, students have opportunities to observe clinical treatment of persons with communication disorders at the Cleveland Hearing and Speech Center as well as other clinical and medical facilities in the surrounding community. Undergraduate students in communication disorders may take 6 credit hours of graduate course work beyond the 120 hours required for the B.A. degree. These 6 credits can be applied to course requirements for a graduate degree in communication disorders at Case Western Reserve. In addition, students can combine undergraduate and graduate study through the Integrated Graduate Studies
The Communication Studies Track

Communication is a fundamental activity that defines and differentiates the human experience. It is a formative process, shaping individuals, relationships, social and political institutions, and cultures. Courses in this track reflect the various contexts, skills, and theories necessary to understand and practice communicative processes in social and professional life. The focus is on the construction, dissemination, and outcomes of messages from a variety of perspectives. Course work provides students with a theoretical foundation in the communication discipline. Students increase problem-solving ability through the practice of critical skills. The major offers development in the following competencies: public speaking, persuasion, rhetoric and argumentation, relational communication, and perceptual processes. The major also entails an interdisciplinary approach tailored by additional electives in the humanities and behavioral sciences. The field of Communication Studies is excellent preparation for a variety of professional careers or further graduate study. Interested students should meet with an advisor for specific course requirements.

The Communication Studies Track is being phased out of the curriculum of the Department of Communication Sciences and will be discontinued as an option for a minor beginning in the fall 2006. Starting with the fall 2004 semester, the communication studies track will not be available to first year students.

Communication Disorders Track

The communication disorders minor track focuses on normal processes of speech, language, and hearing, as well as the speech, language and hearing disorders that result from breakdowns in these processes. Interested students should meet with and advisor for specific course requirements.

Communication Studies Track

Advanced skills and knowledge in communication are consistently ranked among the top qualifications in a wide range of careers such as business, law, political science, and medicine. The communication studies minor track focuses on skill enhancement and understanding of communication processes in a variety of contexts. Interested students should meet with an advisor for specific course requirements. The Communication Studies Track is being phased out of the curriculum of the Department of Communication Sciences and will be discontinued as an option for a minor beginning in the fall 2006. Starting with the fall 2004 semester, the communication studies track will not be available to first year students.

Sequences for Case School of Engineering students

Two sequences, emphasizing either communication studies or communication disorders course work, are offered to fulfill the social science requirements in the Engineering Core. Each includes three courses:

Communication Studies Sequence

COSI 100 and any two of the following: 200, 228, 236, 260, 300, 332, 336, 345

Communication Disorders Sequence

COSI 109 and any two of the following: 211, 321, 325

Departmental Honors

Juniors with a 3.0 overall grade point average and a 3.25 average in the communication sciences are encouraged to apply to the Honors Program. The Honors Program consists of one three-credit course, COSI 395, in which the student carries out an independent project in an area of interest, under the direction of a COSI faculty member. Satisfactory completion of the project qualifies the student to receive the Bachelor of Arts degree with Departmental Honors noted on the transcript. Admission to the Honors Program is by faculty approval. STAT 201 or PSCL 282 and PSCL 375 are prerequisites to COSI 395. Additional information is available from the academic advisor.

Integrated Graduate Studies Program

Students in the communication disorders track may be eligible for the Integrated Graduate Studies (IGS) Program. This program is intended for undergraduate students who are interested in obtaining a graduate degree in communication disorders (speech-language pathology). Qualified students may be accepted for admission to the School of Graduate Studies after completing 90 hours of undergraduate course work. Interested students should consult this bulletin and their academic advisor for additional information concerning the IGS program requirements.

GRADUATE PROGRAMS

Graduate programs leading to the Master of Arts and Doctor of Philosophy degrees in communication disorders (speech-language pathology) are offered.

Master of Arts

The principal goal of the Master of Arts program is to develop clinical scientists who are skilled in the management of individuals with speech and language disorders. The master’s program is accredited by the American Speech-Language-Hearing Association. Upon successful completion of the Master of Arts degree, students will also meet the academic and clinical practicum requirements for certification by the American Speech-Language-Hearing Association and licensure in the State of Ohio. Students may also elect to obtain Ohio Teacher Licensure in speech-language pathology. Degree requirements include completion of 36 credit hours of course work and clinical practicum in communication disorders.
In addition, students must satisfactorily complete written and oral comprehensive exams or may elect to write a master’s thesis. Specific course requirements are determined by the student’s undergraduate background and academic and career goals. The following courses are required for all students: COSI 497, Methods of Research (3); and four semesters of COSI 452, Graduate Clinical Practicum (1).

Clinical Opportunities in Speech, Language, and Hearing Disorders

The Department is affiliated with, and located in, the Cleveland Hearing and Speech Center (CHSC), a non-profit agency that serves children and adults with communication disorders. The CHSC is an American Speech-Language-Hearing Association (ASHA) accredited professional service program and serves as the primary training site for graduate students enrolled in clinical practice. The personnel and facilities of the CHSC provide exceptional clinical experiences for students seeking clinical certification in speech-language pathology. The Department also draws upon clinical resources in University Circle and the greater Cleveland area. In addition to clinical practice experiences at the CHSC, graduate students complete at least two externship site placements in the greater Cleveland area. Some of these include the Cleveland area HeadStart Programs, Cleveland Heights/University Heights Public Schools, Cleveland Public Schools, Cuyahoga Board of MR/DD, Cleveland Clinic Foundation Children’s Hospital, Lakewood Public Schools, Parma Community Hospital, Positive Education Program, Rainbow Babies & Children’s Hospital, Shaker Heights Public Schools, Southwest General Hospital, Heather Hill Rehabilitation Hospital, MetroHealth Medical Center, University Hospitals, and the Veterans Administration Medical Center.

Teacher Licensure

Students enrolled in the master’s program in communication disorders may also complete the requirements for Ohio Teacher Licensure in speech-language pathology. The Department’s Teacher Licensure Program meets the requirements of the Ohio Department of Education and prepares students for employment in a public school setting. (See the departmental advisor for additional details.)

Doctor of Philosophy

The Doctor of Philosophy is awarded to students in recognition of both the mastery, at an advanced level, of a body of knowledge that encompasses the disciplines of communication sciences and speech-language pathology, and the demonstration of the ability to perform independent research and communicate the results of that research. With the major advisor, the student designs an individual plan of study based on his/her professional goals and previous experience. Doctoral students develop expertise in a content area that is the primary focus of their course of study (e.g., communication and aging, medically based speech disorders, child language development and disorders). Each student is encouraged to enhance his or her scholarly preparation by completing course work outside of the primary content area. In addition to course work within the Department, doctoral students may choose course work from graduate programs in other departments of the College of Arts and Sciences, as well as from several professional schools at the University, including the School of Medicine (e.g., neuroscience, genetics), the Case School of Engineering (e.g., biomedical engineering), the School of Dentistry, the Weatherhead School of Management, and the Mandel School of Applied Social Sciences.

Requirements for the doctoral program include course work, research rotations, a supervised classroom teaching experience, written and oral comprehensive examinations, and a dissertation.

- A minimum of 36 hours of course work is required. Twelve credit hours in the area of research are required (nine credit hours of statistics and research design; three credit hours of directed study and research). Fifteen credit hours in the primary content area are required.
- Two research rotations are required. One rotation is completed in the primary content area with the major advisor. The second rotation is completed with a faculty member other than the major advisor. The dissertation research is not included in either of the two research rotations.
- A supervised classroom teaching experience (COSI 690) is completed under the guidance of a faculty member in the Department.
- Written and oral examinations are undertaken after all course work and research rotations are completed.
- A dissertation prospectus is prepared under the guidance of a committee consisting of the dissertation advisor and two additional faculty members. A defense of the dissertation prospectus is required prior to commencing the dissertation study.
- An oral defense of the dissertation takes place at the end of the doctoral program.

COMMUNICATION SCIENCES (COSI)

Undergraduate Courses

COSI 100. Introduction to Human Communication (3)

An overview of human communication processes with an emphasis on skills development. The focus is on the exchange of ideas through oral communication. The role of the individual as a sender/receiver is stressed. Students demonstrate abilities via daily/weekly skill building exercises, oral presentations, rhetorical analysis, and group processes/projects. There is a high degree of student participation and interaction in this course.

COSI 109. Introduction to Communication Disorders (3)

Forty-two million Americans have some type of communication disorder. How does a person with a communication disorder cope with the challenges of daily living? This course will examine the characteristics of communication disorders via first hand and fictionalized accounts in books, films, and simulated communication disorders experiences. Topics will include disorders of speech, language, and hearing in children and adults. Effects of communication disorders on families.

COSI 130. Workshop in Radio Broadcasting (1)

Training in radio broadcasting by participating in the operation of WRUW-FM.

COSI 200. Interpersonal Communication (3)

Communication is a primary means of initiating, maintaining, and dissolving relationships. Managing interpersonal relationships is a human concern across several contexts. Interpersonal communication is a highly interactive course whereby participants investi-
gate the foundations, processes, and issues associated with communication in relationships. The student will become sensitized to theories and processes via traditional lectures and textbook readings. The student is also expected to participate in group discussions. The result is a continuous dialogue with others about communication processes, and outcomes. The goal of this course is to provide a forum for both investigation and increased competence.

COSI 211. Phonetics and Phonology (3)
Theoretical and applied study of the speech sounds of language. The use of the international phonetic alphabet as a tool for characterizing normal and deviant sound patterns. The linguistic structure and function of speech sound systems of both the adult and developing child.

COSI 220. Introduction to American Sign Language I (3)
This course offers basic vocabulary training and conversational interaction skills in American Sign Language. Syntactic and semantic aspects of American Sign Language will be addressed.

COSI 221. Introduction to American Sign Language II (3)
This class is taught without voice, using functional, whole language approaches and in situ experiences, emphasizing communicative competence. It emphasizes sentence structure development, classifiers, and conversational regulating behaviors. It also covers inflection, role shifting, adverbial non-manual behaviors, temporal aspects, sequencing, and includes a brief introduction to ASL English diglossia and biolinguistic aspects. There will be opportunities for discussion of deaf culture. Prereq: COSI 220.

COSI 228. Introduction to Mass Communication (3)
The media of mass communication, particularly in this time of exploding channel availability and information overload, are central factors in the function, maybe even the evolution, of modern society. While most of us are intimately familiar with the products of mass communicators, few understand how media developed, how they function independently and interactively, or what their true effects are. This is a broad survey of mass communication processes.

COSI 236. Public Speaking (3)
Process and lecture course. Develops ability to speak effectively in various contexts. Weekly preparation and delivery of speeches.

COSI 260. Multicultural Aspects of Human Communication (3)
Introduces intercultural/interracial communication by discussing specific communication principles and by putting theory into practice by exploring differences in perception, and verbal and nonverbal communication messages. Course emphasizes relationship between communication, race, culture; nature of race and culture; and how they influence the communication process. Various theories and approaches to study of intercultural/interracial communication will be discussed, along with significant concepts, processes and considerations. Practical outcomes of intercultural/intercultural encounters also will be discussed.

COSI 280. Organizational Communication (3)
This course includes a review of the development of organizational communication theories and how application of theories enhances our understanding of various types of organizations. COSI 280 addresses the communication challenges faced by contemporary organizational leaders and members. Knowledge of the theories and development of analytical skills should improve students’ chances for successful interactions in diverse organizational situations and cultures.

COSI 300. Theories of Human Communication (3)
An introduction to theories and scholarship of communication. Addresses development and evaluation of theories. The focus is on explaining communication phenomena from a variety of perspectives and philosophies. Communication theories are presented via text, seminal articles, lectures, and discussion. Through discussion and case studies students discover new dimensions in their communicative lives, both personal and professional. Prereq: COSI 100.

COSI 305. Neuroscience of Communication and Communication Disorders (3)
The course focuses on neuroanatomy and neurophysiology related to motor control and cognition, particularly aspects of cognition involved in language functions. Topics to be addressed include: principles of neurophysiology and neurochemistry; functional neuroanatomy of the central and peripheral nervous systems; neurological and neuropsychological assessment of communication; neurodiagnostic methods. In part, the course material will be presented in a problem-based learning format. That is, normal aspects of human neuroscience will be discussed in the context of neurological disorders affecting communication. Prereq: Permission of department. Cross-listed as BIOL 379.

COSI 310. Nonverbal Communication (3)
Most people are familiar with the idea of “body language,” but fewer realize the intricacy and potential of nonverbal messages. Nonverbal communication is rule governed, culturally determined, and dependent on encoding and decoding ability. Studying nonverbal communication sensitizes the student to a channel of communication vital to accomplishing shared meaning. Because nonverbal communication is closely related to emotional processes, this course also addresses basic ideas surrounding communication and emotion. Students will read seminal and current literature, make naturalistic observation, and report their findings throughout the semester. Students who take COSI 310 may not receive credit for USSO 204. Students who take USSO 204 may not receive credit for COSI 310. Prereq: COSI 100 or USSO 100. Cross-listed as USSO 204.

COSI 313. Language Development (3)

COSI 321. Speech and Hearing Science (3)
The course will focus on the aspects of normal speech production and perception and hearing perception. The purpose of this course is to provide a foundation in normal aspects of oral communication that will prepare students for advanced study in the assessment and management of disorders of speech and hearing perception. Topics to be covered include motor speech control, aeromechanics, basic acoustics, phonatory acoustics, and speech and hearing perception. Prereq: COSI 325.

COSI 325. Anatomy and Physiology of Speech and Hearing Mechanism (3)
The course will focus on normal anatomy and physiological of the body systems involved in the processes of speech, language, hearing, and swallowing including the following: the auditory, respiratory, phonatory, articulatory, resonatory, and nervous systems. In part, the course material will be presented in a problem-based learning format. That is, normal aspects of human anatomy and physiology will be discussed in the context of the disorders that affect the processes of human communication and swallowing.

COSI 326. Anatomy and Physiology of Singing Voice (1)
For music students with interest in the use of the vocal mechanism in singing. The systems and processes that contribute to a normal voice for speaking and singing. Focus on normal respiration and phonation, with consideration of disorders resulting from vocal abuse.

COSI 328. Media Effects and Literacy (3)
Media play a pivotal role in constructing and delivering various realities. Knowledge of what science has revealed about media influence is a core dimension of media literacy. Media literacy penetrates beyond the rudimentary level of message processing to uncover multiple layers of meaning. This course provides training in the process of selective discrimination, analytical observation, and reasoned assessment of media messages. Through lecture, text, seminal articles, lectures, and discussion, students will synthesize this information and construct their own priorities for understanding media consumption.

COSI 330. Seminar in Radio Broadcasting (3)
One hour of class per week and participation in operation of WRUW-FM. The history of radio, government control and the FCC, public responsibility, program policy, station management with practical broadcast application. Prereq: Two semesters of COSI 130.

COSI 332. Persuasion (3)
This survey course explores the history, theories, and dynamics of persuasion. There is an extensive focus on theoretical models of attitude change. Persuasion also plays a strong role in everyday aspects of our culture. Along these lines, we will investigate persuasion activities in everyday life from compliance gaining to media campaigns. Learning is conveyed through lecture, activities, and observation of the student's everyday life. At the end of the semester, the astute student will be literate in a variety of persuasion strategies and dynamics.

COSI 336. Communication in Professional Contexts (3)
Communication interactions used by professionals, includes interviews, conferences, group interactions, counseling, and others where problem solving and decision making form the primary goal of the communication exchange. Provides an opportunity to gain skills in these activities.

COSI 340. Health Communication (3)
Various communication processes assume a central role in the acquisition and enactment of health care. This course examines communication activity across a broad range of health care contexts. Attention will be given to provider-client communication, communication, and ethical concerns, persuasive health promotion efforts, media impact on health, and basics in health communication methodology and research. Students will consider source, message, and receiver aspects of health communication as well as cultural and illness-specific issues.

COSI 345. Communication and Aging (3)
The normal and abnormal psychological changes that occur during aging and their effects on communic-
COSI 352. Introduction to Clinical Practice in Speech-Language Pathology (3)
Clinical assessment and teaching procedures as well as the role of research/theory in clinical practice. Procedures to observe, measure, analyze communication skills. Practical application through case studies. Students complete 25 hours of observation of speech/language assessment and intervention. Prereq: COSI 211 or COSI 313 or consent of department.

COSI 370. Introduction to Audiology (3)
Disorders of hearing, assessment of hearing; including behavioral and objective measures; intervention strategies; and identification programs. Prereq: COSI 325 and COSI 321 or COSI 421.

COSI 390. Independent Study (1-6)
Individual study, under the guidance of a faculty member, involving specific programs of reading, research and special projects.

COSI 395. Honors Program (3)
Student completes an independent project in the student’s area of interest under the supervision of a faculty member. Prereq: STAT 201 or PSCL 282, and PSCL 375, and/or department approval.

Graduate Courses

COSI 405. Neuroscience of Communication and Communication Disorders (3)
The course focus is neuroanatomy and neurophysiology related to motor control and cognition, particularly aspects of cognition involved in language functions. Topics to be addressed include: principles of neurophysiology and neurochemistry; functional neuroanatomy of the central and peripheral nervous systems; neurological and neuropsychological assessment of communication; neurodiagnostic methods. In part, the course material will be presented in a problem-based learning format. That is, normal aspects of human neuroscience will be discussed in the context of neurological disorders affecting communication. COSI 405 is an introduction to COSI 557 and COSI 561. Prereq: Permission of department.

COSI 413. Language Development (3)
(See COSI 313.)

COSI 421. Speech and Hearing Science (3)
(See COSI 321.)

COSI 445. Communication and Aging (3)
(See COSI 345.) Graduate students are given an opportunity to incorporate information from their own disciplines in a special project, where appropriate.

COSI 452A. Graduate Clinical Practicum I: Case Management (1)
Addresses professional issues in speech-language pathology including case management, clinical effectiveness, counseling and working with families from diverse backgrounds. Four to ten hours of clinical contact per week at the Cleveland Hearing and Speech Center. (Maximum of 2 credits.) Prereq: COSI 352 and COSI 413.

COSI 452B. Graduate Clinical Practicum II: Professional Issues (1)
Addresses professional issues in speech-language pathology including case management, managed health care, ethics and interviewing. Four to ten hours of clinical contact per week at the Cleveland Hearing and Speech Center. (Maximum of 2 credits.) Prereq: COSI 352, COSI 413, COSI 452A, and COSI 453.

COSI 452C. Graduate Clinical Practicum III: Special Populations (1)
Addresses professional issues in speech-language pathology including case management, special clinical populations, collaborating with other professionals, teaming leadership, and use of technology. Fifteen to thirty hours of clinical contact per week at area skilled nursing facilities, hospitals, rehab centers, early intervention centers, centers for developmentally disabled, private practices, etc. (Maximum of 2 credits.) Prereq: COSI 352, COSI 452A, COSI 452B, COSI 453, and COSI 456.

COSI 452D. Graduate Clinical Practicum IV: Student Teaching (1)

COSI 452E. Graduate Clinical Practicum V: Medical Speech Pathology (1)
Addresses professional issues in speech-language pathology including case management, special clinical populations, collaborating with other professionals, documentation, managed health care, and use of technology. Fifteen to thirty hours of clinical contact per week at area skilled nursing facilities, hospitals. (Maximum of 2 credits.) Prereq: COSI 352, COSI 452A, COSI 452B, COSI 452C, COSI 453, and COSI 456.

COSI 453. Articulation and Phonology Disorders (3)
Overview of normal speech sound development and characterization of children with speech sound disorders. Distinctions between phonology and articulation are drawn. Theoretical as well as assessment and treatment issues are addressed.

COSI 455. Fluency Disorders (3)
Stuttering and related disorders of rhythm and prosody in terms of the symptomatology, etiology, measurement, and treatment of nonfluent speaking behavior.

COSI 456. Child Language Disorders (3)

COSI 463. Speech and Language Therapy in Educational Settings (3)
Organization and administration of speech, language, and hearing programs within public and private educational settings. Focus on federal legislation on education of children with disabilities, alternative service delivery models, emergent literacy, reading, writing, and classroom discourse as they relate to speech, language, and hearing disorders. Overview of special populations. Team-based service delivery and (para) professional supervision discussed. Requires supervised practicum experience in public schools that is completed in the following semester.

COSI 464. Case Studies in Communication Disorders: Diagnosis and Treatment (3)
Diagnosis as a clinical skill involving scientific hypothesis testing with clinical problem solving. The course includes academic learning combined with diagnostic clinical experiences. Overview of psychometric principles, survey of psychological communication tests, and measurements. Section on non-biased assessment.
Department of Economics

Peter B. Lewis Building  
James Rebitzer, Chair  
Phone 216-368-5537; Fax 216-368-5039

FACULTY

Eric Bettinger, Ph.D. (Massachusetts Institute of Technology)  
Assistant Professor of Economics

Bo Carlsson, Ph.D. (Stanford University)  
E. Mandel DeWinds Professor of Industrial Economics; Director of Ph.D. Programs and Research

David J. Cooper, Ph.D. (Princeton University)  
Associate Professor of Economics

Avi Dor, Ph.D. (City University of New York)  
John R. Mannix Blue Cross & Blue Shield Associate Professor of Health Care Economics

Robin Dubin, Ph.D. ( Johns Hopkins University)  
Associate Professor of Economics, University Marshal

Asim Erdilek, Ph.D. (Harvard University)  
Professor of Economics

Susan Helper, Ph.D. (Harvard University)  
Professor of Economics

James B. Rebitzer, Ph.D. (University of Massachusetts)  
Frank Tracy Carlton Professor of Economics, Chair of Economics Department

Mari Rege, Ph.D. (University of Oslo, Norway)  
Assistant Professor of Economics

Scott Shane, Ph.D. (University of Pennsylvania)  
Professor of Economics

Robert L. Slonim, Ph.D. (Duke University)  
Associate Professor of Economics

Marcus Stanley, Ph.D. (Harvard University)  
Assistant Professor of Economics

Mark Votruba, Ph.D. (Princeton University)  
Assistant Professor of Economics

Secondary Appointments

Dennis Young, Ph.D. (Stanford University)  
Professor of Nonprofit Management, Mandel School of Applied Social Sciences; Professor of Economics

BACHELOR OF ARTS IN ECONOMICS

Economics is concerned with the problems of allocating scarce resources to meet human needs. Students who study economics gain an understanding of how consumers (households), producers (firms) and governments make decisions affecting the allocation of resources and, therefore, a society’s economic performance. Economics also involves an examination of how the interaction of these decisions in markets and in the political process produces certain outcomes, and how legal and institutional arrangements can influence these outcomes. Finally, the study of economics leads to a better appreciation of the ways in which trade, investment and the movement of people and information across national boundaries tie the global economy together.

An undergraduate major in economics provides an excellent preparation for a variety of professional careers, such as management, law and government service. A major is essential for those wanting to pursue graduate work in economics.

Major (for B.A. degree)

A major in economics consists of 33 hours. It leads to the Bachelor of Arts degree.

Degree Requirements

Core Theory

ECON 102 and 103  
STAT 207 or STAT 243  
ECON 307  
ECON 308 or 309  
ECON 326

Electives

15 ECON credits (at least 6 credits in each of two concentrations)

Senior Capstone (0-6 credits)

Required, to be chosen from a menu of options and in coordination with your major advisor

Economics Concentrations

Resources & Markets

ECON 255 - Economic History of the United States  
ECON 332 - Economics of Labor Markets  
ECON 341 - Banking and Finance  
ECON 368 - Environmental Economics

Industrial Organization

ECON 328 - Experimental Economics  
ECON 329 - Game Theory  
ECON 361 - Managerial Economics  
ECON 369 - Economics of Technological Innovation and Entrepreneurship

Public Economics

ECON 342 - Public Finance  
ECON 343 - Economics of State and Local Governments  
ECON 345 - Public Choice  
ECON 377 - Economics of Nonprofit Organizations  
ECON 378 - Health Care Economics  
ECON 386 - Urban Economics

International Economics

ECON 372 - International Finance  
ECON 373 - International Trade  
ECON 375 - Economics of Developing Countries

Minor (for B.A. or B.S. degree)

A minor in economics consists of 15 hours, as follows:  
ECON 102, ECON 103, and three additional economics courses (9 hours) selected in consultation with the minor advisor, with at least two of the courses in one concentration.

Social Science Sequence (for B.S. based upon Engineering Core Curriculum)

The sequence requirement is satisfied by taking ECON 102, ECON 103, and one other 200- or 300-level ECON course.
Social Sciences/Social Institutions Requirement (for B.A. or B.S. degree based on Arts and Sciences General Education Requirements)
The three-credit minimum may be satisfied by taking any one of the courses below. The six-credit sequence may be satisfied by taking any two of the courses listed below:

ECON 102, ECON 103, or ECON 205.

ECONOMICS (ECON)

Undergraduate Courses

ECON 102. Principles of Microeconomics (3)
This course is an introduction to microeconomic theory, providing a foundation for future study in economics. In particular, it addresses how individuals and businesses make choices concerning the use of scarce resources, how prices and incomes are determined in competitive markets, and how market power affects the prices and quantities of goods available to society. We will also examine the impact of government intervention in the economy.

ECON 103. Principles of Macroeconomics (3)
While Microeconomics looks at individual consumers and firms, Macroeconomics looks at the economy as a whole. The focus of this class will be on the business cycle. Unemployment, inflation and national production all change with the business cycle. We will look at how these are measured, their past behavior and at theoretical models that attempt to explain this behavior. We will also look at the role of the Federal Government and the Federal Reserve Bank of the United States in managing the business cycle.

ECON 205. Economic Perspectives (3)
This course examines important contemporary and historical issues from an economic perspective. It enables students to think about the world “like an economist.” Possible topics of current interest include the transformation of Eastern Europe, ethnic and racial strife, environmental policy and sustainable development, and professional sports.

ECON 255. The Economic History of the United States (3)
(See HSTY 255.) Cross-listed as HSTY 255 and PLCY 255.

ECON 307. Intermediate Macro Theory (3)
Macroeconomics studies aggregate indicators of the performance of an economy, most commonly measured in terms of GDP, unemployment rate and inflation rate. An important goal of macroeconomic researchers is to develop a model of an economy that is simple, yet powerful enough to explain the historical trends of these aggregate economic indicators. Needless to say, coming up with a good model has remained a very difficult task. So far, there is no single model that is good enough to coherently explain even the most prominent historical trends of aggregate economic indicators. But several models have been built, each offering insight into a certain aspect of the economy.

Throughout the course model building is motivated by real world cases from the American economy. Prereq: ECON 103.

ECON 308. Intermediate Micro Theory (3)
This class will give you an overview of microeconomic theory, which forms a basis for much of economic analysis. The main focus of the class will be theoretical, in order to give you a solid foundation for future study in virtually any other field of economics. This includes the theory of how consumers decide what to consume and how firms decide when to stay in business, and how much to produce at what price. Note: a student cannot receive degree credit for both ECON 308 and ECON 309. Prereq: ECON 102.

ECON 309. Intermediate Micro Theory: Math Based (3)
This course will cover the same topics covered in Economics 102: theory of the consumer, theory of the firm, markets and government intervention in the market. However, we will cover these topics in more detail and we will use calculus in our analysis. You should come away from this course with a greater understanding of how consumers and firms make their decisions and how they interact in the market place. Note: a student cannot receive degree credit for both ECON 308 and ECON 309. Prereq: ECON 102; MATH 121 or MATH 125.

ECON 326. Econometrics (3)
Econometrics is the application of statistics to empirical economic analysis. One way of testing the validity of economic theories is to gather data and apply statistical tests to see if the data support the theory. These data are usually gathered by observing actual economies, firms and consumers, rather than by performing experiments in a laboratory. Because economic analysts lack the precision and control of the laboratory, they must compensate by adjusting their statistical procedures. In this class, we will concentrate on regression analysis, which is the basic tool of the economic researcher. We will study the assumptions commonly made in the application of this technique, the consequences of violating these assumptions, and the corrections that can be made. Students will have a chance to formulate and test their own hypotheses using econometric software available for personal computers. Prereq: ECON 102; ECON 103; one semester of statistics.

ECON 328. Experimental Economics (3)
This course introduces students to the methods of studying Economics using laboratory experiments and to examine some of the major insights that have been gained through experiments and to examine some of the major insights that have been gained through experimental economics. Students will examine the three related branches of experimental economics; market institutions, game theory, and individual choice problems. The course presents known robust findings from the past 50 years of experimental economics, some of which conform tightly with economic theory while others have led to significant modifications in the way economists view markets and behavior. Prereq: ECON 102.

ECON 329. Game Theory: The Economics of Thinking Strategically (3)
The term “game theory” refers to the set of tools economists use to think about strategic interactions among small groups of individuals and firms. The primary purpose of this course is to introduce students to the basic concepts of game theory and its applications. The class will stress the use of game theory as a tool for building models of important economic phenomena. The class will also include a number of experiments designed to illustrate the game theoretic results, and to highlight how reality may depart from the theory.

The course will stress the value of thinking strategically and provide students with a framework for thinking strategically in their everyday lives. Rather than approaching each strategic situation they encounter as a unique problem, students will be taught to recognize patterns in the situations they face and to generalize from specific experiences. Prereq: ECON 102.

ECON 332. Economic Analysis of Labor Markets (3)
This course is about the economics of work and pay. We will take a comprehensive look at labor markets in the U.S. and other advanced countries and examine related social policy issues. This will include the effect of unions on wages, the underpinnings of the income distribution of the U.S., issues of poverty and welfare, discrimination and wage differential by gender and race, the relationship between work and family, education as a determinant of wages, and the way firms use wage and employment practices to motivate their employees to work productively. What makes labor economics special is that the commodity we examine is human labor, something that is central to the organization of our lives and the functioning of the economy. Labor economics thus applies the standard neoclassical model of demand, supply, and equilibrium to many areas that also have a profound human dimension. Prereq: ECON 102.

ECON 341. Money and Banking (3)
(See BAFI 341.) Prereq: ECON 103. Cross-listed as BAFI 341.

ECON 342. Public Finance (3)
Government intervention is a pervasive feature of modern economy. The goal of this course is to develop the economic tools for understanding and evaluating a wide range of government behaviors such as taxation and redistribution policy, the public provision of goods and services, and the regulation of private markets. ECON 342 begins by considering “market failures” that justify government intervention in a market economy. To respond to such failures, governments must raise revenues through taxation. Using the tools of microeconomic theory, we will develop a framework for thinking about the positive and normative effects of alternative forms of taxation. Particular attention will be paid to the individual income tax in the U.S., allowing students to understand the efficiency, distributional and behavioral implications of recent changes in the tax code. We will then turn to the expenditure side of the public sector. The economic principles used to evaluate public expenditures will be discussed and exemplified through the analysis of significant public programs. Of particular interest will be the effect of public programs on the incentives faced by workers and families. Prereq: ECON 102. Cross-listed as BAFI 342.

ECON 343. Economics of State and Local Governments (3)
This course uses economic analysis to gain insight in the U.S. system of state and local governments. In the case of local governments, unlike the familiar case of the U.S. government, people often display their displeasure with the government’s actions by leaving rather than by voting against the incumbents. A careful consideration of the circumstances under which people will choose “exit” (moving out) over “voice” (voting) is central to the course. We’ll also examine economic theories of why people vote and how people vote. We consider a broad range of policy issues. Among them are school finance, zoning, local government economic development policies, lotteries, and affordable housing policy. Of course, we also analyze the full range of state
and local government taxes, including the property tax, personal income tax, corporate income tax, and sales tax. Prereq: ECON 102 or consent of instructor.

ECON 345. Public Choice (3)
This course covers economic theory and empirical analysis of the behavior of politicians, bureaucrats, and voters based on the assumption of rational pursuit of self-interest, comparison with other approaches to the study of political behavior, and implications of alternative collective decision procedure. Prereq: ECON 102 and ECON 103.

ECON 361. Managerial Economics (3)
This course explores the economic principles that underlie strategic decisions in firms. Topics include the determination of vertical and horizontal boundaries of firms, strategic positioning, and the sources of competitive advantage. Prereq: ECON 102.

ECON 364. Competition and Public Policy (3)
This course covers alternative market structures and their performance in terms of profit, prices, and productivity, as well as antitrust laws and regulations and their importance to industrial organization. Prereq: ECON 102.

ECON 368. Environmental Economics (3)
This course will use economic theory as an aid to understanding environmental problems and their solutions. We will start with a study of the firm. Once we have developed an understanding of firms’ incentives to pollute and overexploit natural resources, we will learn how various economic policies can change these incentives and thus prevent environmental degradation. Thereafter, we will evaluate the efficiency of these economic policies. Finally, we will apply our theoretical analysis to specific environmental problems. Prereq: ECON 102.

ECON 369. Economics of Technological Innovation and Entrepreneurship (3)
This course is designed to help students identify, evaluate, and obtain control over technological opportunities so they may successfully understand the challenges of starting new companies. The course focuses on four themes: 1) the source, discovery and evaluation of technological opportunities; 2) the process of organizing a new firm to produce new technology that satisfies the needs of customers; 3) the acquisition of financial and human resources necessary to exploit technological opportunities; and 4) the development of mechanism to appreciate the returns from exploitation of technological opportunities. Prereq: ECON 102.

ECON 372. International Finance (3)
This course deals with open-economy macroeconomic and international financial markets, covering open-economy national income analysis, international macroeconomic policy coordination, exchange rate determination, foreign portfolio investment, and global financial crises. Prereq: ECON 102 and ECON 103. Cross-listed as BAFI 372.

ECON 373. International Trade (3)
This course deals with international trade theories and policies, covering gains from and patterns of trade, immigration, foreign direct investment, protectionism, multilateral trade liberalization, regionalism and the costs and benefits of globalization within as well as among nations. Prereq: ECON 102 and ECON 103.

ECON 375. Economics of Developing Countries (3)
This course focuses on international aspects of economic development. The term "developing country" is often defined as a country that exhibits low per capita income, high poverty level, low level of industrialization, or low life expectancy. In terms of size, the developing countries make up at least three-fourth of the world population. Why do we study those countries’ economies separately from the industrialized economies? In fact, low economic growth, high unemployment, or high poverty rates also exist in many developed countries. The differences lie not in the types of problems, but in the causes of these problems. In addition, differences in the kind of institutions that prevail in developing countries also lead to different policy prescriptions. Among developing countries, differences in historical experience, cultural practices, political institutions and economic conditions are also enormous. Illustrations and explanations of those differences are provided from a wide range of developing countries. Prereq: ECON 102; ECON 103.

ECON 377. Economics of Nonprofit Organizations (3)
The purpose of this course is to familiarize students with the private nonprofit sector of the U.S. economy, with economic theory contributing to our understanding of this sector, and with the policy and management issues affecting nonprofit organizations. Topics include understanding the different types of nonprofit organizations; the size, scope and economic significance of the nonprofit sector; the different parts of the economy in which nonprofits operate; economic theories of why nonprofits operate; economic theories of why nonprofit organizations exist and how they behave; analysis of important trends such as commercialization and globalization of the sector and its changing relationships with government, and how the U.S. nonprofit sector compares with the third sector in other countries. Prereq: ECON 102.

ECON 378. Health Care Economics (3)
The health care industry is the fastest growing sector of the U.S. economy, with expenditures on health care now accounting for over 14% of total GDP. Because of its complexity and sheer size, the health care industry affects virtually every facet of the economy including labor productivity, income distribution and international competitiveness. The goal of ECON 378 is to apply the tools of economic analysis to develop students’ understanding of health care markets and related public policy issues. The course begins with an overview of the health care system in the U.S. with attention to disturbing statistics that have inspired calls for reform. The remainder of the course is approximately divided between analysis of the consumer side of the health care market and analysis of the provider side. Throughout the course, proposals for reforming the health care system will be described and discussed. Prereq: ECON 102.

ECON 386. Urban Economics (4)
Microeconomic theory as taught in principles (and even intermediate) does not usually take into account the fact that goods, people, and information must travel in order to interact. Rather, markets are implicitly modeled as if everyone and everything is at a single point in space. In the first part of the course, we will examine the implications of spatial location for economic analysis. In the second part of the class, we will use microeconomic tools to understand urban problems. Topics that we will cover include urban growth, suburbanization, land use, poverty, housing, local government, transportation, education, and crime. Prereq: ECON 102.

ECON 397. Honors Research I (3)
Prereq: ECON 397.

ECON 399. Individual Readings and Research (1-6)
Intensive examination of a topic selected by the student.

Graduate Courses
ECON 403. Economics for Management (3)
This course surveys the basic principles of micro and macroeconomics. Topics covered in microeconomics include supply and demand, the theory of production and costs, market structures and factor markets. Macroeconomics topics are the national incomes accounts, the determination of national income, employment and inflation, fiscal and monetary policies and international trade.

ECON 415. Economic Analysis for Managers-E.M.B.A. (2)
This course, which is limited to students in the Executive M.B.A. program, explores the basic elements of the economic system which the executive needs to know in order to understand how the firm interacts with the system and how economic factors affect decision making.

ECON 421. Health Economics and Strategy (3)
This course has evolved from a theory-oriented emphasis to a course that utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and hospital mergers, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and consultants in health systems management. Prereq: ECON 403 or MBAC 426. Cross-listed as HSMC 421 and MPH 421.

ECON 424. Innovations, Markets, and Organization in the Pharmaceutical Industry (3)
The global pharmaceutical industry is one of the most profitable and fastest growing industries in the world. While the industry is dominated by a few large firms, smaller biotech startups are competing aggressively with new product development and management issues governing the industry. In addition to examining how pharmaceutical companies respond to competitive pressures, we will explore the role of government regulation in the development and the role of insurance as a demand driver. Topics were chosen to benefit those wishing to gain a general familiarity with a view to consulting, as well as those seeking to enter the industry. Students taking this course may not receive credit for ECON 464 and ENTP 441. Open to Undergrads with permission. Cross-listed as HSMC 424, BIOS 424, and MPH 424.

ECON 431. Economics of Negotiation and Conflict Resolution (3)
Students frequently enroll in a negotiation class with one thought in mind—negotiating a better job offer from an employer. They soon learn, however, that negotiation skills can do far more than improve a pay check. Negotiations occur everywhere: in marriages, in divorces, in small work teams, in large organizations, in getting a job, in losing a job, in deal making, in decision making, in board rooms, and in court rooms. The remarkable thing about negotiations is that, wherever they occur, they are governed by similar principles. The current wave of corporate restructuring makes the study of negotiations especially important for M.B.A.s. Mergers, acquisitions, downsizing and joint ventures call into question well established business and employment relationships. Navigating these choppy waters by
building new relationships requires negotiation skills. The increased stress on quality and other hard-to-measure aspects of relationships with customers and suppliers makes the process of negotiation even more complex and subtle. For these reasons, negotiation classes have taken center stage in the study of management. Every major business school now offers classes in negotiation and these classes are overflowing with students. Cross-listed as LHRP 413.

This course, which is limited to students in the Executive M.B.A. program, presents the basic elements in the analysis of production and technological change. It explores the uses and limitations of theory in analyzing innovative activity in industry and examines the role of technological progress in the growth of firms and industries.

ECON 436A. Economics of Organizations- E.M.B.A. (2)
Dramatic changes in technology, work force demographics and economic competition are forcing firms to rethink their internal organization. Implementing new internal strategies is remarkably hard for organizations and managers to do. This class is designed to provide the economic tools that managers need to understand why their organizations are the way they are and why change can be as difficult as it is important. This course focuses on two elements of a firm's internal strategy: structuring incentives and investing in relationships. In the incentives section, we analyze how organizations allocate decision rights; evaluate performance; and implement motivation strategies. In the relationships section, we analyze how organizations sustain functional, long-term relationships in competitive or conflictual environments. A small number of surprisingly simple economic models, it turns out, offer important insights into incentive design and investments in long-term relationships.

ECON 436B. Economics of Organizations-M.B.A. (3)
Dramatic changes in technology, work force demographics and economic competition are forcing firms to rethink their internal organization. Implementing new internal strategies is remarkably hard for organizations and managers to do. This class is designed to provide the economic tools that managers need to understand why their organizations are the way they are and why change can be as difficult as it is important. This course focuses on two elements of a firm's internal strategy: structuring incentives and investing in relationships. In the incentives section, we analyze how organizations allocate decision rights; evaluate performance; and implement motivation strategies. In the relationships section, we analyze how organizations sustain functional, long-term relationships in competitive or conflictual environments. A small number of surprisingly simple economic models, it turns out, offer important insights into incentive design and investments in long-term relationships.

ECON 441. Economics of Financial Intermediation (3)
Institutions such as commercial banks, investment banks, insurance companies, and mutual funds perform important financial intermediation roles in an economy. This course provides a conceptual framework that allows the exploration of how these financial institutions perform their intermediation role through their different activities, such as loan origination, underwriting, insurance, asset management. This framework also lends itself to the study of how and why regulation can be critical in ensuring the safety and soundness of the financial system. Prereq: ACCT 401, MBAC 416 or BAFI 402, ECON 403 or MBAC 426, and QMNN 414 or MBAC 414.

ECON 461. Managerial Economics (3)
This course explores the economic principles that underlie strategic decisions in firms. What determines their boundaries - i.e., which activities do they expand, acquire and divest? What are the sources of competitive advantage, and how do firms position themselves strategically? Prereq: ECON 403 or MBAC 426.

ECON 462. E-Business and the New Economy (3)
This new economy course focuses on the following questions: What is this phenomenon variously called the digital economy, the global information economy, the new economy, or the networked society? How is it related to E-business or E-commerce? What are its most important features? What impact will it have on competition, business organization, and business strategy? What does it mean for businesses in Cleveland (U.S. vs. other countries)? Why is the stock market valuation of Procter and Gamble lower than that of companies that have been around for only a couple of years and never made a profit? Prereq: ECON 403 or MBAC 426.

ECON 466. Economic Perspective of Technology and Entrepreneurship (3)
This course is designed to help students to identify, evaluate, and obtain control over technology opportunities that they can successfully exploit by starting new companies. The course focuses on four themes: (1) the source, discovery, and evaluation of technological opportunities, (2) the process of organizing innovation to produce new technology that satisfies the needs of customers, (3) the different mechanisms available to appropriate the returns from the exploitation of technological opportunities, and (4) the differences between opportunities and approaches that are valuable and sustainable for independent entrepreneurs and large firms. Prereq: May not receive credit for ECON 424 and ENTP 441. Cross-listed as ENTP 464.

ECON 472. The World's Regions and Strategic Advantage (3)
This course will focus on business decisions in an increasingly complex regional and global economic environment and the significance of place in business success. Every company decision involves location-renting, locating headquarters or an R&D lab, choosing where to invest, evaluating a merger, evaluating the investment portfolio of a bank, locating a new facility, and marketing your product. Topics include: high technology development, interpreting business climate indexes, the business location decision, sources of regional advantage, case studies of the world’s important cities, geographic clustering of industries, and business partnerships for improving regional economies. Prereq: ECON 403 or MBAC 426.

ECON 474. International Trade (3)
This course deals with the causes and effects of international trade and investment. Its coverage includes the global and regional commercial agreements and institutions that affect the international business environment. The European Union, the North American Free Trade Agreement, and the World Trade Organization are treated extensively. Prereq: ECON 403 or MBAC 426.

ECON 475. International Finance (3)
This course covers the global financial markets that multinational corporations, government agencies, and banks use in conducting business. These financial markets include the market for foreign exchange, the Eurocurrency and related money markets, the Eurobond and global equity markets, the commodity markets, the markets for forward contracts, options, swaps, and other derivatives. Prereq: ECON 403 or MBAC 426.

This course deals with the fundamentals of business activities that cross national boundaries. It focuses on not only exports and imports, but all other issues, such as foreign direct investment, international technology transfer, organizational structure, and financial management, that required a corporate strategy in establishing and maintaining global competitiveness. It covers the basic international business activities within an interdisciplinary framework, drawing from economics, finance, accounting, marketing, organizational behavior, political science, and history. Its aim is not only to enable an understanding of such technical issues as how the effects of tariffs and quotas differ or how foreign exchange rates are determined, but also to provide a systemic view of how government policies and corporate strategies interact in changing the environment of international business. The basic premise of the course is that to formulate successful global corporate strategies, we must comprehend and cope with the political, cultural, and economic environment of international business.

ECON 482. High-Tech Regions and Business Strategy (3)
Many regions of the world seek to emulate Silicon Valley's success as a high-tech center. These include Taiwan, Israel, India, Britain, Cote d’Azur (“Europe's California”), Pyramind Technology Park of Egypt, Taiwan, Israel, India, Britain, Cote d’Azur (“Europe’s California”), Pyramind Technology Park of Egypt, and Malaysia. A region's innovation system serves as both a source of strategic advantage for high-tech companies and as a critical infrastructure for supporting the development and use of new technology by a region's companies and industries. In this course we look at what makes Silicon Valley so successful as a high-tech region, and whether it can be used as a model for high-tech development in other countries and regions. We examine alternative systems of innovation in other regions of the world and the U.S., including older industrial regions. Countries and regions will be selected depending on class composition. The class will focus on the critical ingredients that form a regional innovation system and their effect on the performance of companies and industries. Prereq: ECON 403 or MBAC 426 or equivalent.

ECON 486. Value Creation through Real Estate (3)
Introduction to economic analysis of real estate markets, with focus on development of urban land. Introduction to financial instruments used in development, and to the role of government in facilitating and controlling the use of real property. Prereq: MBAC 426 or ECON 403 or equivalent.

ECON 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ECON 525. Advanced Microeconomic Theory (3)
This course will give students an introduction to microeconomic theory at the Ph.D. level. Topics to be covered include consumer theory, the theory of the firm, general equilibrium (in other words, the theory of competitive markets), imperfect competition (models of Cournot oligopoly, Bertrand oligopoly, etc.), information economics (with focus on principal-agent problems), and auction theory. Students in the
course will be expected to have a working knowledge of calculus. Some knowledge of constrained optimization and real analysis will be useful, although this is not required. While this is not a course in game theory, basic game theoretic concepts will be introduced to the extent they are necessary to understand the material. No previous background in economics will be assumed. Prereq: Ph.D. standing.

**ECON 526. Advanced Econometrics (3)**
This course focuses on the theoretical underpinning of multivariate regression analysis. The course also develops practical applications of econometric analysis. The course also introduces students to more advanced topics including discrete choice analysis, instrumental variables, and time-series methods.

**ECON 601. Special Problems and Readings (1-18)**
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

**ECON 701. Dissertation Ph.D. (1-18)**
**ECON 703. Dissertation Fellowship (1-8)**

---

**Department of English**

106 Guilford House  
Phone 216-368-2340; Fax 216-368-4367  
William R. Siebenschuh, Chair  

The Department of English offers courses of study leading to the Bachelor of Arts, Master of Arts, and Doctor of Philosophy degrees. Included among the department's offerings are literary and cultural studies, linguistics, film, journalism, creative writing, and composition.

Combining the intellectual resources of a major research university with a scale and a set of values more typical of a liberal arts college, the department puts great stress on class discussion, individual conferences or tutorials, and other opportunities for students and faculty to work closely together. Likewise, the curriculum is deliberately flexible enough to respond to student needs and interests and to encourage close cooperation with the faculty in planning a course of study.

An undergraduate major in English prepares one first and foremost to be a thoughtful, responsible person and a lifelong learner. A major in English also prepares one for various sorts of careers. Three paths are common:

- English leads readily to careers that put a premium on writing skills and on the ability to analyze complex human situations. In addition to the fields that have often been of first interest to English majors (writing and publishing, journalism, advertising, the film industry, public relations, and teaching), significant opportunities exist in the corporate world, in government, and in non-profit organizations such as those devoted to social service, the environment, or the arts.

- The B.A. in English is usually essential to anyone expecting to do graduate work in English or to pursue a career as a teacher or a scholar in the field.

- The B.A. in English traditionally has been an important stepping stone to success in professional school, and many of our English majors choose this path. A significant number go on to law school, many to medical or business school, and some to nursing, journalism, social work, or library school, as well as directly into the business world.

The department is home to *The Emily Dickinson Journal* and *The Society for Critical Exchange*, an international community of scholars in literary and cultural theory.

**FACULTY**

William R. Siebenschuh, Chair, Ph.D. (University of California, Berkeley)  
Professor 18th- and 19th-century literature

Brian Ballentine, M.A. (University of Rochester)  
*Instructor*  
*Business and Professional Writing*

Thomas G. Bishop, Ph.D. (Yale University)  
*Associate Professor*  
*Shakespeare; Renaissance literature; post-colonial literature*

Thomas Sayers Ellis, M.F.A. (Brown University)  
*Associate Professor*  
*Creative Writing (poetry); African-American literature*

Kimberly Emmons, Ph.D. (University of Washington)  
*Assistant Professor*  
*Director of Composition*  
*Rhetoric, composition, gender, language*

Christopher Flint, Ph.D. (University of Pennsylvania)  
*Associate Professor*  
*18th Century English literature; history of the book*

Mary Grimm, M.A. (Cleveland State University)  
*Associate Professor*  
*Creative writing (fiction), contemporary literature*

Ted Gup, J.D. (Case Western Reserve University)  
*Shirley Wormser Professor of Journalism*  
*Journalism, non-fiction writing*

Kurt Koenigsberger, Ph.D. (Vanderbilt University)  
*Assistant Professor*  
*Associate Director, Society for Critical Exchange*

William H. Marling, Ph.D. (University of California, Santa Barbara)  
*Professor*  
*American literature; modernism*

Heather Meakin, D. Phil. (University of Oxford)  
*Assistant Professor*  
*Renaissance literature, women's studies*

Todd V. Oakley, Ph.D. (University of Maryland)  
*Associate Professor*  
*Director of Graduate Studies*  
*Rhetoric; linguistics*

Judith Oster, Ph.D. (Case Western Reserve University)  
*Professor*  
*The teaching of English; American literature; poetry*

Robert Spadoni, Ph.D. (University of Chicago)  
*Assistant Professor*  
*Film Studies*

Gary Lee Stonum, Ph.D. (Johns Hopkins University)  
*Orienteer Professor*  
*Editor, The Emily Dickinson Journal*  
*American literature, literary theory*

Athena Vrettos, Ph.D. (University of Pennsylvania)  
*Associate professor*  
*19th-century English literature, women's studies*
Martha Woodmansee, Ph.D. (Stanford University)
Professor
Executive Director, Society for Critical Exchange
Literary theory; 18th- and 19th-century literature; comparative literature

UNDERGRADUATE PROGRAMS

Major

N.B. All text in bold face represents changes or modifications that are awaiting final decision from the Committee on Educational Programs.

The major in English includes two tracks. The primary track consists of at least 30 semester hours in English above the 100 level, including ENGL 300 (English Literature to 1800), either ENGL 302 (English Literature since 1800) or ENGL 308 (American Literature), ENGL 380 (Senior Seminar), and a minimum of 15 additional hours at the 300 level or above which must include one course from an approved list of courses dealing with literature before 1800. Two of the following courses, English 300, 302, & 308, are prerequisites for the senior seminar. To qualify for honors, one follows a track consisting of at least 36 hours above the 100 level, including ENGL 300 (English Literature to 1800), either ENGL 302 (English Literature since 1800) or ENGL 308 (American Literature) ENGL 380, 24 hours of approved electives in literary and cultural studies, and one of the following language courses: FRCH 202, GREK 202, GRMN 202, JAPN 202, LATN 202, SPAN 202, or equivalent in a language for which 300-level literature courses are available. In addition, of the 24 hours of electives, six must be in literature before the 19th century and 3 must be in theory or methods of analysis. The award of honors requires a minimum GPA of 3.5 in courses taken for the Honors Program. Two of the following courses, English 300, 302, and 308, are prerequisites for the senior seminar in the honors track. Because of the flexibility of departmental requirements and the variety of career paths to which the major may lead, all students should confer frequently and closely with advisors. No courses outside the department are required for the major, but the department recommends courses in comparative literature, history, philosophy, history and criticism of the fine arts, theater, and literature in other languages. Students planning to go to graduate school are reminded of the importance of foreign language study. Completion of the University composition requirement (ENGL 150 or SAGES First Seminar) is a prerequisite for most English courses at the 200 level and above.

Teacher Licensure in Integrated Language Arts

A special program is available that leads to the B.A. and candidacy for licensure by the State of Ohio to teach Integrated Language Arts in grades 7-12 (Adolescents to Young Adults.) The teaching credential is valid in Ohio, and it is honored in many other states. The program consists of a more prescriptive form of the normal English major and a series of education courses (35 credit hours, see Education [EDUC & EDJC]) that includes student teaching in a local school. Because of the student teaching and because some of the education courses must be taken at John Carroll University, early and careful planning is vital. Consult Professor Judith Os ter, the English advisor, for this program.

Subject Area Requirements (42 credit hours): ENGL 150, 200, 202, 204, 256, 390, 380, 393; ENGL 255 or 257K; ENGL 324 or 325; ENGL 301, 379, or COSI 313; two of ENGL 257B, 270, 363H, 365E, 365N, 365Q, 366G; ENGL 368A, 368B, or 368C. Recommended Electives: ENGL 203, 213, 214, 303, 304, 310, 317, 392, 480.

Minor

The minor in English consists of at least 15 hours above the 100 level. Students who wish to minor in English arrange their sequence of courses in consultation with the department's minor advisor. Minors are strongly advised to take ENGL 200 (Literature in English) early in the sequence. They also should keep it in mind that the flexibility of the department’s requirements often makes it possible to take English as a second major.

Sequences for Case School of Engineering Students

Sequences in English provide students with an examination of major literary texts, close study of a cultural period or genre (including film), increased facility in writing, and a better understanding of the nature and functioning of language. Any sequence of three courses above the 100 level (9 hours) that meets at least two of these goals normally will be acceptable. Students should consult the department’s sequence advisor in planning their programs. ENGL 398 and 398N cannot be counted toward a sequence or a minor.

Integrated Graduate Studies

The Department of English participates in the Integrated Graduate Studies Program, which makes it possible to complete both a B.A. and an M.A. in English within about five years of full-time study. The department particularly recommends the program to qualified students who are interested in seeking admission to highly competitive professional schools or Ph.D. programs. Interested students should note the general requirements and the admission procedures in this publication.

GRADUATE PROGRAM

The Department of English offers programs in American and English literature and language leading to the Master of Arts and Doctor of Philosophy degrees. At either the M.A. or Ph.D level students may elect a concentration in Writing History and Theory. For current information on this and other graduate programs in the department consult the department’s website, http://www.cwru.edu/artscl/engl.engl.html.

Candidates for graduate work in English should present an undergraduate major in English or a minimum of 18 semester hours of English (or its equivalent) beyond the freshman level. In some cases,
students will be required to make up deficiencies without graduate credit. The department requires all candidates for admission to submit their scores on aptitude sections of the Graduate Record Examination. Candidates are also required to submit a writing sample of at least 15 pages of academic writing. Students whose native language is not English are normally admitted only as provisional students. After 12 semester hours of satisfactory work they are granted regular status.

A maximum of six semester hours of transfer credit will be accepted from another institution provided it was earned in graduate-level courses and has the approval of the department and the dean of graduate studies. Such courses must have been taken within five years of matriculation at Case Western Reserve University and passed with grades of B or better. The department welcomes part-time students.

Although not formally a requirement for graduate degrees, teaching is viewed as part of the education of every graduate student. The department provides opportunities for graduate assistants to gain teaching experience in a variety of courses offered by the department. Other teaching opportunities exist elsewhere in the university and in the Greater Cleveland area.

New and continuing graduate students may apply for graduate student assistantships, which are awarded by the dean on recommendation of the department. Applicants with previous teaching experience are preferred. Graduate assistants without previous teaching experience will be required to take ENGL 400, Seminar in Rhetoric and the Teaching of Writing, before the first semester in which they teach.

Special Master of Arts Programs

Master of Arts in comparative literature (English and French, German or Spanish). A more detailed description of all graduate programs in English is available from the departmental office or the Office of Graduate Admissions.

FACILITIES

Faculty and graduate student offices are in Guilford House, as is a faculty/student lounge and reading room (Guilford 223). Camera, recorders, and monitors are available in Guilford for making and viewing videotapes. The Film Society maintains a state-of-the-art film projection facility in Strosacker Auditorium. Kelvin Smith Library, a part of the University Libraries, houses the collections of printed and audiovisual material. In addition to manuscript and rare-book holdings in the Special Collections Division, the library has strengths in Renaissance literature, 18th- and 19th-century English literature, and American literature. The Library has recently acquired an outstanding collection of approximately 6500 art films on videotape, supported in part by English department endowment funds.

CURRENT AREAS OF RESEARCH

Current topics of faculty research include 16th and 17th century women's writing, Shakespeare's theater, biography and autobiography, cognitive linguistics, authorship and intellectual property, the export of American popular culture, immigrant and cross-cultural literature in the United States; the history of the book; native American literature, medical and psychological contexts of Victorian literature; the literature of empire; and the aesthetics of modernism.

ENGLISH (ENGL)

Undergraduate Courses

ENGL 148. Introduction to Composition (3)
Practice and training in various modes of writing. Includes regular individual conferences as well as classes. Texts and readings vary from section to section. May be repeated in special instances, but a maximum of three semester hours will count toward a Bachelor's degree. Students placing into ENGL 148 must complete the course with a grade of C or higher in order to enroll in ENGL 150.

ENGL 150. Expository Writing (3)
Practice and training in expository writing. Although a common quantity of writing is assigned, methods and texts may vary from section to section. A grade of C or better in ENGL 150 fulfills the university composition requirement.

ENGL 180. Writing Tutorial (1-2)
Students who pass ENGL 150 with a grade of D and transfer students who are placed in ENGL 180 on the basis of the ENGL placement test must pass ENGL 180 with a grade of C or higher to meet the ENGL composition requirement of the colleges. Others desiring substantial scheduled tutorial work in composition may report to the Writing Center during the first week of classes to arrange a tutorial appointment. May be repeated in special instances, but no more than three semester hours of ENGL 180 credit will count toward the degree.

ENGL 181. Reading Tutorial (1)
Scheduled tutorial in reading for those who need work beyond ENGL 148 or who come to the Writing Center seeking substantial help. May be repeated in special instances, but only one semester hour will count toward the degree.

ENGL 200. Literature in English (3)
This course introduces students to the reading of literature in the English language. Through close attention to the practice of reading, students are invited to consider some of the characteristic forms and functions of imaginative literature and to come to an understanding of the effects of the changes that have taken place in what and how readers read. Prereq: ENGL 150 or USFS 100.

ENGL 202. Expository Writing (3)
A workshop-style course for students who wish to refine the skills acquired in ENGL 150. Special attention to style and presentation.

ENGL 203. Introduction to Creative Writing (3)
A course exploring basic issues and techniques of writing, including prose and verse through exercises, analysis, and experiment. For students who wish to try their abilities across a spectrum of genres. Prereq: ENGL 150 or USFS 100.

ENGL 204. Introduction to Journalism (3)
Print news and feature stories, broadcast writing, advertising copy, and public relations. Considerable writing. Guest speakers from the profession. Prereq: ENGL 150 or USFS 100.

ENGL 213. Introduction to Fiction Writing (3)
A beginning workshop in fiction writing, introducing students to the craft of the short story. May include discussion of literary examples as well as personal experience. Prereq: ENGL 150 or USFS 100.

ENGL 214. Introduction to Poetry Writing (3)
A beginning workshop, focusing on such elements of poetry as verse form, syntax, figures, sound, tone. May include discussion of literary examples as well as student work. Prereq: ENGL 150 or USFS 100.

ENGL 255. Major British Writers (3)
Introduction to literary studies and survey of selected English authors from the Medieval period to the present. Prereq: ENGL 150 or USFS 100.

ENGL 257A. Poetry (3)
Introductory readings in the novel. May be organized chronologically or thematically. Attention to the novel as a historically situated genre.

ENGL 257B. Poetry (3)
Introductory readings in poetry. May be organized chronologically or thematically. Attention to the formal
qualities of poetry in relation to meaning, expressivity, etc.
ENGL 268. Understanding Movies (3)
An introductory course designed to familiarize students with the language systems and aesthetic components of the movies and provide the means to analyze how movies work as complex aesthetic entities. Films are shown in 35mm. Prereq: ENGL 150 or USFS 100.
ENGL 270. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women’s studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, and art history. It is the required introductory course for students taking the women’s studies major. Prereq: ENGL 150 or USFS 100. Cross-listed as WMST 201.
ENGL 285. Special Topics Seminar (1)
One-credit seminars on special topics in literature or language; see departmental listings for topics each term. Maximum of 3 credits. Prereq: ENGL 150 or USFS 100.
ENGL 290. Masterpieces of Continental Fiction (3)
Major works of fiction from the 19th century and earlier. Cross-listed as WLIT 290.
ENGL 291. Masterpieces of Modern Fiction (3)
Major works of fiction of the 20th century. Cross-listed as WLIT 291.
ENGL 300. English Literature to 1800 (3)
A survey of major British authors from Wordsworth to T.S. Eliot. Some attention to the major dialects of American prose fiction. Thematic approaches may include: satire, the nature of tragedy, national history, gender roles, sexual politics, the state and its opponents, theatrical conventions. Assessment may include opportunities for performance. Prereq: ENGL 150 or USFS 100.
ENGL 309. Topics in Journalism (3)
Study and practice of specialized forms of journalism. Maximum of six credits. Prereq: ENGL 150 or USFS 100.
ENGL 310. History of the English Language (3)
An introductory course covering the major periods of English language development: Old, Middle, and Modern. Students will examine both the linguistic forms and the cultures in which the forms were used. Prereq: ENGL 150 or USFS 100.
ENGL 312. Chaucer (3)
An introduction to the work of Geoffrey Chaucer, with emphasis on “The Canterbury Tales.” Prereq: ENGL 150 or USFS 100.
ENGL 317. Business and Technical Writing (3)
Professional communication in theory and practice, including audience analysis, logic and strategy applied to the writing of technical reports, proposals, manuals, progress and feasibility studies, memoranda, and letters. Prereq: ENGL 150 or USFS 100.
ENGL 320. Renaissance Literature (3)
Aspects of English Renaissance literature and its contexts from 1500-ca. 1620. Genres studied might include poetry, drama, prose fiction, expository and polemic writing, or some works from Continental Europe. Writers such as Shakespeare, Spenser, Milton, Donne. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 323. Milton (3)
Poetry and selected prose, including the careful study of “Paradise Lost.” Prereq: ENGL 150 or USFS 100.
ENGL 324. Shakespeare: Histories and Tragedies (3)
Close reading of a selection of Shakespeare’s tragedies and history plays (e.g., “Richard the Third,” “Julius Caesar,” “Hamlet,” “King Lear”). Topics of discussion may include Renaissance drama as a social institution, the nature of tragedy, national history, gender roles, sexual politics, the state and its opponents, theatrical conventions. Assessment may include opportunities for performance. Prereq: ENGL 150 or USFS 100. Cross-listed as THTR 334.
ENGL 325. Shakespeare: Comedies and Romances (3)
Close reading of selected plays of Shakespeare in the genres of comedy and romance (e.g., “The Merchant of Venice,” “Twelfth Night,” “Measure for Measure,” “The Tempest”). Topics of discussion may include issues of sexual desire, gender roles, marriage, the family, genre conventions. Assessment may include opportunities for performance. Prereq: ENGL 150 or USFS 100. Cross-listed as THTR 335.
ENGL 327. Eighteenth-Century Literature (3)
Survey of a variety of writings from or relevant to the eighteenth century. Writers discussed may include Dryden, Behn, Defoe, Pope, Swift, Gay, Fielding, Richardson, Burney, Wollstonecraft and others working in drama, lyric and epic poetry, biography and autobiography, political and philosophical writings and prose fiction. Thematic approaches may include: satire, journalism and literature, the rise of the novel. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 328. Studies in the Eighteenth Century (3)
This course examines selected topics in the English literary culture of the eighteenth century, a culture which extended to the Americas and to other English colonies. Literary writings will be examined in relation to other aspects of the century culture, which may include visual arts, marital institutions, the printing industry, property law, medicine, and other topics. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 329. English Literature, 1780-1837 (3)
Aspects of English literature and its contexts in the early 19th century. Genres might include poetry, prose fiction, political and philosophical writing, literary theory of the period. Writers such as the Wordsworth, Coleridge, Blake, Austen, Byron, the Shelles. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 330. Victorian Literature (3)
Aspects of English literature and its contexts during the reign of Queen Victoria. Genres studied might include poetry, prose fiction, political and philosophical writing. Writers such as the Brontes, Gaskell, Dickens, Eliot, Hardy, Tennyson, the Bronwings, Arnold, Carlyle, Ruskin, Gosse, Swinburne, and Hopkins. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 331. Studies in the Nineteenth Century (3)
Individual topics in English literary culture of the 19th century. Topics might be thematic or formal, such as literature and science, medicine, labor, sexuality, or Empire; literature and other arts; Gothic fiction, decadence. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 332. Twentieth-Century British Literature (3)
Aspects of British literature (broadly interpreted) and its contexts during the 20th century. Genres studied might include poetry, fiction, and drama. Such writers as Joyce, Woolf, Conrad, Ford, Lawrence, Mansfield, Shaw, Beckett, Stoppard, Yeats, Edward or Dylan Thomas, Stevie Smith, Bowen, Spark. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 333. Studies in the Twentieth Century (3)
Individual topics in twentieth-century literary culture. Particular issues and topics may cross national boundaries and genre lines as well as crossing political, psychological, and social themes, such as movements, comparative studies across the arts, literature and war, literature and occultism. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 353. Major Writers (3)
Close and detailed study of the work of one or two writers: development, social and aesthetic contexts, reception, interpretation, significance. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 356. American Literature Before 1865 (3)
Aspects of American literature and its contexts from the colonial period through the end of the Civil War. Writers such as Bradstreet, Taylor, Franklin, Poe, Stowe, Alcott, Melville, Hawthorne, Emerson, Douglass. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 357. American Literature 1865-1914 (3)
Aspects of American literature and its contexts from the Civil War to the First World War. Writers such as Whitman and Dickinson, Twain, Howells, James, Chopin, Wharton. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.
ENGL 358. American Literature 1914-1960 (3)
Aspects of American literature and its contexts from the First World War to the Cold War. Genres studies
might include fiction, poetry, drama, polemics. Writers such as T.S. Eliot, Pound, Stevens, Moore, W.C. Williams, Dos Passos, West, Fitzgerald, Hemingway, Cathe, Faulkner, Barnes, Miller, T. Williams, O’Neill. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 359. Studies in Contemporary American Literature (3)
Individual topics in literary culture since the 1960s. Topics may include the Beats, literature of the Vietnam war, post-modern fiction, contemporary poetry, the documentary novel. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 360. Studies in American Literature (3)
Individual topics in American literary culture such as regionalism, realism, impressionism, literature and popular culture, transcendentalism, the lyric, proletarian literature, the legacy of the Civil War. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 363H. African-American Literature (3)
A historical approach to African-American literature. Such writers as Wheatley, Equiano, Douglass, Jacobs, DuBois, Hurston, Hughes, Wright, Baldwin, Ellison, Morrison. Topics covered may include slave narratives, African-American autobiography, the Harlem Renaissance, the Black Aesthetic, literature of protest and of assimilation. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 363H.

ENGL 365E. The Immigrant Experience (3)
Study of fictional and/or autobiographical narrative by authors whose families have experienced immigration to the U.S. Among the ethnic groups represented are Asian-American, Jewish-American, Hispanic-American. May include several ethnic groups or focus on a single one. Attention is paid to historical and social aspects of immigration and ethnicity. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 365E.

ENGL 365N. Topics in African-American Literature (3)
Selected topics and writers from nineteenth and twenthieth-century African-American literature. May focus on a genre, a single author or a group of authors, a theme or themes. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 365N.

ENGL 365Q. Post-Colonial Literature (3)
Readings in national and regional literatures from former European colonies such as Australia and African countries. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 365Q.

ENGL 366G. Minority Literatures (3)
A course dealing with literature produced by ethnic and racial minority groups within the U.S. Individual offerings may include works from several groups studied comparatively, or focus on a single group, such as Native Americans, Chicano/Chicana, African-American, Caribbean-Americans. African-American works may also be included. May cover the entire history of the U.S. or shorter periods. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 366G.

ENGL 368A. Introduction to Film Studies (3)
This course will help students develop a sophisticated awareness of some of the major schools of thought employed in analyzing Hollywood and world cinema, such as formalism, psychoanalytic theory, Marxist criticism, postmodernism, feminist film theory, and reception theory, among other interpretive approaches. Attention will also be paid to the role of the cinema in a world of rapidly changing technologies. Prereq: ENGL 150 or USFS 100 and ENGL 268 or permission of department. Cross-listed as WLIT 368A.

ENGL 368B. History of Film (3)
Analysis of selected topics in film history, such as film before 1940, American cinema 1940 to the present, European or Asian cinema since 1940. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 368C. Topics in Film (3)
Individual topics in film, such as a particular national cinema, images of women in film, film comedy, New Wave film, literature and film. Maximum 12 credits. Cross-listed as WLIT 368C.

ENGL 371. Topics in Women’s Studies (3)
Individual topics and issues in women’s studies relating to writing by and about women, such as feminist theory and criticism; the politics of gender and sexuality; women in popular culture; women in the writing business. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 372. Studies in the Novel (3)
Selected topics in the history and formal development of the novel, such as detective novels; science fiction; epistolary novels; the rise of the novel; the stream of consciousness novel; the Bildungsroman in English. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 373. Studies in Poetry (3)
Selected topics and issues in the study of poetry, such as reading poetry, the elegy, pastoral poetry, love poetry, the long poem, form and meter in poetry. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 374. Internship in Journalism (3-6)
Students work as interns at area newspapers, magazines, trade publications, radio or television and meet as a class to share their experiences as interns and to focus on editorial issues--reporting, writing, fact-checking, editing--that are a part of any journalistic enterprise. Students are responsible for pre-arranging their internship prior to the semester they intend to take the class but can expect guidance from the instructor in this regard. Prereq: ENGL 204 or permission of the department.

ENGL 375. Internship in Technical Communication (3-6)
Students create technical and professional documents in a selected corporate or organizational setting, do assigned reading, and meet as a class to participate in seminar discussions and review of work. Students must pre-arrange internship assignment with instructor prior to semester. Prereq: ENGL 317 or ENGL 398N and permission of department.

ENGL 376. Studies in Genre (3)
Topics in literary genres, such as comedy, biography and autobiography, satire, allegory, the short story, the apocalypse, narrative poetry. May cross over the prose/poetry boundary. Maximum 6 credits. Prereq: ENGL 150 or USFS 100.

ENGL 379. Topics in Language Studies (3)
Aspects of contemporary language studies. Topics such as history of rhetoric, Saussurean linguistics, generative grammar, psycholinguistics, sociolinguistics, cognitive and construction grammars, metaphor, language acquisition, stylistics. Maximum 9 credits. Prereq: ENGL 150 or USFS 100.

ENGL 380. Senior Seminar (3)
Capstone course required of all English majors in the senior year. Limited to senior English majors. Maximum 6 credits. Prereq: ENGL 300 and either ENGL 302 or ENGL 308.

ENGL 385. Special Topics in Literature (3)
Close study of a theme or aspect of literature not covered by traditional generic or period rubrics, such as “spatial imagination,” “semiotics of fashion in literature,” “epistolarity.” Maximum 9 credits. Prereq: ENGL 150 or USFS 100.

ENGL 386. Studies in Literature and Culture (3)
Boundary-crossing study of the relations between literary and other aspects of a particular culture or society, including theoretical and critical issues raised by such study. For example, literature and medicine, gay and lesbian literature, Asian/Western literary relations, emotion in literature, philosophy and literature, literature and music. Maximum 9 credits. Prereq: ENGL 150 or USFS 100.

ENGL 387. Literary and Critical Theory (3)
A survey of major schools and texts of literary and critical theory. May be historically or thematically organized. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 387.

ENGL 390. Independent Study and Creative Projects (1-6)
Up to six semester hours of independent study may be taken in a single semester. Must have prior approval of faculty member directing the project. Projects may be critical or creative in nature.

ENGL 392. Classroom Teaching (3)
For undergraduate students who assist in the teaching of ENGL 150, 180, or 181. Interested students should check with the director of composition (for ENGL 150, 180, 181) before the beginning of the semester in which they wish to participate. May be repeated only once; not more than three semester hours in ENGL 392 may be counted toward the major. May also include up to three semester hours of supervised peer tutoring at the University Writing Center.

ENGL 393. Seminar and Practicum in Literary (3)
Taken for credit in conjunction with tutoring in Project STEP-UP, a University-sponsored collaboration with city middle schools. Students must commit to 60 hours of tutoring at one of the approved sites during the term they take ENGL 393, as well as participating in weekly one-hour seminar sessions and completing reading and writing assignments.

ENGL 398. Professional Communication for Engineers (2)
A writing course for engineering majors only. Subjects covered include audience adaptation, problem/solution formats, lab reports, journal articles, proposals, feasibility studies, and oral presentations. Corequisite is a particular engineering lab course; students should consult advisors. Prereq: ENGL 150 or USFS 100. Coreq: Concurrent enrollment in appropriate engineering course.

ENGL 398N. Professional Communication for Engineers (3)
Principles and practices of effective communication in the workplace, with an emphasis on computer-mediated communication. Topics include analyzing audience needs in context, visual communication, computer-mediated documents, ethics, and team writing. Typical assignments include e-mail, memos, letters, reports, documentation, and oral presentations. Prereq: ENGL 150 or USFS 100.

ENGL 399. Senior Thesis (3)
Elective research or creative project. Should be used for Honors Projects option. By department approval only. Maximum 6 credits. Prereq: Consent of department.
Environmental Studies Program

211 Smith Building
Phone 216-368-3676; 216-368-2741
Fax 216-368-3691
Peter McCall, Director

PROGRAM FACULTY

Peter L. McCall, J.D., Ph.D. (Yale University) Professor, Geological Sciences; Director, Environmental Studies
Joseph F. Koonce, Ph.D. (University of Wisconsin, Madison) Professor, Biology
Timothy K. Beal, Ph.D. (Emory University) Associate Professor, Religion
Mihajilo Mesarovic, Ph.D. (Serbian Academy of Science) Cady Style Professor of Engineering
Carroll W. Pursell, Ph.D. (University of California, Berkeley) Adeline Barry Davee Distinguished Professor of History of Technology
Norman Robbins, M.D. (Harvard University), Ph.D. (Rockefeller University) Professor of Neurosciences; Director, Center for Environment
Theodore Steinberg, Ph.D. (Brandeis University) Associate Professor of History; Associate Professor, School of Law

UNDERGRADUATE PROGRAM

Environmental studies is a multi-disciplinary program that introduces students to the societal determinants and implications of environmental problems. Emphasis is given to the moral, cultural, and political dimensions of environmental problems and solutions. It brings to bear
the issues and methods of the humanities and social sciences as well as the sciences and professions on environmental questions. The program is designed to serve the needs of students seeking a liberal education as well as those who desire a broad intellectual base for more technical training in environmental sciences. Students in environmental studies can pursue a major, a minor, or Engineering Core sequence.

Major

The environmental studies program offers a major (30 credit hours) leading to the Bachelor of Arts degree. However, it may be elected only as a second major. The double major is required so that the multi-disciplinary perspective offered by the program may be complemented by a concentrated disciplinary major. To declare the major, students should have declared a first major and have sophomore or junior standing. Up to six credits in required and elective courses taken by students for their first major may be applied to their environmental studies major. None of the required courses may be taken pass/no pass.

The required courses are:
ESTD 101. Introduction to Environmental Thinking.
ESTD 398. Environmental Seminar
and one course from each of the three following areas of emphasis:

Humanities
RLGN 206. Religion and the Environment
HSTY 378. History of the American Environment

Social Policy
ECON 368. Environmental Economics
GEOL 303 (POSC 303). Environmental Law

Science and Engineering
ESCI 340. Introduction to Global Issues
BIOL 350. Introduction to Ecosystem Analysis
GEOL 202. Global Environmental Problems

At least 15 credit hours must be taken from a list of approved electives. This list will change from time to time as departmental offerings change. An approved Washington Semester internship may be used to satisfy part or all of the elective requirement. Students should consult with the program director for current information. All student programs must be approved by the director.

Minor

The minor in the College of Arts and Sciences (15 credit hours) consists of ESTD 101, one course from two of the three disciplinary groups above, and two of the approved electives, which may include courses from the third unselected disciplinary grouping.

Sequence

The sequence in environmental studies in the Case School of Engineering consists of 9 credit hours comprising ESTD 101 and two courses from the above disciplinary list.

ENVIRONMENTAL STUDIES (ESTD)

Undergraduate Courses

ESTD 101. Introduction to Environmental Thinking (3)
Critical comparison of scientific, historical, religious, and literary conceptions of nature. Theories of environmental ethics, legal, and economic conceptions of environmental goods. Current controversies concerning human population growth, energy use, the consumer society, and attitudes towards animals.

ESTD 387. Multidisciplinary Approach to Environmental Problems (1-3)
This course is designed to illustrate, using a different topic each year, the necessity for a multidisciplinary approach to environmental problems in order to understand and manage environmental problems. Multiple faculty and community leaders participate in the teaching. Students registering for 1 credit attend weekly seminars; those registering for 2-3 credits do an individual research project in addition. Past topics include: lead poisoning in the urban environment, sustainability and the Great Lakes, setting environmental priorities, and reducing CWRU’s environmental impacts.

ESTD 398. Seminar in Environmental Studies (3)
Small group discussion and student presentations concerning the cultural determinants of environmental attitudes. Each student presents two seminars on current environmental issues, one local and one global. Prereq: ESTD 101.

ESTD 487. Multidisciplinary Approach to Environmental Problems (1-3)
(See ESTD 387.)

Ethnic Studies Program

Guilford House 204
Tel: 216-368-4885/216-368-2216
Email: gxd22@cwru.edu
Gilbert Doho, Director

PROGRAM FACULTY

Gilbert Doho, Ph.D. (University of Paris 3, Sorbonne Nouvelle)
Associate Professor of French (African Literature and Film)

Tom Bishop, Ph.D. (Yale University)
Associate Professor of Anthropology (Africa, Mozambique)

Rachel Chapman, Ph.D. (University of California, Los Angeles)
Assistant Professor of Anthropology (Africa, Mozambique)

Christine Cano, Ph.D (Yale University)
Assistant Professor of French (Francophone Studies)

Thomas J. Csordas, Ph.D. (Duke University)
Anthropological theory; Native America and the United States

Gabriela Copertari, Ph.D. (Georgetown University)
Assistant Professor of Spanish (Latin American Literature and Film)

Atwood D. Gaines, Ph.D. (University of California, Berkeley), M.P.H (University of California, Berkeley, School of Public Health)
Professor of Psychiatry and Professor of Biochemical Ethics; religion, aging; cultural studies of sciences; bioethics; social identity; United States, the Mediterranean

Janis Hunter Jenkins, Ph.D. (University of California, Los Angeles)
Professor of Anthropology, Latin America, Brazil, Colombia, Mexico, Puerto Rico, Cuba

Kurt Koenigsberger, Ph.D. (Vanderbilt University)
Assistant Professor of French (African Studies)

Tom Bishop, Ph.D. (Yale University)
Assistant Professor of English (Postcolonial Studies)

Katherine Lavelle, Ph.D. (Northwestern University)
Assistant Professor of Political Science (African Politics)
Jacqueline Nanfio, Ph.D. (University of California, Los Angeles)
Associate Professor of Spanish (Latin American Studies)

Constantine Petridis, Ph.D. (Ghent University)
Assistant Professor of Art History (African Art)

James Pfeiffer, Ph.D. (University of California, Los Angeles)
Assistant Professor of Anthropology (Southern Africa, Mozambique)

Rhonda Y. Williams, Ph.D. (University of Pennsylvania)
Associate Professor of History (African American History and Culture)

Jonathan Sadowsky, Ph.D. (The John Hopkins University)
Associate Professor of History (Africa)

Thomas Sayers Ellis, M.F.A. (Brown University)
Associate Professor of English (African American Literature)

Mary Step, Ph.D. (Kent State University)
Emotion and Affect in human communication processes

Cheryl Toman, Ph.D. (University of Illinois, Urbana-Champaign)
Assistant Professor of French (Francophone Studies)

UNDERGRADUATE PROGRAM

Minor

The goal of the Ethnic Studies program in the College of Arts and Sciences at Case Western Reserve University is to expand and enhance course offerings on ethnicity and race in the United States. The program's objectives are (1) to examine relationships among racial/ethnic groups and the processes of racial/ethnic formation - and their intersections with class, gender and sexuality - at the personal and collective levels; (2) to foster the development of research skills in a broad range of disciplines in the humanities; (3) to contribute to an interdisciplinary knowledge of the challenges and contributions of ethnic minorities in the United States; (4) to impart to students a deep knowledge of the cultures of Africa, and Latin America; (5) to help students to develop competencies for working with people of different racial/ethnic backgrounds and to foster an understanding of racial/ethnic diversity; (6) to support students and faculty in the transmission of knowledge, in the discovery and development of new ideas, and in research and writing in the field of ethnic studies; (7) to inculcate in students an understanding of the complexity and challenges of multiethnic societies, and to prepare them for careers in education, business, law, government service, social work, social welfare, health care, teaching, public policy, law enforcement, urban and community development, and the arts.

Ethnic Studies is an interdisciplinary program. The program develops fundamental skills in critical and global thinking and in comparative analysis, as well as an understanding of the interactions of race, class, gender, and sexuality in the experiences of a range of social groups. It is designed to bring together a community of students, faculty and staff devoted to the transmission of knowledge and the discovery of new ideas in the field of ethnic studies. Ethnic Studies also offers diverse perspectives that challenge monolithic thinking about the formation of identities and societies. The program's core courses focus on the exploration and comparison of the cultures, history, politics, and economics of Africa, Latin America, and their diasporas. Program offerings explore ethnicity and cross-cultural exchange globally and in postcolonial frames. Ethnic Studies will support research pertinent to the field and encourage cultural and academic exchange among scholars and students. This program is part of Case's mission to enhance the recruitment, retention, and excellence of a diverse faculty and student body. Our long-term goals are to extend program offerings to encompass other ethnic minority groups and to develop a center that will foster an appreciation of ethnic diversity and difference in the learning and research communities of Case Western Reserve University.

Requirements

The Ethnic Studies minor is open to all undergraduate students. It requires a minimum of 15 credit hours. Students are required to take nine (9) credits from among Ethnic Studies Core Courses and six (6) credits in their chosen areas of concentration. Community projects are strongly advised and students are encouraged to carry out field research in their areas of concentration.

I. Core Courses (9 credits)

The Core Courses are designed to introduce students to the interdisciplinary field of Ethnic Studies. Courses may be individually or team taught and at times will incorporate the Seminar Approach to General Education and Scholarship (SAGES) and be conducted in seminar format. Students are encouraged to use the tools and perspectives of several disciplines (history, literature, art history, anthropology, film, sociology, and political science, for example) to address the experiences of African-Americans and Latina/o Americans. Courses center on the examination of social, cultural, political, and economic structures that shape the life of these ethnic minorities in the United States. They examine how race, class, and gender have impacted their identities as well as their economic, social, political, and cultural productions. Assignments and courses are designed with the objective of maximizing use of University Circle institutions.

ETHS 251: Introduction to the Study of Race and Ethnicity (3)

This course is designed to introduce students to the study of ethnicity. Basic concepts such as race, gender, class, and identity construction will be examined. Students are encouraged to use the tools, and perspectives of several disciplines to address the experiences of ethnic groups in the United States.

ETHS 252 A : Introduction to African-American Studies (3)

This course is designed to introduce students to the study of African American history, cultures, economics, and politics. Students will learn about the development of the discipline by exploring theoretical questions, methodological approaches, and major themes that have shaped the study of black people in the United States.

ETHS 252 B : Introduction to Latino/A Studies (3)

Interdisciplinary introduction to the basis for a Latino/a ethnicity through an exploration of commonalities and differences among the peoples of Latin American and Caribbean origin in the continental United States. Topics include immigration and acculturation experiences and their commonalities and differences, comparison of Latino/a experiences to those of other racial, ethnic and immigrant groups, and the potential for a pan-ethnic identity.
political realities in present-day Latin America. The identifies the forces which shape social, economic and cultural development of Latin America and can History (3)

relational movements, colonialism, nationalism, and the dilemmas of independent African states.

ETHS 253 B: Introduction to Modern Latin American History (3)
This course provides an introduction to the historical and cultural development of Latin America and identifies the forces which shape social, economic and political realities in present-day Latin America. The course centers on the colonial period, the wars of independence, and the emergence of nation-states. It raises issues such as migration and urbanization, popular protest, great power intervention, and the integration of the region into the global economy.

II. Areas of Concentration (6 credits)

Available approved courses

Concentration on African Studies
ANTH 322: Living Africa (3)
ARTH 290: Introduction to the Art of Sub-Saharan Africa (3)
HSTY258: History of Southern Africa (3)
HSTY 268: Colonialism in African (3)
FRCH/WLIT 295: The Francophone World (3)
FRCH 308/ WLIT 308: The Paris Experience (3)
FRCH/WLIT 365: Francophone Literature in Translation (3)
FRCH/WLIT 395: Francophone Literature in Translation (3)
POSC 366: Government and Politics of Africa (3)
COSI 260. Multicultural Aspects of Human Communication (3)
COSI 328. Media effects and Literacy (3)
ECON 375: Economics of Developing Countries (3)

Concentration on African-American Studies
HSTY 261: African-American History 1865-1945 (3)
ENGL 365N: Topics in African-American Literature (3)
ENGL 368H: African-American Literature (3)
HSTY 260: Slavery and Emancipation (3)
HSTY 262: African-American History since 1945 (3)
HSTY 318: History of Black Women in U.S. (3)
COSI 260. Multicultural Aspects of Human Communication (3)
COSI 328. Media Effects and Literacy (3)
ECON 375: Economics of Developing Countries (3)

Concentration on Latin America and Caribbean Studies
SPAN/ WLIT 205: The Hispanophone World (3)
SPAN 385: Hispanic Literature in English (3)
SPAN 336: Chicano/a Literature (3)
SPAN 370: SPC TPC: Latin American Cinema (3)
ECON 375: Economics of Developing Countries (3)
SPAN 303: Latin American Cultural Conflicts (3)
SPAN 322: Latin American Short Story (3)
SPAN 326: The Fantastic in Latin American Prose (3)
SPAN 339: Latin American Poetic Revolt (3)
SPAN 342: Latin American Feminist Voices (3)
SPAN 343: The New Drama in Latin America (3)
POSC 364: Dictatorship and Democracy in 20th Century Latin America (3)
COSI 260. Multicultural Aspects of Human Communication (3)
COSI 328. Media effects and Literacy (3)
ECON 375: Economics of Developing Countries (3)

Concentration on Global Ethnic Studies
ANTH 388: Globalization, Development, and Underdevelopment (3)
ANTH 314: Cultures of the United States (3)
ANTH 345: Ethnicity, Gender, and Mental Health (3)
ANTH 357: Native American Cultures (3)
ANTH 530: Race, Class and Gender in Place (3)
COSI 260. Multicultural Aspects of Human Communication (3)
COSI 328. Media effects and Literacy (3)
ECON 375: Economics of Developing Countries (3)
ENGL 270: Introduction to Gender Studies (3)
ENGL Q 365/WLIT 365 Q: Postcolonial Literature (3)
FRCH/WLIT 285: The Francophone World (3)
SOC 302: Race and Ethnic Minorities in American Society (3)
HSTY 321: Colonialism, Sex, Race, and Gender (3)
ECON 375: Economics of Developing Countries (3)

POSC 362 Politics of Central Asia (3)  
POSC 370K Nationalism, Ethnicity, and Religion in World Politics (3)  
POSC 374: Politics of Development in the Global South (3)  
SPANWLIT285: Hispanophone World (3)

Evolutionary Biology
238 Mather Memorial Building  
Telephone 216 368 2264  
Fax 216 368 5334  
Cynthia Beall, Chair of Steering Committee

PROGRAM FACULTY

Cynthia Beall, Ph.D. (The Pennsylvania State University), Professor of Anthropology  
Joseph Koonce, Ph.D. (The University of Wisconsin-Madison), Professor and Chair of Biology  
Peter McCall, J.D., Ph.D. (Yale University), Professor of Geological Sciences  
Prof. Patricia Princehouse, Ph.D. (Harvard University), Visiting assistant professor of biology  
Prof. Mark Willis, Ph.D. (University of California – Riverside), Assistant professor of biology  
Prof. Scott Simpson, Ph.D. (Kent State University), Associate professor of anatomy, adjunct professor of anthropology  
Prof. Bruce Latimer, Ph.D. (Kent State University), Associate professor of anatomy, adjunct professor of anthropology, Director, Cleveland Museum of Natural History  
Prof. Yohannes Haile-Selassie, Ph.D. (University of California – Berkeley), Adjunct professor of anthropology, Head of Physical Anthropology, Cleveland Museum of Natural History

UNDERGRADUATE PROGRAM

The program in Evolutionary Biology is designed to provide students with knowledge of macro- and micro-evolutionary processes underlying the evolution and diversification of life on Earth and an understanding of the meta-scientific issues involved in this unique field of study.
The program includes grounding in the history and philosophy of evolutionary thought and alternative conceptualizations of the mechanisms, patterns, and processes of evolution. It emphasizes evolutionary theory, foundations of ecology and genetics, focused study of particular organisms or groups of organisms, and the dynamics of evolutionary principles in scientific inquiry.

The Major

The 30 credit interdisciplinary major consists of three foundation courses, one senior seminar, one course in ecology, one in the philosophy/history of science, and four approved electives. In consultation with a major advisor, students will tailor intense study to suit particular interests within the major. This is a second major in conjunction with a conventional disciplinary major. The courses will be selected from the following list of courses. Up to twelve credits in required and elective courses taken by students for their first major may be applied to their Evolutionary Biology major.

Major Course Outline
3 Foundation courses (9 credits)
1 Senior Seminar (3 credits)
1 Philosophy/History of science (3 credits; additional courses in this section may be selected as approved electives)
1 Ecology course (3 credits)
4 approved elective courses (12 credits; may be selected from Approved Elective and Philosophy/History of Science lists)

The Foundation Courses are
BIOL 114: Principles of Biology
OR
BIOL 214: Genes and Evolution
GEOL 210: Historical Geology/Paleontology
PHIL 225: Evolution

The Senior Seminar is
PHIL 394: Seminar in Evolutionary Biology

The Philosophy/History of Science Options are
HSTY 201: Science in Western Thought I
HSTY 202: Science in Western Thought II
HSTY 394: History of Biology
HSTY 402: Survey of the History of Science II
PHIL 203: Natural Philosophy I
PHIL 204: Natural Philosophy II
PHIL 303: Topics in Philosophy of Science (Evolution, Creation, and Science; Darwin's Revolution; Evolutionary Theory and Race)
PHIL 309: Philosophical Issues in Genetics

The Ecology Options are
BIOL 216: Organisms and Ecosystems
BIOL 336: Aquatic Biology
BIOL 337: Marine Ecology
BIOL 370: Ecology

Approved Elective Courses include
ANTH 103: Introduction to Human Evolution
ANAT 375: Human Evolution: The Fossil Evidence
ANAT 377: Human Musculoskeletal Anatomy
ANAT 383: Evolutionary Anatomy
ANTH 105: Worldwide Variation in Human Biology
ANTH 295: Comparative Primate Behavior
ANTH 302: Darwinian Medicine
ANTH/BIOL/GEOL/PHIL 367: Topics in Evolutionary Biology
ANTH 393: Human Ecology: Biology of Human Adaptability
ANTH/BIOL/GEOL/PHIL 396: Undergraduate Research in Evolutionary Biology
ANTH 397: Epidemiology and Evolution of Human Disease
BIOL 223: Vertebrate Biology
BIOL 305: Herpetology
BIOL 326: Genetics
BIOL 343: Microbiology
BIOL 358: Animal Behavior
BIOL 362: Principles of Developmental Biology
GEOL 307/BIOL 307: Evolutionary Biology and Paleobiology of Invertebrates
GEOL 451: Isotopy Geology

GEOL 452: Geochronology
PSCL 350: Behavioral Genetics

French and Francophone Studies (FFS)

214 Guilford House
Phone: 216-368-8983; Fax 216-368-2216
Marie Lathers, Director

FRENCH AND FRANCOPHONE STUDIES PROGRAM
COMMITTEE AND ADVISORS

Marie Lathers, Ph.D. (Brown University)
Director French Studies
Elizabeth M. and William C. Treuhaft Professor of French and Humanities

Women and the visual arts; nineteenth-century French literature and the arts; gender, science, and technology; feminist theory; space studies

Laura E. Hengehold, Ph.D. (Loyola University)
Assistant Professor of Philosophy
Political and social philosophy; philosophy of law; philosophy of feminism; Hegel; contemporary continental philosophy

Miriam R. Levin, Ph.D. (University of Massachusetts)
Associate Professor of History
Industrial culture; European technology; French cultural history

Catherine B. Scallen, Ph.D. (Princeton University)
Associate Professor of Art History
Northern Renaissance and Baroque art and historiography

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone literature, especially Cameroon; women’s writing; immigrant communities in France

THE FRENCH AND FRANCOPHONE STUDIES PROGRAM

Designed to develop cross-cultural awareness and to foster international understanding in a global world, the French and Francophone Studies (FFS) Program
adds an exciting new dimension to the traditional liberal arts curriculum. The French and Francophone Studies major differs from the traditional French major in two respects: by its interdisciplinary nature and by its greater flexibility to accommodate students’ own areas of interest. The FFS major answers the needs of students with a strong interest in cultural issues in general and in French Francophone history and society in particular. By allowing students to take coursework in English, the FFS major allows them to profit from the many courses on campus in various departments that focus on France and the Francophone world.

The FFS Program is an interdisciplinary, integrated program that understands the term “French” in its broadest sense, in an effort to represent the diversity characteristic of the field of French studies today as reflected in a variety of cultures of Francophone expression: Canada, the Caribbean, North and West Africa, the Middle East, and Southeast Asia. Reaching beyond disciplinary and national boundaries, the program encourages students to study in several disciplines, choosing from a large selection of courses in the humanities, the arts, and the social sciences. The program takes advantage of the varied resources the university has to offer in order to provide a meaningful course of study and an outstanding preparation for various graduate and professional schools or for careers in international business and finance, law, journalism, diplomatic service, non-profit and other international organizations, health, teaching, or the arts.

FRENCH AND FRANCOPHONE STUDIES MAJOR

Each student prepares a program of study in close consultation with a faculty advisor drawn from the Advisory Committee membership. Students should also discuss their choice of a minor or a second major with their advisor. The major in French studies requires a minimum of 30-32 credit hours in the following areas:

I. Foundations in Language (8)

For students entering at the 200-level of French language, completion of French 201 and 202. Students entering at the 300-level of language study complete 21 credits in III below.

II. Foundations in Culture (9)

These courses introduce students to French and Francophone cultures. FRCH/WLIT 295 (The Francophone World) is required. Beyond this, students select two courses from FRCH 316, 318, 319, and HSTY 310.

III. Elective Related Courses in French and Other Disciplines (15-21)

Students select from courses that focus on French and Francophone cultures in FRCH and other disciplines (art history, political science, history, etc.). These are chosen from the approved list (see below) and in conjunction with a FFS advisor. No more than 9 of these credits may be chosen from FRCH courses.

Anthropology

ANTH 322 Living Africa
ANTH 337 Comparative Medical Systems
ANTH 356 Mediterranean Culture and Society
ANTH 399 Independent Study (French content)

Art History

ARTH 240 Introduction to Medieval Art
ARTH 260 Art in the Age of Grandeur
ARTH 280 Modern Art and Modern Science
ARTH 284 History of Photography
ARTH 290 Introduction to the Art of Sub-Saharan Africa
ARTH 340 Issues in Non-Western Art
ARTH 367 Seventeenth- and Eighteenth-Century French Art
ARTH 374 Impressionism to Symbolism
ARTH 379 Issues in Nineteenth-Century Painting (French content)
ARTH 381 Neoclassicism to Realism
ARTH 392 Issues in Twentieth-Century Art (French content)
ARTH 398 Independent Study (French content)

World Literature

WLIT 211 World Literature I
WLIT 212 World Literature II
WLIT 229 Theater History II (also THTR 229)
WLIT 290 Masterpieces of Continental Fiction (also ENGL 290)
WLIT 300 The City In Literature (French content)
WLIT 368C Topics in Film (also ENGL 368C) (French content)
WLIT 390 Topics in World Literature (French content)
WLIT 399 Independent Study (French content)

Economics

ECON 372 International Finance
ECON 373 International Trade
ECON 375 Economics of Developing Countries

English

ENGL 290 Masterpieces of Continental Fiction (also WLIT 290)
ENGL 301 Linguistic Analysis (French content)
ENGL 368C Topics in Film (also WLIT 368C) (French content)
ENGL 379 Topics in Language Studies (when taught as Semiotics)
ENGL 387 Literary and Critical Theory (also WLIT 387)

History

HSTY 151 Technology in European Civilization
HSTY 201/202 Science in Western Thought
HSTY 212 Modern European History
HSTY 215 Europe in the Twentieth Century
HSTY 220 The Early Modern Mediterranean
HSTY 250 Issues and Methods in History (French content)
HSTY 268 Colonialism in Africa
HSTY 309 Reformation Europe, 1500-1650 (also RLGN 374)
HSTY 310 The French Revolutionary Era
HSTY 313 Women in Modern European History
HSTY 314 Imposters in Early Modern Europe
HSTY 315 Heresy and Dissidence in the Middle Ages (also RLGN 315)
HSTY 321 Colonialism, Sex, Race, and Gender (French content)
HSTY 332 European Diplomacy in the Age of Nationalism: 1789-1914
HSTY 348 Political and Social Thought in the Machine Age (also POSC 348)
HSTY 397 Undergraduate Tutorial (French content)

**International Studies**
INTL 396 International Independent Study (French content)

**Music**
MUSC 321 History of Western Music I
MUSC 322 History of Western Music II
MUSC 336 History of Western Music III

**Philosophy**
PHIL 302 Modern Philosophy
PHIL 315 Selected Topics in Philosophy (French content)
PHIL 325 Philosophy of Feminism (French content)
PHIL 399 Directed Study (French content)

**Political Science**
POSC 326 Comparative Constitutions
POSC 348 Political and Social Thought in the Machine Age (also HSTY 348)
POSC 351 Modern Political Thought (French content)
POSC 366 Government and Politics of Africa
POSC 367 Western European Political Systems
POSC 370A Political Economy
POSC 373 Politics of the European Union
POSC 374 Politics of Development in the Global South
POSC 395 Special Projects (French content)

**Religion**
RLGN 315 Heresy and Dissidence in the Middle Ages (also HSTY 315)
RLGN 374 Reformation Europe, 1500-1650 (also HSTY 309)
RLGN 392 Independent Study (French content)

**Theater**
THTR 229 Theater History II (also WLIT 229)
THTR 329 Dramatic Literature (French content)
THTR 399 Independent Study (French content)

**Language Requirement**
FFS majors should demonstrate French language ability by completing French 201-202 or the equivalent. They will also take at least one 300-level FRCH course (see Foundations in History and Culture).

**Study Abroad**
Study abroad in France, Belgium, Switzerland, French Canada, the Francophone Caribbean, or a Francophone African or Middle Eastern country is strongly encouraged but not required for FFS majors. The Department of Modern Languages and Literatures offers a summer study abroad program in Paris (FRCH/WLIT 308) in even numbered years. A summer study program in Cameroon, to be offered in odd numbered years, is in preparation. A spring-break service learning excursion to Montreal is FRCH 208.

**Teacher Licensure Option**
Students participating in the teacher licensure program complete a 45-47 semester hour major in French, including course work in French language, culture, and literature, and a 35 hour sequence in professional education. Course work in French begins in the freshman year with a language course appropriate to the student’s proficiency level and continues until the student has completed a range of upper-level courses and has met the goals of the program. Students are strongly urged to complete some of their course work in a French-speaking country and are assisted in identifying opportunities for study abroad. Interested students should contact Professor Marie Lathers. The professional education component (see Education [EDUC & EDJC] for overview and course requirements) begins with a sequence taken on campus, followed by 23 semester hours at John Carroll University, culminating in the student teaching requirements.

**Subject Area Requirements (select from):**

*Required only for students who begin their French Major at the Intermediate Level.

**Students at the Intermediate (200) Level**
Select five courses (15 credit hours); students entering the program at the Advanced (300) Level select seven courses (21 credit hours).

**Minor (15-17 Credits) and Sequence Requirements**
For the minor, students entering at the 200-level of language competence take 201, 202, and three more courses in FRCH and from the approved list. At least 6 credits should be taken in disciplines other than FRCH. Students entering at the 300-level of language competence take five courses at the 200 and 300 levels in FRCH and from the approved list. At least 3 credits should be in courses from FRCH taught in the French language and at least 6 credits should be taken in disciplines other than FRCH.

The sequence in French studies consists of one of the following courses: FRCH/WLIT 295, FRCH 316, FRCH 318, FRCH 319, or HSTY 310; and two additional 300-level courses.

**Department of Geological Sciences**
112 A.W. Smith Building
Phone 216-368-3690; Fax 216-368-3691
Gerald Matisoff, Chair

The geological sciences encompass a wide range of inquiries into the physical, chemical, and biological processes that shape the earth and the planets. Application of these inquiries to understanding a planet’s evolution through time is a unique attribute of geological investigations. Knowledge of the past and present reveals the constraints of our environment and serves as a guide for the future. In recent years major advances have been made in the...
# BACHELOR OF ARTS DEGREE

**Major in Geological Sciences**

### Freshman Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td><strong>CHEM 105, Principles of Chemistry I</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or equivalent</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>MATH 125, Calculus I</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>ENGL 150, Expository Writing</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>PHED 101, Physical Education Activities</strong></td>
<td>(0)</td>
</tr>
<tr>
<td>Spring</td>
<td><strong>CHEM 106, Principles of Chemistry II</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or equivalent</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>CHEM 113, Principles of Chemistry Laboratory</strong></td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td><strong>MATH 126, Calculus II</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>PHED 102, Physical Education Activities</strong></td>
<td>(0)</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td><strong>GEOL 110, Physical Geology</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 119, Geology Laboratory</strong></td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td><strong>PHYS 115, Introductory Physics I</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td>(3)</td>
</tr>
<tr>
<td>Spring</td>
<td><strong>GEOL 210, Historical Geology and Paleontology</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or <strong>Approved elective</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>PHYS 116, Introductory Physics II</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Electives</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td><strong>GEOL 301, Stratigraphy and Sedimentation</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 341, Introductory Mineralogy and Petrology</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Approved elective</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Electives</strong></td>
<td>(6)</td>
</tr>
<tr>
<td>Spring</td>
<td><strong>Approved elective</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 210, Historical Geology and Paleontology</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 315, Structural Geology and Geodynamics</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 344, Igneous and Metamorphic Petrology</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 317, Spring Field Course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 390, Introduction to Geological Research</strong></td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Summer between Junior and Senior years</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 360, Summer Field Camp</strong></td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 341, Introductory Mineralogy and Petrology</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 301, Stratigraphy and Sedimentation</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 391, Senior Project</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Electives</strong></td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 344, Igneous and Metamorphic Petrology</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 315, Structural Geology and Geodynamics</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 317, Spring Field Course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 392, Professional Presentation</strong></td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td><strong>Approved elective</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Elective</strong></td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td><strong>GEOL 301, Stratigraphy and Sedimentation</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 341, Introductory Mineralogy and Petrology</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td><strong>GER course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Approved elective</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Electives</strong></td>
<td>(6)</td>
</tr>
<tr>
<td>Spring</td>
<td><strong>GEOL 344, Igneous and Metamorphic Petrology</strong></td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>or <strong>GEOL 315, Structural Geology and Geodynamics</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 317, Spring Field Course</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>GEOL 392, Professional Presentation</strong></td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td><strong>Approved elective</strong></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td><strong>Elective</strong></td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Minor in Geological Sciences

Up to three courses from GEOL 101, 110, 115, and 117, plus GEOL 119 and sufficient upper level GEOL courses to total at least 15 hours.

---

*a* Suggested outline only. Program is finalized in consultation with the departmental advisor.

- a. GEOL 101 or 115 may be substituted for GEOL 110.
- b. GEOL 210 is offered even-numbered years.
- c. GEOL 301 (3 credits) is offered even-numbered years, GEOL 341 (4 credits) odd-numbered years.
- d. GEOL 315 (3 credits) is offered odd-numbered years, GEOL 344 (4 credits) even-numbered years.
- e. GEOL 317 (3 credits) is offered odd-numbered years.
## BACHELOR OF SCIENCE IN GEOLOGICAL SCIENCES DEGREE*

### Freshman Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course and Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>CHEM 105, Principles of Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or equivalent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ECES 131, Elementary Computer Programming</td>
<td>(3)*</td>
</tr>
<tr>
<td></td>
<td>MATH 121, Calculus for Science and Engineering I</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>ENGL 150, Expository Writing</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>PHED 101, Physical Education Activities</td>
<td>(0)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>CHEM 106, Principles of Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or equivalent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CHEM 113, Principles of Chemistry Laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>MATH 122, Calculus for Science and Engineering II</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>PHYS 121, General Physics I</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>PHED 102, Physical Education Activities</td>
<td>(0)</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course and Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>GEOL 110, Physical Geology</td>
<td>(3)b</td>
</tr>
<tr>
<td></td>
<td>GEOL 119, Geology Laboratory</td>
<td>(1)</td>
</tr>
<tr>
<td></td>
<td>PHYS 122, General Physics II</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>Upper level MATH or STAT course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>GEOL 210, Historical Geology and Paleontology</td>
<td>(3)c</td>
</tr>
<tr>
<td></td>
<td>or Approved elective</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>PHYS 221, General Physics III</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>Upper level MATH or STAT course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Approved elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course and Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>GEOL 301, Stratigraphy and Sedimentation</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or GEOL 341, Introductory Mineralogy and Petrology</td>
<td>(4)d</td>
</tr>
<tr>
<td></td>
<td>Upper level Science or Math course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Approved elective</td>
<td>(6)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>Approved elective</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or GEOL 210, Historical Geology and Paleontology</td>
<td>(3)e</td>
</tr>
<tr>
<td></td>
<td>GEOL 315, Structural Geology and Geodynamics</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>or GEOL 344, Igneous and Metamorphic Petrology</td>
<td>(4)f</td>
</tr>
<tr>
<td></td>
<td>GEOL 317, Spring Field Course</td>
<td>(3)g</td>
</tr>
<tr>
<td></td>
<td>GEOL 390, Introduction to Geological Research</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Upper level Science or Math course</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>GER course</td>
<td>(3)</td>
</tr>
</tbody>
</table>

### Summer between Junior and Senior years

<table>
<thead>
<tr>
<th>Course and Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 360, Summer Field Camp</td>
<td>(6)</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course and Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
<td>GEOL 341, Introductory Mineralogy and Petrology</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>or GEOL 301, Stratigraphy and Sedimentation</td>
<td>(3)d</td>
</tr>
<tr>
<td></td>
<td>GEOL 391, Senior Project</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Approved elective</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>(3)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
<td>GEOL 344, Igneous and Metamorphic Petrology</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>or GEOL 315, Structural Geology and Geodynamics</td>
<td>(3)f</td>
</tr>
<tr>
<td></td>
<td>GEOL 317, Spring Field Course</td>
<td>(3)e</td>
</tr>
<tr>
<td></td>
<td>GEOL 392, Professional Presentation</td>
<td>(2)</td>
</tr>
<tr>
<td></td>
<td>Approved electives</td>
<td>(6)</td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>

* Suggested outline only. Program is finalized in consultation with the departmental advisor.

a. Another computer programming course may be substituted for ECES 131.

b. GEOL 101 or 115 may be substituted for GEOL 110.

c. GEOL 210 is offered even-numbered years.

d. GEOL 301 (3 credits) is offered even-numbered years, GEOL 341 (4 credits) odd-numbered years.

e. Upper level Science course must be in a discipline other than geology.

f. GEOL 315 (3 credits) is offered odd-numbered years, GEOL 344 (4 credits) even-numbered years.

g. GEOL 317 is offered odd-numbered years.
### Freshman Year

**Fall**
- CHEM 105, Principles of Chemistry I ................................... (3)
- or equivalent
- MATH 125, Calculus I .................................................. (4)
- ENGL 150, Expository Writing ...................................... (3)
- GER course ....................................................................... (3)
- GER course ....................................................................... (3)
- PHED 101, Physical Education Activities .......................... (0)

**Spring**
- CHEM 106, Principles of Chemistry II ............................... (3)
- or equivalent
- CHEM 113, Principles of Chemistry Laboratory ............... (2)
- MATH 126, Calculus II .................................................... (4)
- GER course ....................................................................... (3)
- GER course ....................................................................... (3)
- PHED 102, Physical Education Activities .......................... (0)

### Sophomore Year

**Fall**
- GEOL 110, Physical Geology .......................................... (3)
- GEOL 119, Geology Laboratory ...................................... (1)
- PHYS 115, Introductory Physics I ...................................... (4)
- GER course ....................................................................... (3)
- Electives ........................................................................... (6)

**Spring**
- GEOL 210, Historical Geology and Paleontology ............. (3)
- or Equivalent elective .................................................... (3)
- GER course ....................................................................... (3)
- Approved elective .......................................................... (3)
- Electives ........................................................................... (6)

### Junior Year

**Fall**
- ESTD 101, Introduction to Environmental Thinking ........... (3)
- BIOL 110, Principles of Biology ....................................... (3)
- Approved elective .......................................................... (3)
- or
- GEOL 303, Environment and Law ................................... (3)<sup>a</sup><sup>b</sup><sup>c</sup>
- STAT 201, Basic Statistics for Social and Life Sciences ....... (3)
- or
- GEOL 321, Hydrogeology ............................................... (3)<sup>b</sup>
- GER course ....................................................................... (3)

**Spring**
- Approved elective .......................................................... (3)
- or
- GEOL 210, Historical Geology and Paleontology ............. (3)<sup>a</sup>
- GEOL 220, Environmental Geology ................................... (3)
- Elective ............................................................................. (3)
- or
- GEOL 305, Geomorphology and Remote Sensing ............. (3)<sup>a</sup>
- GEOL 317, Spring Field Course ....................................... (3)<sup>b</sup>
- GEOL 390, Introduction to Geological Research (2)
- GER course ....................................................................... (3)
- Electives ........................................................................... (3)

### Senior Year

**Fall**
- GEOL 303, Environment and Law ................................... (3)<sup>a</sup><sup>b</sup><sup>c</sup>
- or
- GEOL 317, Spring Field Course ....................................... (3)<sup>b</sup>
- or
- STAT 201, Basic Statistics for Social and Life Sciences ....... (3)
- GEOL 391, Senior Project ............................................... (3)
- Elective ............................................................................. (3)

**Spring**
- GEOL 305, Geomorphology and Remote Sensing ............. (3)<sup>a</sup>
- or
- Elective ........................................................................... (3)
- GEOL 317, Spring Field Course ....................................... (3)<sup>b</sup>
- GEOL 392, Professional Presentation .............................. (2)
- Electives ........................................................................... (6)

* Suggested outline only. Program is finalized in consultation with the departmental advisor.

a. GEOL 210, 305, and 317 are offered even-numbered years.
b. GEOL 303 or 317 and 322 are offered odd-numbered years
c. GEOL 202 (offered in Fall of even-numbered years) may be substituted for GEOL 303.
understanding of plate tectonics, properties of the earth’s interior and the interior of other planets, the nature of surface and near-surface processes, the history of the earth’s climate, and the ecology of living and ancient organisms. Geologic knowledge is fundamental to resource conservation, land use planning, environmental geochemistry, hydrology, engineering construction works, and other environmental concerns. The faculty focus their research in three areas: surface and near-surface processes, planetary and deep-earth materials, and geochemistry.

The Department of Geological Sciences offers degree programs leading to the B.A. and B.S. in geological sciences, B.A. in environmental geology, Master of Science (M.S.), and Doctor of Philosophy (Ph.D.).

**FACULTY**

Gerald Matisoff, Ph.D. (Johns Hopkins University)  
Professor and Chair  
Sedimentary and environmental geochemistry  
Ralph P. Harvey, Ph.D. (University of Pittsburgh)  
Associate Professor  
Planetary geology  
Steven A. Hauck, II, Ph.D. (Washington University)  
Assistant Professor  
Geodynamics  
Peter L. McCall, Ph.D. (Yale University)  
Professor; Director, Environmental Studies Program  
Benthic ecology, paleoecology  
Samuel M. Savin, Ph.D. (California Institute of Technology)  
Jesse Earl Hyde Professor of Geological Sciences  
Isotope geochemistry  
Beverly Z. Saylor, Ph.D. (Massachusetts Institute of Technology)  
George B. Mayer Assistant Professor of Urban and Environmental Studies  
Sedimentary geology  
James A. Van Orman, Ph.D. (Massachusetts Institute of Technology)  
Assistant Professor  
Geochemistry  

Peter J. Whiting, Ph.D. (University of California, Berkeley)  
Associate Professor  
Geomorphology, surface water hydrology, environmental geology  

**Adjunct Faculty**

James Aronson, Ph.D. (California Institute of Technology)  
Assistant Professor  
Geochronology, igneous petrology  
Philip O. Banks, Ph.D. (California Institute of Technology)  
Adjunct Associate Professor  
Geology, geochronology  
Enriqueta Barrera, Ph.D. (Case Western Reserve University)  
Adjunct Associate Professor  
Geochemistry, paleoclimatology  
Joseph T. Hannibal, Ph.D. (Kent State University)  
Adjunct Assistant Professor; Cleveland Museum of Natural History  
Invertebrate paleontology  
Michael Ketterer, Ph.D. (University of Colorado)  
Adjunct Assistant Professor; Northern Arizona University  
Analytical chemistry  
David Saja, Ph.D. (University of Pennsylvania, Philadelphia, PA.)  
Adjunct Assistant Professor; Cleveland Museum of Natural History.  
Mineralogy  
Richard C. Schmidt, Ph.D. (McGill University, Canada)  
Adjunct Professor  
Economic geology  

**UNDERGRADUATE PROGRAMS**

**Major Programs**

Students in the geological sciences obtain a solid background in basic science and mathematics as well as intensive training in the major. In addition, because of the wide variety of ways in which geologic knowledge can be applied, all students are encouraged to take electives in subjects appropriate to their personal objectives, which may be as diverse as the engineering applications of geology or the socio-economic and legal systems bearing on environmental issues. The undergraduate programs stress practical experience and field work as well as classroom study. The environmental geology major combines courses in geological sciences with courses in basic and applied sciences to provide students with an understanding of environmental problems, with employable skills, and with a background for graduate study or professional school. All students participate in a three-semester Senior Project sequence in which they propose a research project, conduct the research, write a thesis, and present it to the Department.

**Geological Sciences Major**

The minimum requirements set by the department include 8 hours each of chemistry, physics, and calculus, plus any one of GEOL 101, 110, and 115, plus GEOL 119, 210, 301, 315, 317, 341, 344, 360, 390, 391, and 392. GEOL 360 provides comprehensive field training in the summer between the junior and senior years (this course necessitates transfer credit, which must be approved by the department).

**Environmental Geology Major**

The minimum requirements set by the department include 8 hours each of chemistry and calculus, plus BIOL 110, ESTD 101, PHYS 115, and STAT 201, plus GEOL 110, 119, 210, 220, 303, 305, 317, 321, 390, 391, and 392. In the above majors, the student and his or her advisor will design the remainder of the curriculum based on individual interests, consonant with departmental and college requirements. An integrated undergraduate-graduate program leading to a master’s degree in five years is available. Special programs, such as interdisciplinary majors, also may be arranged.

**Minor in Geological Sciences**

Students may complete a minor in geological sciences by taking up to three of GEOL 101, 110, 115, and 117, plus GEOL 119 and sufficient upper level GEOL courses to total 15 hours.
GRADUATE PROGRAMS

Graduate programs leading to the Master of Science and Doctor of Philosophy degrees are offered. Both programs are flexible so as to meet the needs of the individual student. General areas of study include aquatic systems, aquatic and groundwater chemistry, environmental geochemistry, benthic ecology, biostratigraphy and paleontology, environmental and urban geology, geomorphology, limnology, paleoclimatology, petrology, sedimentary geochemistry, sedimentation and stratigraphy, stable isotope studies, meteoritics, planetary materials, geodynamics of planetary interiors, and planetary geology. More specific information will be furnished upon request by the departmental office and the Office of Admission of the School of Graduate Studies.

FACILITIES

The department is housed in the Albert W. Smith Building. Research facilities include thin sectioning and mineral separation facilities; laboratories for chemical analysis of water including an ion chromatograph, colorimetric spectrometer, electrochemistry, and an environmental glove box; alpha and gamma spectroscopic facilities for analysis of environmental nuclides; equipment for studying animal-sediment relations, including a scanning gamma spectrometer; scanning electron microscope; electron microprobe; and two double collecting gas source mass spectrometers and extraction equipment for stable isotope studies; and chemical reactors for high-temperature and high-pressure geochemical experiments. Also housed in the department are laboratories for paleontological and micropaleontological investigations and for work in ecology and sedimentology. A well-field owned by the University is available for groundwater sampling and analysis.

The department also contains a wide range of other equipment such as reflected and transmitted light microscopes, fluid inclusion microscope, cathodoluminescence microscope, submicron and clay-silt-sand particle size analyzers, high magnetic field mineral separator, X-ray diffractometer, and field equipment for groundwater and geophysical work including resistivity meter, seismic refraction instrument, ground conductivity meter, magnetometer, and gravimeter.

GEOLOGICAL SCIENCES (GEOL)

Undergraduate Courses

GEOL 101. The Earth and Planets (3)
An examination of the geological processes that have shaped the planets and moons of the inner solar system, focusing on those with relevance to our own planet Earth. Following an introduction to the fundamentals of planetary geology, lectures and exercises will explore how the inner planets (the asteroids, Mercury, Venus, Earth, the Moon, and Mars) exhibit the effects of planetary differentiation, impact cratering, volcanic activity, tectonics, climate, and interactions with life.

GEOL 110. Physical Geology (3)
Introduction to geologic processes and materials that shape the world we live in. Hydrologic cycle and evolution of landscapes. Earthquakes, volcanoes, plate tectonics, and geologic resources. Students desiring laboratory experience should enroll in GEOL 119 concurrently.

GEOL 115. Introduction to Oceanography (3)
The sciences of oceanography. Physical, chemical, biologic, and geologic features and processes of the oceans. Differences and similarities between the oceans and large lakes including the Great Lakes. Required: Sunday field trip.

GEOL 117. Weather and Climate (3)
Introduction to the study of weather and climate. Covers the basics of meteorology, climate zones, the hydrologic cycle, and weather prediction. Lectures address timely topics including greenhouse warming, past global climates, and recent advances in meteorology.

GEOL 119. Geology Laboratory (1)
Principles and techniques common to the geological sciences including rock and mineral identification, map interpretation, land form analysis, application of geological information to engineering works, and more. One three-hour laboratory or field trip weekly. Prereq: GEOL 110.

GEOL 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

GEOL 196. Energy and Society (3)
(See PHYS 196.) Cross-listed as PHYS 196.

GEOL 202. Global Environmental Problems (3)
Science, policy and ethics of environmental problems that affect the entire planet. Examination of problems of current interest, such as population growth, climate change, ozone depletion, and fisheries, from a variety of viewpoints. Construction of simple computer models of a global process using Stella II. No prerequisite.

GEOL 210. Historical Geology/Paleontology (3)
History of life as recorded in sedimentary rocks. Case histories of important basins of deposition; the interrelationships of paleogeography, plate tectonics, and evolution. Two lectures and one laboratory weekly.

GEOL 220. Environmental Geology (3)

GEOL 225. Evolution (3)
(See PHIL 225.) Cross-listed as PHIL 225.

GEOL 301. Stratigraphy and Sedimentation (3)
Formation, distribution, and composition of sediments and sedimentary rocks. Modern depositional environments and their ancient analogues; principles of stratigraphic and biostratigraphic correlation. Two lectures and one laboratory per week.

GEOL 303. Environmental Law (3)
Problems in the environmental geosciences and the legal response. Types of pollution regulation, regulation of petroleum and coal exploration and development, water rights, wildlife and public lands management, common law remedies, and the role of scientific experts. Topics of current social interest.

GEOL 305. Geomorphology and Remote Sensing (3)
Recognition and interpretation of land forms and their significance in revealing present and past geologic processes. Introduction to acquisition and analysis of data through aerial photography and satellite imagery. Two lectures and one laboratory weekly. Prereq: GEOL 110 and GEOL 119.

GEOL 307. Evolutionary Biology and Paleobiology of Invertebrates (3)
Important events in the evolution of invertebrate life; structure, function, and phylogeny of major invertebrate groups.

GEOL 315. Structural Geology and Geodynamics (3)
Theoretical analysis of deformation in earth materials, with illustrations of deformational styles in various tectonic settings and the dynamics of the Earth’s interior. Prereq: GEOL 110.

GEOL 317. Introduction to Field Methods (3)
Practice in field procedures, recognition and testing of hypotheses in the field, field mapping and analysis of sedimentary, igneous, and metamorphic rocks in deformed and tectonically active settings. Weekly meeting plus spring break field trip. Required to pay partial cost of meals, lodging, and travel. Prereq: GEOL 119.

GEOL 318. Topics in Field Methods (3)
Field analysis of geological and environmental problems. Topics and locations will vary. Requires preparatory meetings and week-long field trip, usually during spring break. Students required to pay partial cost of meals, lodging, and travel. Prereq: GEOL 119 or permission of instructor.

GEOL 321. Hydrogeology (3)
Basic and applied concepts pertaining to the occurrence and movement of groundwater. Definitions, basic equations, applications to a variety of geologic settings, wells. Requires one Saturday field trip to make field measurements, collect and analyze data, and prepare a report.

GEOL 330. Geophysical Field Methods and Laboratory (4)
Use of seismic refraction and reflection, gravity, electrical, magnetic, and electromagnetic methods to infer the earth’s structure and composition. Application of inverse theory to estimate model parameters. Requires students to make field measurements, analyze data, and
prepare a report. Includes several required Saturday field trips.

**GEOL 336. Aquatic Chemistry (4)**
Chemical equilibria occurring in natural waters. Quantitative methods of describing acid-base, metal ion/ligand, precipitation/dissolution, and oxidation/reduction reactions. Geochemical cycling of trace metals and nutrients.

**GEOL 341. Mineralogy (4)**
Crystallography, hand specimen mineralogy and petrology, principles of crystal structure and crystal chemistry, elementary thermodynamics and phase diagrams, and an introduction to the petrographic microscope. Three lectures and one three-hour laboratory weekly. Prereq: GEOL 119.

**GEOL 344. Igneous and Metamorphic Petrology (4)**
Composition, classification, and genesis of igneous and metamorphic rocks, emphasizing physical and chemical principles governing their origin. Laboratory study of rocks in thin section. Two lectures and two three-hour laboratories weekly. Prereq: GEOL 341.

**GEOL 345. Planetary Materials (1-3)**
An introduction to the materials that make up the solid matter of the solar system. Student presentations will review our current understanding of accessible primitive materials such as meteorites, cosmic dust, lunar and ancient terrestrial rocks, and their relationship to modern natural materials and solar system processes.

**GEOL 349. Geological Problems (1-3)**
Special work arranged according to the qualifications of the student.

**GEOL 350. Geochemistry (3)**
Introduction to geochemistry. Properties of the elements, elemental and isotopic fractionation, element transport, geochemical systems, geochronology, mineral reactions, the solid Earth, Earth in the solar system. A quantitative approach to modeling geochemical processes will be emphasized throughout.

**GEOL 360. Summer Field Camp (6)**
Six-week course in geologic field methods and mapping. Not offered at CWRU; must be taken at another college or university. Credits will be transferred.

**GEOL 367. Topics in Evolutionary Biology (3)**
(See ANTH 367.) Cross-listed as ANTH 367.

**GEOL 390. Introduction to Geological Research (2)**
Examination of factors in the selection, design, and conduct of research projects and in the analysis and interpretation of research results. Consideration of ethical issues in scientific research. Practice in proposal writing and oral presentation. Consultations with department faculty in preparation for individual Senior Project proposals.

**GEOL 391. Senior Project (3)**
Research project required of all department majors, based on formal project proposals presented to department faculty. Proposals may be submitted prior to the semester in which GEOL 391 is taken. Emphasis is on independence, initiative, and follow-through in planning and conducting the project. Grading deferred until completion of GEOL 392 (required). Prereq: GEOL 390.

**GEOL 392. Professional Presentation (2)**
Preparation and presentation of final written and oral reports on individual Senior Projects. Class meetings focus on group discussion of problem areas in analysis and interpretation of project results, and in styles of writing and oral presentation as demonstrated by practice examples. Prereq: GEOL 391.

**GEOL 393. Seminar in Evolutionary Biology (3)**
(See PHIL 394.) Cross-listed as PHIL 394.

**GEOL 396. Undergraduate Research in Evolutionary Biology (3)**
(See ANTH 396.) Cross-listed as ANTH 396.

**Graduate Courses**

**GEOL 405. Geomorphology and Remote Sensing (3)**
Recognition and interpretation of land forms and their significance in revealing present and past geologic processes. Introduction to acquisition and analysis of data through aerial photography and satellite imagery. Two lectures and one laboratory weekly. Prereq: GEOL 110 and GEOL 119.

**GEOL 415. Structural Geology and Geodynamics (3)**
(See GEOL 315.)

**GEOL 421. Hydrogeology (3)**
(See GEOL 321.)

**GEOL 425. Geotectonics (3)**
Interpretation of the major crustal features of the earth in terms of plate tectonics and associated phenomena.

**GEOL 436. Aquatic Chemistry (4)**
Chemical equilibria occurring in natural waters. Quantitative methods of describing acid-base, metal ion/ligand, precipitation/dissolution, and oxidation/reduction reactions. Geochemical cycling of trace metals and nutrients.

**GEOL 437. Chemistry of Natural Waters (3)**
Advanced topics in aquatic chemistry. Thermodynamics models for ion/ligand speciation in natural waters; origin and composition of seawater, chemical and mineralogical sequence during evaporation, chemical weathering, groundwater and river water chemistry, chemical cycling and a global mass balances; perturbations on natural systems by man. Predictive capabilities of box models.

**GEOL 444. Flow and Sediment Transport (3)**
This course focuses on open channel flow and sediment transport mechanics. A mathematical framework for the description of free surface flow and various modes of particle transport is built. This framework is used in discussions of geomorphic and sedimentologic processes and features. Specific topics covered include dimensional analysis, forces on settling particles, fluid flow, initiation of particle movement, bedload and suspended load transport and their calculation, and channel form.

**GEOL 445. Planetary Materials (1-3)**
An introduction to the materials that make up the solid matter of the solar system. Student presentations will review our current understanding of accessible primitive materials such as meteorites, cosmic dust, lunar and ancient terrestrial rocks, and their relationship to modern natural materials and solar system processes.

**GEOL 450. Geochemistry (3)**
(See GEOL 350.)

**GEOL 455. Isotope Geochemistry (3)**
Principles and applications of naturally occurring variations of isotopic abundances in geologic, hydrologic, and biologic systems. Includes consideration of radioactive and radiogenic isotopes and their use in geochronology and as tracers; consideration of isotopic fractionations (especially of light stable isotopes), their thermodynamic and kinetic causes, and their use in understanding mechanisms and conditions of geologic processes and as tracers. Prereq: Consent of department.

**GEOL 494. Seminar in Evolutionary Biology (3)**
(See PHIL 494.) Cross-listed as PHIL 494.

**GEOL 503. Seminar: Geomorphology/Geologic Geography (1)**

**GEOL 504. Seminar: Geochemistry (1)**

**GEOL 506. Seminar in Geophysics (1-3)**
Selected topics in geophysics: advanced research issues, classical papers, current state of the field, advanced techniques. Course content will vary depending on interests of students and faculty.

**GEOL 509. Seminar: Graduate Research (1)**

**GEOL 511. Special Readings in Geology (1-6)**
Detailed study of a selected topic in geology under the guidance of a faculty member.

**GEOL 512. Special Readings in Geology (1-6)**
Detailed study of a selected topic in geology under the guidance of a faculty member.

**GEOL 536. Seminar in Great Lakes Issues (1-3)**
Selected topics related to Great Lakes basin studies: research problems, scientific processes, classic research papers, current events, policy issues, and legislative initiatives. Course content will vary depending on interests of students and faculty. Cross-listed as BIOL 536.

**GEOL 601. Special Problems and Research (1-18)**
(Credit as arranged.)

**GEOL 651. Thesis M.S. (1-18)**
(Credit as arranged.)

**GEOL 701. Dissertation Ph.D. (1-18)**
(Credit as arranged.)

**GEOL 703. Dissertation Fellowship (1-8)**

---

**German Studies Program**

Max Kade Center for German Studies
113 Clark Hall
Phone 216-368-6202
Guilford House 305

**GERMAN STUDIES PROGRAM COMMITTEE**

Jutta Ittner
Associate Professor of German and Director, Max Kade Center for German Studies
Margaretmary Daley
Associate Professor of German
Laura Hengehold
Assistant Professor of Philosophy
Ken Ledford
Associate Professor of History
Vincent E. McHale
Professor of Political Science
Kelly McMann
Assistant Professor of Political Science
THE GERMAN STUDIES PROGRAM

In its reconstituted form, Germany has again become a major player in European and global affairs. Germany has always been considered important to European development—at various times it has been called the crossroads of the entire continent. But the economic might of modern Germany and the integration of the European Union have now made American understanding of German culture and civilization, of German contributions to the development of western civilization, more important to—and worthy of study by—American students than at any other time since 1945.

Based on the premise that understanding is beneficial to the citizens of both nations in a variety of ways, Case Western Reserve University has responded to Americans' need for preparation for the challenges of the 21st century by establishing the German Studies Program, an integrated program of study leading to the B.A. degree. The German Studies Program prepares students for life-long learning. It enables and encourages them to pursue a course of study that helps prepare them for a career in international business, for study toward a graduate degree in a variety of disciplines, or for future study in professional programs such as law, business administration, and others.

The German studies major differs from the traditional German language and literature major by the breadth of its offerings. A German studies major encourages students to study in several disciplines from a generous selection of approved courses in the humanities, arts, social sciences, and economics. A graduate of the German Studies Program is expected: to be prepared for lifelong learning; to be knowledgeable about and conversant in German contributions to western culture in such areas as literature, film, philosophy, and music; to be proficient in the German language; to understand and be able to discuss German history, government, attitudes about religion; and to use all of the above as the mark of an educated person in pursuit of a career in business or in study toward a graduate or professional degree.

Facilities available to students in the German Studies Program include the many printed and other resources available in the Max Kade Reading Room, Clark Hall Room 113.

REQUIREMENTS FOR THE MAJOR IN GERMAN STUDIES

Thirty hours from the list of approved German studies courses, including German 303, German Studies 398 (Senior Colloquium), and 24 additional hours from the approved list, no more than 9 of which may be in any one department.

SAMPLE CONCENTRATIONS FOR THE GERMAN STUDIES MAJOR

History and philosophy; German literature and theater history; political science and history; art history, music history, and religion; etc. Note that the above combinations are examples only. Within program requirements, students are free to shape the major as they wish based on their own intellectual interests.

REQUIREMENTS FOR A MINOR IN GERMAN STUDIES

At least German 303 or 311; four additional 300-level courses on the approved list of German studies courses from any two departments; or a thematic course of study (12 hours) approved in advance by the director of the German Studies Program.

Approved German Studies Courses

(Complete course descriptions are given under the appropriate departmental listings in this General Bulletin.

Art History Courses (Prerequisite: None)

ARTH 374 Impressionism to Symbolism
ARTH 381 Neoclassicism through Realism
ARTH 399 Independent Studies

Comparative Literature Courses (Prerequisite: None)

For an updated list of World Literature courses consult the program director
CMPL 190 Introduction to Comparative Literature
CMPL 300 Turning Points in Modern Culture
CMPL 399 Independent Studies

Economics Courses (Prerequisite: ECON 102; 103)

ECON 335 Comparative Economic Systems
ECON 399 Independent Studies

English Courses

ENGL 366K Feminist Theory
ENGL 368A Introduction to the Film
ENGL 368B International Cinema since 1940
ENGL 368M History of Cinema to 1940
ENGL 390 Independent Study & Creative Projects

German Language & Literature Courses

For an updated list of courses consult the program director.
GRMN 303 Studies in German Civilization
GRMN 311 Advanced Conversation
GRMN 313 Introduction to Literary Interpretation
GRMN 330 The German Novella
GRMN 326 Witches, Weddings, and Wolves
GRMN 365 Literature of Enlightenment/Storm and Stress
GRMN 366 From Lessing to Young Goethe
GRMN 350 Topics in German Lyric
GRMN 367 German Classicism/Romanticism
GRMN 375 19th Century Literature
GRMN 380 20th Century Literature I
GRMN 386 20th Century Literature II
GRMN 395 Special Topics in German Literature
GRMN 399 Independent Studies

German Studies Course (Prerequisite: Senior Status in GRST)
GRST 398 Senior Colloquium

History Courses (Prerequisite: None)

HSTY 309 Reformation Europe
HSTY 313 Women in Modern European History
HSTY 334 History of Nineteenth-Century Germany
Gerontological Studies

226 Mather Memorial
Phone 216-368-2700; Fax 216-368-2676

The gerontological studies program is a multi-disciplinary program designed to integrate research and theory about aging and old age. Prompted in part by the “graying” of the world’s population, humanists, scientists, social scientists, and professionals have become interested in understanding the position of the aged in society, the aging process in various contexts, the meaning of aging to individuals, and the physical changes that accompany aging. The program draws on the most recent thinking and research in a variety of disciplines to provide students with a background that will be helpful after graduation both in work and in graduate or professional school.

In keeping with the interdisciplinary nature of the program, the core courses are drawn from five departments: anthropology, communication sciences, history, psychology, and sociology. Students may choose from a variety of courses according to their own interests. Most of the electives are not specifically gerontology courses but cover topics that contribute to the understanding of aging and the aged. The perspectives gained in the core courses will provide the student with the background needed to relate the material in the more general courses to gerontological issues. The program is firmly grounded in the liberal arts and thus provides the student with the challenge to think and communicate effectively and to integrate diverse information, theories, and practice. Gerontological studies is an appropriate major or minor for students with a wide variety of career goals. The aging of the population has made available entry-level positions for persons with baccalaureate degrees in organizations that provide services to and formulate policy for the elderly. Many graduate programs now include an emphasis on aging for which a degree in gerontological studies would serve as a useful background. Students planning to pursue professional degrees will find that an increasing number of their clients or patients will be older adults and that problems with which they must deal will be related to the aged. The perspective provided by participating in the Gerontological Studies Program will provide students with excellent background in working with older populations. This background is particularly important for students who plan to pursue careers in human services, business, law, medicine, academics, or the sciences.

CURRENT AREAS OF RESEARCH

Faculty members associated with the program are engaged in a variety of funded research projects which include studies of: Alzheimer’s disease; cancer survivorship; patterns of care for the urban elderly in China; visual perception changes that accompany aging; the impact of high levels of physical activity on the biological aging process; grandparent-grandchild relationships; and stress, coping, and adaptation among urban community and institutionalized elderly.

PROGRAM FACULTY

Robert Binstock, Ph.D. (Harvard University)
Henry R. Luce Professor, School of Medicine
Public policy and aging; Health care policy

Dale Dannefer, Ph.D. (Rutgers University)
Professor, Sociology
Sociology of the life course and aging; theory; work & family; research methods

Gary T. Deimling, Ph.D. (Bowling Green State University)
Professor, Sociology
Sociological of aging; medical sociology; family sociology

Grover C. Gilmore, Ph.D. (Johns Hopkins University)
Professor, Psychology
Perceptual development and aging; visual information processing; memory; psychophysics

Brian Gran, Ph.D. (Northwestern University)
Assistant Professor, Sociology
Sociology of law; political sociology; comparative sociology; health care policy

Charlotte Ikels, Ph.D. (University of Hawaii)
Professor, Anthropology
Gerontology; ethnicity; Chinese and overseas Chinese; life cycle; Hong Kong, China, United States

Eva Kahana, Ph.D. (University of Chicago)
Pierce T. and Elizabeth D. Robson Professor of Humanities, Sociology; Director, Elderly Care Research Center
Sociology of aging; coping and stress in late life; institutionalization
T.J. McCallum, Ph.D. (University of Southern California)
Assistant Professor, Psychology

Chronic stress in older adults; ethnicity and caregiving; religious coping; end-of-life issues
Diana Lynn Morris, Ph.D., R.N., F.A.A.N. (Case Western Reserve University)
Associate Professor, Nursing

Aging and Mental Health; caregiver well-being; minority elder health
Richard Settersten, Ph.D. (Northwestern University)
Professor and Chair, Sociology

Sociology of aging; social theory; life course
Mary Step, Ph.D. (Kent State University)
Instructor, Communication Sciences

Emotion and affect in human communication processes
Eleanor Stoller, Ph.D. (Washington University)
Selah Chamberlain Professor, Sociology

Medical sociology; Sociology of aging
May L. Wykle, Ph.D., R.N., F.A.A.N. (Case Western Reserve University)
Florence Cellar Professor and Dean, School of Nursing; Director, University Center on Aging and Health

Health and mental health; caregiving in minority populations

UNDERGRADUATE PROGRAMS

Major
The gerontological studies program offers a major that leads to the Bachelor of Arts degree. However, it may be selected only as a second major, the first major being in a traditional academic department. The major consists of a minimum of 30 credits; 15 are in required courses and 15 are in approved elective courses. The required courses are:

ANTH 304, Anthropology of Aging (3)
COSI 345, Communication and Aging (3)
PSCL 369, Adult Development and Aging
SOCI 369, Aging in American Society (3)
SOCI 496, Public Policy and Aging (3)

At least 15 credit hours must be earned in the approved electives listed below. This list changes from time to time as departmental offerings change. Check with the director of the gerontological studies program for current information.

ANTH 215, Health, Culture, and Disease: An Introduction to Medical Anthropology (3)
ANTH 301/401, Biological Aging in Humans (3)
ANTH 318, Death and Dying (3)
SOC 269, Young and Old Face the Twenty-first Century
SOC 311, Health, Illness, and Social Behavior (3)
SOC 313, Sociology of Stress and Coping (3)
SOC 319, Sociology of Institutional Care (3)
SOC 370, Family Structure and Process (3)
GERO 397, Special Studies in Gerontology (1-3)
GERO 398, Seminar in Gerontological Studies (3)
GERO 399, Independent Studies in Gerontology (1-3)

Minor
The minor consists of 15 credits, including at least two of the core gerontology courses (ANTH 304, COSI 345, PSCL 369, SOCI 369 and SOCI 396), and any three of the approved electives or remaining core courses.

Sequence
A sequence in gerontological studies consists of 9 credit hours in three courses chosen from among the following courses: ANTH 304, COSI 345, PSCL 369, SOCI 369 and SOCI 496.

GERONTOLOGY (GERO)

Undergraduate Course
GERO 397, Special Studies in Gerontology (1-3)
Independent study. Limited to junior and senior majors and minors.

Graduate Courses
GERO 496, Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.
GERO 498, Seminar in Gerontological Studies (3)
Major themes in gerontology. Seminar members choose a problem area, explore the relevant literature from a multi-disciplinary perspective, and develop a research project using knowledge gained through community observation and library exploration.
GERO 601, Independent Study (1-3)
For students enrolled in the graduate certificate program in gerontology.

Graduate Certificate Program in Gerontology

The University Center on Aging and Health is dedicated to the premise that aging is a developmental process spanning the entire life cycle, and brings together social and behavioral sciences, health sciences, and the humanities to encourage teaching and research activities in every unit of the University.

The University Center sponsors a certificate program in gerontology for graduate and professional students and for those who already hold graduate degrees.

A student interested in a graduate certificate in gerontology must be enrolled in a master’s or doctoral program, or be a special non-degree student with at least a master’s degree (or equivalent).

To receive a certificate in gerontology, a student must submit a formal application, be approved by the University Center on Aging and Health, and take 12 credit hours of course work.

The student must complete the following courses:

1. Two three credit hour courses in gerontology within the student’s discipline, one of which can be an independent study.
2. One three credit hour course in gerontology or independent study outside the student’s discipline.
3. A three credit hour seminar in gerontology offered by the center.

For further information, contact the University Center on Aging and Health at the address listed above. Any changes in the requirements must be approved by the center director.
The Department of History offers comprehensive undergraduate and graduate programs in American history; the history of science, technology, environment and medicine; social history and policy; and the history of law. Historical studies are sometimes categorized among humanistic studies and sometimes among the social sciences. Allied with both traditions, historians seek an understanding of the past by analyzing societies and how they change over time. The Department of History offers instruction within the customary frameworks that have formed the basis of historical studies, and it also has developed special emphases in social, cultural, political, and economic perspectives that allow instruction and research on such topics as the African-American experience, the environment, business and economy, technology and science, medicine, women’s history and gender studies, legal history and comparative social history. Courses in history, or a formal major or minor in history, traditionally have been attractive to students as preparation for a wide variety of career and professional interests, including teaching, law, government, journalism, and such public history activities as archival administration, historical museum administration, restoration and preservation of historic sites, and writing.

FACULTY
Alan Rocke, Ph.D. (University of Wisconsin, Madison)
Henry Eldridge Bourne Professor and Chair
History of science; science, technology, and society

Molly W. Berger, Ph.D. (Case Western Reserve University)
Instructor
History of technology; U.S. cultural history; nineteenth and twentieth centuries

John Grabowski, Ph.D. (Case Western Reserve University)
Krieger-Mueller Associate Professor in Applied History

David C. Hammad, Ph.D. (Columbia University)
Hiram H. Haydn Professor
American social and urban history; economic history

Elisabeth Koll, D.Phil. (Oxford University)
Associate Professor
East Asian history; Chinese economic history

Kenneth F. Ledford, Ph.D. (Johns Hopkins University), J.D. (University of North Carolina)
Associate Professor; Secondary Appointment, School of Law
Modern German history; Modern European history; European legal history; history of the professions

Miriam R. Levin, Ph.D. (University of Massachusetts)
Associate Professor
Industrial culture; European technology; French cultural history

Jonathan Sadowsky, Ph.D. (Johns Hopkins University)
Dr. Theodore J. Castele Associate Professor of Medical History; Secondary Appointment, School of Medicine
Medical history; African history; comparative history

Renée Sentilles, Ph.D. (College of William and Mary)
Assistant Professor
American women’s history; U.S. cultural history; American studies

Theodore L. Steinberg, Ph.D. (Brandeis University)
Professor; Secondary Appointment, School of Law
U.S. environmental and legal history

Gillian L. Weiss, Ph.D. (Stanford University)
Assistant Professor
Early modern France; comparative slaveries

Rhonda Williams, Ph.D. (University of Pennsylvania)
Associate Professor
American-Indian history; U.S. social history

Adjunct Faculty
James M. Edmonson, Ph.D. (University of Delaware)
Adjunct Associate Professor and Director, Dittrick Medical History Center
History of technology; history of medicine; museum studies

UNDERGRADUATE PROGRAM
The department offers these basic undergraduate history programs: the history major leading to the Bachelor of Arts degree, available in two options (the regular major, and the teacher licensure major); the history minor and sequence; and the Integrated Graduate Studies Program (IGS). The department encourages student participation in the Junior Year Abroad program. Students who elect a major, a minor, or a sequence in history must consult the departmental advisor each semester for guidance in planning their schedules. In addition, the Department of History and the Department of Philosophy together offer an undergraduate major in the history and philosophy of science. The History Department also participates in, and contributes courses to, American studies, Asian studies, Environmental studies, French studies, German studies, International studies, and Women’s studies.

Major
The history major may be elected in one of two formats: the regular major, and the teacher licensure major.

A. The regular major requires a minimum of 30 hours in history courses, including HSTY 112, HSTY 113, HSTY 250 (Issues and Methods in History), and HSTY 398 (Senior Research Seminar), as well as six additional courses in history, agreed upon in consultation with the departmental advisor.

B. The teacher licensure major requires thirty hours of history, including the same four courses required for the regular major and a minimum of six semester hours in each of three focus areas: United States history, World/European studies, and Asian, African,
of the Graduate School, but must also consult the departmental advisor about the specific requirements, guidelines, and opportunities for IGS in history.

Advanced Placement Credit

Students with Advanced Placement (AP) scores of 4 or better will receive three semester hours of college credit, applicable to the total number of credits required for graduation as well as to any major, minor, or sequence in history. AP credit may not be applied to the HSTY 112 and 113 core courses. Credit by way of AP examination in U.S. history is given for HSTY 256: American Political History, and in European history for HSTY 212: Modern European History.

GRADUATE PROGRAMS

The Department of History offers both the M.A. and the Ph.D. in history, but it emphasizes its two focused Ph.D. programs, in Social History and Policy and in the History of Science, Technology, Environment and Medicine. In practice, these two programs are closely related. The department also joins with the Law School to offer an M.A. in History/J.D. double-degree program. Informally, students can combine graduate study in History with the certificate or degree programs of the Mandel Center for Nonprofit Organizations. All applicants for graduate degrees in history must submit transcripts from all previous undergraduate, graduate, and professional study, scores on the GRE aptitude test or a comparable standardized test, and three letters of recommendation. The department recommends, but does not require, an undergraduate major in history. The M.A. in history requires 27 hours of course work, including 6 hours of carefully supervised work on a master's thesis (a work of original research based on primary sources), and can be completed in as few as three semesters. It is possible to earn an M.A. in African, American, Asian, or European history; the strengths of the department are in U.S. and European history. For the joint J.D./M.A. program, students must be admitted to both the history graduate and law schools, and they can complete their degrees in either three and one-half years or three years and two summers of study, completing a total of 106 hours (including double credits of up to nine hours). Students are admitted into the History Department's graduate programs with or without a master's or professional degree. Students who do not have a master's degree in history may be required to complete that degree in the department before moving on to the Ph.D.; those who have earned graduate or professional degrees closely related to their Ph.D. programs may petition for direct admission to the Ph.D. program. Students who first complete their M.A. in history at Case Western Reserve must complete an additional 18 hours of course work, pass the qualifying exams required by their program of study, and prepare a Ph.D. dissertation while enrolling in at least 18 hours of supervised dissertation-writing work. Students who have completed their master's-level work before coming to Case Western Reserve must complete at least 18 hours of course work before taking their qualifying exams.

Program in Social History and Policy

The Social History and Policy Program is designed to prepare students for careers either as analysts and administrators of social policy, or as teachers and researchers in colleges and universities. The program defines social policy broadly to include not only welfare, family and juvenile matters, aging, health care, and medicine, but also education, urban history, environmental history, cultural policies regarding museums, libraries and similar agencies, and labor. The program recognizes that social policies are made and put into practice by private, nonprofit organizations and through legal institutions as well as through federal, state, and local legislatures and executives. Applicants for the Social History and Policy Ph.D. program must submit scores on the GRE aptitude test and three letters of recommendation. The program does not require an M.A. in history, and has admitted several students with J.D., M.S.W., library science, and other degrees, but it often requires students with limited backgrounds in U.S.
Program in the History of Science, Technology, Environment, and Medicine

The program in the History of Science, Technology, Environment and Medicine was established in 1961 as the first in the nation to emphasize the history of technology as well as the history of science. The program’s areas of particular strength include the social and cultural history of technology, both American and European, technology and science policy, the history of the physical sciences since the Renaissance, gender issues in technology and science, the history of medicine, and the history of the environment.

The course of study for the Ph.D. in the History of Science, Technology, Environment and Medicine includes the M.A. requirements, written and oral qualifying examinations, and a dissertation. While most graduates of the program teach in universities, others work in museums, archives, or deal with science policy questions. The Department of History also offers a traditional Ph.D. program in U.S. history. For this program, which does not admit students every year, an M.A. in history is strongly recommended. This program requires 18 hours of course work beyond the M.A., comprehensive oral examinations in the general field (U.S. history from the colonial period to the present), in a major field (a period or subfield of U.S. history), and in two cognate fields, at least one of which is in a field other than U.S. history.

FACILITIES FOR HISTORICAL RESEARCH AT THE UNIVERSITY

Case Western Reserve University, the other institutions in the University Circle neighborhood, and the Cleveland area in general offer excellent facilities for historical research. These facilities are especially strong in the fields of social history and policy and in the history of medicine, health care, nonprofit organizations, technology, and science. The university library’s extensive collections in these fields are significantly augmented by the holdings of the nationally-ranked Allen Memorial Library in the history of medicine and health care, and of the equally distinguished Western Reserve Historical Society in regional economic, social, nonprofit, ethnic, African-American, and Jewish history. Both the Allen Library and the Western Reserve Historical Society library are adjacent to the campus. The Cleveland Public Library, just five miles from campus in downtown Cleveland, is the third largest public library in the U.S.; it maintains excellent research collections in Ohio, U.S., and British history, technology, and business. The University has also pioneered in the development of electronic connections to other libraries and to research resources in general. Ohio’s many colleges and universities have one of the nation’s leading interlibrary loan programs.

HISTORY (HSTY)

Undergraduate Courses

HSTY 112. Introduction to American History (3)
History of the United States from the first settlements to the present. Emphasis on themes such as political and social revolution, slavery and race relations, industrialism, and national cultures.

HSTY 113. Introduction to Modern World History (3)
The history of the nineteenth and twentieth centuries in global context. Emphasis on the forces that have created or shaped the modern world: industrialization and technological change; political ideas and movements such as nationalism; European imperialism and decolonization; and the interplay of cultural values.

HSTY 117. Introduction to American Studies (3)
(See AMST 117) Cross-listed as AMST 117.

HSTY 133. Introduction to Chinese History and Civilization (3)
This course explains the continuities and discontinuities in the history of China by stressing the development and distinctive adaptations of cultural, religious, and political patterns from the origins of Chinese civilization to the present. By focusing on major cultural, socio-economic, and political issues such as Confucianism, Buddhism, trade relations, imperialism, and intellectual discourse in the overall Asian context (with particular reference to Korea and Japan), we discuss the historical development of China and its situation on entering the 21st century. Taking into account the key historical events in the last century, we examine the emergence of China as a modern nation-state and the fundamental transformation of Chinese society in the post-war period. Cross-listed as ASIA 133.

HSTY 134. Introduction to Japanese History and Civilization (3)
This course provides an introduction to various aspects of Japanese civilization, from its origins to the present. By focusing on major cultural, socio-economic, and political issues such as the adaptation and transformation of Confucianism, Buddhism, Shintoism, social structures, material culture, foreign relations, militarism, nationalism, and intellectual discourse in the overall Asian context (with particular reference to Korea and China), we discuss the historical development of Japan and the country’s position on entering the 21st century. We examine the emergence of Japan as a modern nation-state and the fundamental transformation of its society in the post-war period. Cross-listed as ASIA 134.

HSTY 135. Introduction to Modern African History (3)
A general introduction to major themes in modern African history, with an emphasis on the nineteenth and twentieth centuries. Topics include oral tradition and narrative, economic structure and dynamics, religious movements, colonialism, nationalism, and the dilemmas of independent African states. Cross-listed as ETHS 253A.

HSTY 151. Technology in European Civilization (3)
The history of technology in ancient Mediterranean, medieval, and modern European society until the First World War. The course introduces students to the relationship between technology and its social, political, and cultural settings, and to the values invested in technology at significant historical moments. There will be visits to local industrial sites, architectural and engineering monuments, and the Cleveland Museum of Art.

HSTY 152. Technology in America (3)
Origins and significance of technological developments in American history, from the first settlements to the present. Emphasis on the social, cultural, political, and economic significance of technology in American history.

HSTY 196. Energy and Society (3)
(See PHYS 196.) Cross-listed as PHYS 196.

HSTY 200. The Ancient World (3)
Ancient Western history from the origins of civilization in Mesopotamia to the dissolution of the Roman Empire in the West. Cross-listed as CLSC 201.

HSTY 201. Science in Western Thought I (3)
The development of Western thinking about the natural world and our relation to it, as part of culture, from pre-classical civilizations to the age of Newton.

HSTY 202. Science in Western Thought II (3)
The development of Western thinking about the natural world and our relation to it, as part of culture, from Newton to the modern age. HSTY 201 is not a prerequisite.
HSTY 203. Natural Philosophy (3) (See PHIL 203.) Cross-listed as PHIL 203.

HSTY 204. Introduction to the Nonprofit Sector (3) The United States has by far the largest and most important “nonprofit sector” in the world, a sector consisting of voluntary non-governmental organizations that provide health care, education and social services as well as arts, religious, and advocacy activities. Using mostly primary sources, this course considers the significance of the nonprofit sector in the U.S., its advantages and disadvantages, its uses for different groups of Americans, and current trends. Students have the option of writing either a standard term paper, or a study of strategic challenges facing a contemporary nonprofit organization.

HSTY 207. Natural Philosophy II (3) (See PHIL 204.) Cross-listed as PHIL 204.

HSTY 208. Social History of Crime (3) This course explores the relationship between law and history in American society. It uses social history methodology to suggest new ways of understanding how the law works as a system of power to advance certain interests at the expense of less powerful groups. Emphasis is on issues of pressing concern to America’s poor and working class, including the death penalty, abortion, rape, the war on drugs, and the prison industry.

HSTY 209. Women in Industrial America 1820-1930 (3) The history of American women from 1820 to 1930, set within the context of the United States’ transformation to an industrial nation. Explores the differing perspectives that race, class, and region bring to the changing nature of women’s work, their spatial and material world, efforts at national reform, and the struggle for women’s rights.

HSTY 210. Byzantine World 300-1453 (3) Development of the Byzantine empire from the emperor Constantine’s conversion to Christianity and founding of the eastern capital at Constantinople to the fall of Constantinople to Turkish forces in 1453. Cross-listed as CLSC 210.

HSTY 211. The Medieval World, 300-1500 (3) Medieval history and civilization from the fall of the Roman Empire to the age of the Renaissance. Interactions between medieval Europe and other Mediterranean and Eurasian cultures.

HSTY 212. Modern European History (3) The history of Europe from the late eighteenth century to the present. Topics normally vary from year to year.

HSTY 213. Earthquake, Flood, and Fire: Natural Disaster in History (3) The wind blows, mobile homes take flight, and people die. Natural disasters are that simple. Or are they? This course employs a historical approach to penetrate the mythology of natural disaster, focusing on the human dimension behind these so-called natural acts. By peeling back the layers of obscuration, deposited there by successive generations of city boosters and technocrats, we learn that there is nothing simple or natural behind hurricane, tornado, flood, and earthquake calamities.

HSTY 214. Comparative Slavery (3) People around the world have been enslaving one another since the beginning of time. From the seventeenth to the nineteenth centuries, millions of African chattel labored on southern plantations, supporting the “peculiar institution” whose terrible legacy remains with us today. For hundreds of years before European slave traders began ferrying human cargo across the Atlantic, however, coercive bondage was a well-entrenched feature of Mediterranean civilizations, justified by religious and secular law alike. This course will explore diverse types of unfree labor, from slavery in ancient Greece and Rome, serfdom in medieval Europe, captivity in North Africa and indentured servitude in colonial America. Did earlier systems of domination around the Mediterranean prepare the way for the establishment of Atlantic slavery? How did ideologies about religious difference, ethnicity, and race help justify this ultimate form of human degradation?

HSTY 215. Europe in the 20th Century (3) The twentieth century has seen stupendous transformations in the internal structures of European politics, economics, society, and culture in Europe’s place in the world. This course traces Europe’s transition from a continent of sovereign nation-states or empires ruled by monarchs with starkly hierarchical social structures, through wars, revolution, dictatorships, destruction, division, and destitution, to a conflicted present. The contradictory combination of peace, freedom, and pluralism combined with cultural critique of the very consumer society that has reduced conflict challenges students’ linear notions of historical development.

HSTY 216. Vikings and Medieval Scandinavia (3) A survey of the history of the Vikings and medieval Scandinavia, covering approximately the eighth to the fifteenth centuries AD. Topics explored include: causes of the “outbreak” and cessation of Viking expeditions, the role of the Vikings as raiders and/or traders in Western Europe, the role of the Vikings in the emerging states of Russia, Iceland and medieval Scandinavian law, the historicity of the saga literature, and Viking descendents—Normans and “Rus.”

HSTY 217. History of Corporate America (3) This course will explore the origins and evolution of big business’s role in American society. It is not a course about the history of corporations but rather a course that examines how corporate entities have affected fundamental aspects of political, social, and economic life. It will deal with the period from the late nineteenth century to the present and cover such topics as diverse as labor relations and advertising to media issues and lobbying. Our goal is to examine how an historical perspective can help us come to grips with topics of pressing importance to us as Americans today.

HSTY 221. Medieval and Tudor/Stuart England (3) English history from Anglo-Saxon times through the Tudor and Stuart age; kings and kingship, the growth of Parliament, the common law, international politics, and England’s relations with Celtic Britain.

HSTY 222. History of Modern England (3) Survey of English history, 1700-present, with some attention also to Wales, Scotland, and Ireland, as well as the effects of the British Empire “at home.” Themes include political change, the industrial revolution, nineteenth-century global power and twentieth-century decline, and the roles of gender, class, race, and region in British social and cultural history.

HSTY 223. The Rise and Decline of the British Empire (3) This course traces the history of the British empire, the geographically largest and perhaps politically most powerful empire of the modern world. Begins with the eighteenth century and the loss of most of the British colonies in the Americas, traces through the height of the Empire in the late 19th century, and then follows its decline and the process of decolonization in the 20th century. Examines the British Empire in its military, political, economic, social, cultural, gendered, and ideological facets.

HSTY 224. Early Modern Europe (3) Europe has not always existed. To find out who created it and when, this course will ask two fundamental questions: First, how did the geographic, linguistic, religious and ethnic characteristics of European identity develop over the course of the sixteenth, seventeenth and eighteenth centuries? Second, how did Europeans in this period influence other parts of the world? Through close readings of memoirs, treatises and chronicles, and discussions of secondary literature, we will explore the political, social, and religious history of Europe from roughly 1500 to 1800. Topics include: exploration and conquest; Protestant and Catholic reformation; witchcraft and popular culture; science and medicine; Enlightenment and Revolution.

HSTY 225. Evolution (3) (See PHIL 225.) Cross-listed as PHIL 225.

HSTY 227. Culture and Computers (3) This course explores ideas about the relationship between culture and computers. Topics range from the historical development of the internet to the process of shaping cyber-identities to representations of various computer worlds in film and fiction.

HSTY 230. Colonialism and Nationalism - The Indian Context (3) Examines British rule in India between 1700 and 1947, focusing on the colonial policies, processes, and the national movement which led to Indian independence in 1947.

HSTY 231. India Since Independence (3) The course focuses on the series of changes that contributed to building a new nation after Indian independence—in terms of caste system, issues of untouchability, arranged marriages, the agrarian struggle, women’s movements, and the Kashmir dilemma.

HSTY 232. Women in India (3) Examines the changing position of women in India, as portrayed in Vedic customs, in British India, and in contemporary modern India. Cross-listed as WMST 232.

HSTY 240. The Body in History (3) This course examines the changing experiences of human bodies in history. It shows how science and culture have shaped diverse human experiences which often appear immutable, including sexuality, eating, race, and sickness.

HSTY 250. Issues and Methods in History (3) A methodological introduction to historical research. Students use a variety of approaches to interpret and study historical problems. Specific topics and instructors normally vary from year to year.

HSTY 253. Technology and American Culture (3) American technology is a cultural phenomenon, a part of, rather than separate from, more general concerns. Examines technology through historical writings, literature, images, and both material and popular culture.

HSTY 254. The Holocaust (3) (See RLGN 254.) Cross-listed as RLGN 254.

HSTY 255. Economic History of the United States (3) The growth of the American economy from the colonial period to the present. Comparing explanations of economic growth; significant attention to the political
HSTY 261. African-American History 1865-1945
From the origins of American politics in the colonial period to the present. The Revolution and Constitutional debate; presidential politics and leadership; voters and voting patterns; Congress and the courts. Emphasis both on the ideas that animated American politics and on the relation of politics to society.

HSTY 257. Immigrants in America (3)
Immigration to America has constantly reshaped the way the nation views itself. This course examines the overall history of immigration to the United States, but places that movement within a global context. It also pays particular attention to the roles that policy and technology have played in controlling or defining immigration to America.

HSTY 258. History of Southern Africa (3)
A survey of southern Africa from about 1600. Topics include the social structure of pre-colonial African societies, the beginnings of European settlement, the rise of Shaka, the discovery of minerals and the development of industry, Zimbabwe's guerrilla war and independence, and the rise and apparent demise of apartheid.

HSTY 260. Slavery and Emancipation (3)
 Begins with the African encounter with Europeans during the emergence of the modern slave trade. Students are introduced to the documents and secondary literature on the creation and maintenance of slavery, first in colonial America, and then in the United States. The course concludes with the destruction of slavery.

HSTY 261. African-American History 1865-1945 (3)
Explores the fashioning of a modern African-American culture between emancipation and the end of World War II. Emergence of a northern-based leadership, the challenge of segregation, emergence of bourgeois culture, the fashioning of racial consciousness and black nationalism, the shift from a primarily southern and rural population to one increasingly northern and urban, the creation and contours of a modern African-American culture, the construction of racial/gender and racial/class consciousness.

HSTY 262. African-American History Since 1945 (3)
Completes the three-term sequence of the African-American history survey (although the first two courses are not prerequisites for this course). Explores some of the key events and developments shaping African-American social, political, and cultural history since 1945.

HSTY 265. History of the Professions (3)
Professions are one of the central occupational structures of modern society. This course teaches about the historical context of the professions that many students will seek to join. It covers the three classic “learned” professions of clergy, law, and medicine, and newer ones such as accounting, engineering, management, and nursing. It is comparative and interdisciplinary, examining the liberal, small-state, contexts of England and the United States, and the contrasting strong-state contexts of France, Germany, and Russia, applying theory from sociology, anthropology, and gender studies.

HSTY 266. The Engineer in America (3)
History, culture, politics, ethical considerations, and gender issues of the engineering profession in the United States.

HSTY 268. Colonialism in Africa (3)
Examines the immense social and cultural changes which took place in Africa as a result of colonial occupations, in the period roughly from 1880 to 1965. It is organized around three major rubrics which were central to the colonial experience: the spread of Christianity, economic forces which led to new forms of labor, and the growth of nationalist resistance.

HSTY 270. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women’s studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, and art history. It is the required introductory course for students taking the women’s studies major. Cross-listed as WMST 201.

HSTY 272. Sports in America: From Play to Profit (3)
This course reviews the history of sports in America from the colonial period to the present. It gives particular attention to the evolution of sports as a major business and to the roles of gender, ethnicity, and race in the history of American sport, as well as to the emergence of sport as a major defining characteristic of American life and society.

HSTY 282. Modern China (3)
Beginning with the Opium Wars, we review the historical development of intellectual discourse, public reaction, and political protest in late Imperial and Republican China from the early 19th century to the communist revolution in 1949. In contrast to the conventional description of China from a Western point of view, this course tries to explain the emergence of modern China in the context of its intellectual, political, and socio-economic transformation as experienced by Chinese in the 19th and 20th century. By discussing the influence of the West, domestic rebellions, and political radicalism, we examine how the Chinese state and society interacted in search for modernization and reforms, how these reforms were continued during the Republican period, and to what extent historical patterns can be identified in China’s present-day development.

HSTY 284. Daily Life in Imperial China (3)
This course is an interdisciplinary study of Chinese society using methodological approaches from the fields of social, cultural, economic, and art history. In order to explore the fabric of society in Imperial China (from the beginning to the early 20th century) in a creative, interactive way—including folk customs, life at the court, in city and countryside, religious activities, gender roles, material culture, consumption, entertainment, and social hierarchies—we use the excellent Chinese collection in the Cleveland Museum of Art and various visual aids such as slides and CD-ROMs in the classroom. Cross-listed as ASIA 284.

HSTY 285. Modern Japan (3)
This course introduces students to the many changes that characterize the social, political, economic, and intellectual history of modern Japan from the mid-19th century to the present. We discuss to what extent the Meiji state was built upon Japan’s “traditional” heritage, how modernization and Western influence were implemented in and perceived by society, and which factors led the government to adopt extreme imperialist and militarist policies in the early 20th century. Looking at the emergence of a new Japan after World War II, we focus on employment structures, mass culture, urbanization, gender roles, and social patterns in order to understand the transformation of modern Japanese society.

HSTY 299. Topics in History (3)
Subject matter will vary with instructor but will focus on some particular topic or historical approach. Course description available from departmental office.

HSTY 302. Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)
The rise of Hellenic thought and institutions from the eighth to the third centuries B.C., the rise of politics, the evolution of democracy at Athens, the crises of the Persian and Peloponnesian wars, fifth century historiography, the growth of individualism, and the revival of monarchy in the Hellenistic period. Cross-listed as CLSC 302.

HSTY 303. History of the Early Church: First Through Four Centuries (3)
Explores the development of the diverse traditions of Christianity in the Roman Empire from the first through the fourth centuries C.E. A variety of New Testament and extra-Biblical sources are examined in translation. Emphasis is placed on the place of Christian in the larger Roman society, and the variety of early Christian ideals of salvation, the Church, and Church leadership. Cross-listed as RELGN 373.

HSTY 304. Ancient Rome: Republic and Empire (3)
Examines the development of the Roman state from the unification of Italy in the early third century B.C. to the establishment of the oriental despotism under Diocletian and Constantine. The growth of empire in the Roman Wars, the uncertain steps toward an eastern hegemony, the crises in the Republic from the Gracchi to Caesar, the new regime of Augustus, the transformation of the leadership class in the early Empire, and the increasing dominance of the military over the civil structure. Cross-listed as CLSC 304.

HSTY 306. History Museums: Theory and Reality (3)
This course is an intensive summer internship (10 hours per week) at the Western Reserve Historical Society, complemented by extensive readings in museum/archival theory and public historical perception. It is designed both to introduce students to museum/archival work and to compare theoretical concepts with actual museum situations. Interns will be assigned a specific project within one of the Society’s curatorial or administrative divisions, but will have the opportunity to work on ancillary tasks throughout the Historical Society’s headquarters in University Circle. Prereq: Consent of department.

HSTY 307. Development of Chemistry and Chemical Engineering (3)
The development of chemical ideas: theories of matter, composition, structure, and reaction; the application of chemistry and chemical theory from antiquity to the 20th century; all considered in social context.

HSTY 308. Italian Renaissance 1350-1600 (3)
Political and cultural history of Renaissance Italy. Florence, Venice, Rome, and the development of Humanism. Extensive reading of major writers such as Machiavelli.

HSTY 309. Reformation Europe, 1500-1650 (3)
Origins and development of Protestantism, the Catholic Counter-Reformation, and the interaction between
HSTY 310. The French Revolutionary Era (3)
Causes, progress, and results of the internal transformation of France from 1789 to 1815; impact of revolutionary ideas on other European and non-European societies.

HSTY 311. Seminar: Modern American Historiography (3)
This seminar examines the approaches that professional historians of the United States have taken to the writing of American history in the past fifty years, with emphasis on changes in historical concerns, master debates among historians, and contemporary interests. Topics covered include national politics and government, economic development, social history, the history of ethnicity, race, and gender, and foreign policy and international relations. Each student will read widely and will prepare a series of reports on selected books and authors.

HSTY 312. European Legal History (3)
Examines the development of the legal systems of Central and Western Europe since the reception of Roman law. Focus will fall upon the alliance of Roman law and the absolutist state, the rise of bureaucratic absolutism, codification and the rise of liberal constitutional revolutionary ideas on other European and non-European countries from 1789 to 1815; impact of count Hail Marys on a rosary. European exploration of Muslims to baptize their children and Protestants of HSTY 314. Impostors in Early Modern Europe (3)
Examines modern European history from the perspective of women's experiences. Considers how women's productive and reproductive roles have changed, as well as changes in their political and legal rights, their social and cultural contexts, and their participation in historical movements and events.

HSTY 314. Impostors in Early Modern Europe (3)
Religious persecution during the early modern period (16th-18th centuries) compelled Jews to attend Mass, Muslims to baptize their children and Protestants of count Hail Marys on a rosary. European exploration of Asia, Africa and the Americas inspired an Englishman to pass himself off as Taiwanese and an African to present himself as a European. The choice between marriage and a convent led one woman to cut off her hair, sew her skirt into britches and make herself into a conquistador in Peru. In pursuit of social mobility, courtiers remade themselves to suit the conventions of the court. Posing, passing and pretending, these early modern Europeans crossed lines of religion, gender, race and class. Today we might call some of these figures impostors but praise others as self-made men and women. What was the difference between lying and self-fashioning in early modern Europe? What forces and phenomena compelled people to remake themselves? Was the early modern period the age of dissimulation? This course explores these questions by reading memoirs, handbooks, inquisitorial documents and plays from the period of light of contemporary theoretical literature.

HSTY 315. Heresy and Dissidence in the Middle Ages (3)
Survey of heretical individuals and groups in Western Europe from 500 - 1500 A.D., focusing on popular rather than academic heresies. The development of intolerance in medieval society and the problems of doing history from hostile sources will also be explored. Cross-listed as RLGN 315.

HSTY 318. History of Black Women in the U.S. (3)
Chronologically arranged around specific issues in black women's history organizations, participation in community and political movements, labor experiences, and expressive culture. The course will use a variety of materials, including autobiography, literature, music, and film.

HSTY 319. The Crusades (3)
This course is a survey of the history of the idea of “crusade,” the expeditions of Western Europeans to the East known as crusades, the Muslim and Eastern Christian cultures against which these movements were directed, as well as the culture of the Latin East and other consequences of these crusades. Cross-listed as RLGN 319.

HSTY 321. Colonialism, Sex, Race, and Gender (3)
This course is an exploration of four extended historical episodes in which categories of race, gender and, inevitably, sexuality have interacted and shifted as a result of colonial encounters. In different parts of the globe and at different moments in the last three centuries, these encounters between expanding imperial cultures and indigenous cultures produced societies with racial and gender hierarchies, where sex was a site of colonial anxiety, exploitation and regulation.

HSTY 322. Feminist Theory, Women's History, Gender History (3)
A reading seminar designed to expose students to current theory and methods in feminist history, as well as feminist scholarship more generally. It includes a variety of topics representative of interests and concerns shared by feminist historians, as well as a range of methodological approaches and theoretical debates. The course aims to impart a sense of the ways in which feminist theory has been applied to and has transformed historical scholarship. Cross-listed as WMST 322.

HSTY 325. U.S. Politics, Culture, and Society: 1778-1865 (3)
Explores politics, culture, and society in the United States between the War for Independence and the Civil War. Topics include the transformation of political ideology, the political process, capitalist development in cities, factories, and the countryside, and changing dynamics of class, race, and gender in both the North and South.

HSTY 332. European Diplomacy in the Age of Nationalism: 1789-1945 (3)
Presents a broad interpretation of the development of the international system in Europe between the French Revolution of 1789 and the end of the European era in 1945. It explains why and how the closed European state system at the beginning of the nineteenth century evolved into an international transcontinental system by the early twentieth century.

HSTY 334. History of 19th Century Germany (3)
Examines the political, social, economic, and cultural history of Germany from the late eighteenth century to 1914. Explores the intellectual and social background to the rise of German liberalism and nationalism, the struggle with bureaucratic absolutism, the revolutions of 1848, industrial capitalism and the emergence of a class society, unification under Bismarck, the role of the state, culture, religion, and changes of mentality, the development of mass politics, and the coming of World War I.

HSTY 335. History of 20th Century Germany (3)
Examines the tumultuous history of Germany from 1914 to the unification of the two Germanys in 1989-1990. From the totalizing and traumatic experience of World War I, through a failed revolution, the republican experiment of Weimar, the National Socialist dictatorship under Hitler and the divided Germany suspended between the superpowers, to the newly unified democratic Federal Republic. Examines the ways in which Germans have tried to reconcile the state to their society, economy, and individual lives.

HSTY 342. Russia Since the Revolution (3)
Beginning with the background to the Russian Revolutions of 1905 and 1917, this course explores the rise and fall of the communist system of the Soviet Union. It examines the radical upheavals imposed upon the Russian and other peoples of the Soviet Union, the Stalinist autocracy, post-Stalinist attempts to make the system work, the superpower era, sclerosis and stagnation, glasnost and perestroika, coup and collapse.

HSTY 348. Political and Social Thought in the Machine Age (3)
Explores the responses of economist writers, philosophers, cultural critics, and public policy makers to changes in Western society wrought by industrialization, by focusing on their concerns with technological change. Cross-listed as POSC 348.

HSTY 351. Colonial America 1607-1763 (3)
The formative years of American society and culture. Slavery and racism, expansionism, regionalism, the family, pluralism, sense of mission, and republican ideology.

HSTY 352. The Era of the American Revolution, 1763 - 1815 (3)
The causes and consequences of the American Revolution, the formation of the American Republic, and the early years of the new nation. Federalism and republicanism as theories and in application, and the role of the Americans’ experience in the age of democratic revolutions.

HSTY 353. Women in American History I (3)
The images and realities of women’s social, political, and economic lives in early America. Uses primary documents, biographies and memoirs to observe individuals and groups of women in relation to legal, religious, and social restrictions.

HSTY 354. Women in American History II (3)
With HSTY 353, forms a two-semester introduction to women's studies. The politics of suffrage and the modern woman's efforts to balance marriage, motherhood, and career. (HSTY 353 not a prerequisite.)

HSTY 355. Age of American Civil War 1815-80 (3)
This course examines the causes and consequences of the Civil War, focusing on the rise of sectionalism, the dynamics of conflict, and reconstruction. Heavy emphasis is placed on archival research in relevant primary sources.

HSTY 356. Industrial America: 1880-1940 (3)
The social, economic, and political development of American society to the industrial age. The impact of industrialism on such recurrent historical problems as technological change, race relations, social reform, urbanization, and political participation.

HSTY 358. America Since 1940 (3)
A comprehensive introduction to the recent history of the United States, organized around changes in national policy and politics. Special emphasis on the impact of World War II and the Cold War; the expansion of the federal government through the Great Society and
It considers the timing of the urban and suburban countryside. This course explores the rise of cities and urbs, and nearby towns of large metropolitan regions; nearly all Americans now live in the big cities, suburbs, and nearby towns of large metropolitan regions; one hundred years ago most Americans lived in the countryside. This course explores the rise of cities and metropolitan regions as the settings for American life. It considers the timing of the urban and suburban movements, explanations for urbanization and suburbanization, and the changing character of city, suburb, and small town life. The course pays special attention to the consequences of urban and metropolitan growth for economic opportunity, for metropolitan government, for social life and conflict, and for cultural expression and cultural change.

HSTY 366. Science, Technology, and Government (3)
Traces the development and influence of federal technology and science policies from colonial times to the present, with emphasis on the 20th century. Cross-listed as POSC 365.

HSTY 368. Modern American Legal History (3)
Examines the workings of the modern American legal system from the Civil War to the present. Focus on the relationships between the law and social, economic, and professional change. Lectures, discussions, and analysis of legal documents.

HSTY 373. Advanced Topics in American Women's History (3)
This advanced seminar is designed to allow students to investigate aspects of American women's history that are not deeply explored in other courses. The two central purposes of the course are to move students forward in their study of American women's history and to provide advanced study for graduate students and other students interested in women-focused topics. The topic is subject to change, but may be any of the following or something similar: women and medicine, images of women in popular culture, growing up female, women and political movements, women and war, etc. Prereq: HSTY 353/453 or HSTY 354/454 or consent of the department.

HSTY 377. Nuclear Weapons and Arms Control (3)
National and international problems concerning nuclear weapons, and the past and present attempts both to control their spread and to prevent their use. Topics covered include the science and technology of fusion and fusion warheads and delivery vehicles; history, domestic policies, and international relations concerning nuclear weapons; and arms control treaties and their verification. Cross-listed as POSC 375.

HSTY 378. Environmental History of North America (3)
Explores the way nature has shaped history as well as the ecological consequences of development. Focus is on the relationship between the natural and the cultural with special attention to such topics as economic growth, wilderness, disease, environmental justice, and the conquest of the American West.

HSTY 379. America in the '50s (3)
American life and culture in the decade of Elvis, Eisenhower, McCarthy and the beginnings of the Civil Rights Movement. Films, novels and recordings will supplement lectures and discussions on such topics as the Cold War, conformity, the role of women, television, the Korean War, and beatniks.

HSTY 380. The Sixties in America (3)
This course examines social, cultural, and political changes in the United States during the 1960s. We begin by examining the economic prosperity and "fragile" political consensus of the post-WWII period as well as the undercurrent of poverty, dissent, and Cold War fears. We then cover the civil rights movement, student activism, the women's movement, the growth of Liberal America and the welfare state, the Vietnam War, the counterculture and conservative youth movements, the growth of a national consumer-driven, mass-mediated market, and the music, art, and pop culture--as well as their growing reliance on technological intervention--during this period of creative efflorescence. We will do this through reading books, but also through "reading" contemporary evidence of life in America, including listening to music, viewing films, analyzing pictures and artifacts.

HSTY 381. City as Classroom (3)
In this course, the city is the classroom. We will engage with the urban terrain. We will meet weekly at League Park Community Center in Hough, interact with community members, and interface--both literally and figuratively--with the city as a way to examine the linkages between historical, conceptual, and contemporary issues, with particular attention paid to race and class dynamics, inequality, and social justice. This course will have four intersecting components, primarily focusing on American cities since the 1930s: the social and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles. Cross-listed as POSC 381 and SOCI 381.

HSTY 382. Chinese Business and Economic History (3)
This course explores China's business and economic history from the opening of the treaty ports in the early 19th century to the post-war socialist economy, the market reforms in the 1980s and 1990s, and the most recent developments in the context of China's social political transformation. One major focus of the course is a comparative approach to the issue of industrialization and the introduction of modern enterprises and economic structures into China. By examining the socio-economic background of Chinese business from family and personal networks to property rights, students learn about the institutional, cultural, and social aspects which are still relevant for business transactions and institutions in China today.

HSTY 383. The People's Republic of China (3)
Now more than ever, the Chinese state and society are facing tremendous economic, social, and political challenges. This course presents an overview of the development of Chinese Communist thought and practice from 1949 to the present day. Among the topics covered are the Great Leap Forward, the Cultural Revolution, the economic reforms of the 1980s, the Tiananmen student protests, the Communist party's crisis of legitimacy, the Taiwan problem, ecological challenges, the new socialist market economy, and current social developments from domestic migration to youth culture and new forms of nationalism. The class involves a mixture of lectures and discussion and draws on a combination of primary and secondary sources, including current news reports, films, documentaries, and fiction in translation. Cross-listed as POSC 368.

HSTY 390. Seminar in History and Philosophy of Science (3)
Required of majors in the History and Philosophy of Science.

HSTY 391. Food in History (3)
Food is intricately interconnected with the development of agriculture and other technologies, with the rise and fall of empires, with increasing understanding of diet and nutrition, with laws and regulations, with the arts, with economic development and consumer culture, and with religious and ethnic identities. By examining collective and representative episodes pertaining to each of these topics, this course explores the global history of food, from the agricultural revolution of the neolithic era to the consumer revolution of the last generation.

HSTY 394. Seminar in Evolutionary Biology (3)
(See PHIL 394.) Cross-listed as PHIL 394.

HSTY 395. History of Medicine (3)
This course treats selected topics in the history of medicine, with an emphasis on social and cultural history. Focusing on the modern period, we examine illnesses, patients, and healers, with attention to the ways sickness and medicine touch larger questions of politics, social relations and identity.

HSTY 397. Undergraduate Tutorial (1-3)
Individual instruction with members of the history faculty. Prereq: 12 hours of History.

HSTY 398. Senior Research Seminar (3)
Training in the nature and methods of historical writing and research. Prereq: Majors only, Senior standing.

Graduate Courses

HSTY 400. Graduate Topical Seminar (3)
A rotating graduate seminar, offered every semester by a different faculty member. Each semester focuses on a topic of central historiographical or methodological importance.

HSTY 402. Survey of the History of Science (3)
A graduate-level historiographic review of the history of the sciences from the seventeenth century to the present.

HSTY 404. Introduction to the Nonprofit Sector (3)
(See HSTY 204.)
HSTY 406. History Museums: Theory and Reality (3)
(See HSTY 306.)

HSTY 410. Seminar: Early American Historiography (3)
This seminar examines the historiography of early America. It is designed to acquaint history doctoral students with the major themes, methods, and scholars of American history from the seventeenth century to the mid-nineteenth century. Students will be expected to read and report on major works in the field.

HSTY 411. Seminar: Modern American Historiography (3)
(See HSTY 311.)

HSTY 422. Feminist Theory, Women's History, Gender History (3)
(See HSTY 322.) Cross-listed as WMST 422.

HSTY 451. Seminar in the History of European Technology (3)
A graduate-level, research seminar on the history of European technology from the Industrial Revolution to the present. Special emphasis is on cultural history of technology with a transatlantic view. The themes of the seminar vary from year to year, but include: communications, industrialization, control, cultural and intellectual approaches to the history of technology. Required work includes a research paper based on original sources.

HSTY 452. Readings in the History of American Technology (3)
A graduate-level review of the history of American technology.

HSTY 453. Women in American History I (3)
(See HSTY 353.)

HSTY 454. Women in American History II (3)
(See HSTY 354.)

HSTY 470. History and Cultural Studies (3)
This course explores the uses of cultural and critical theory by historians, in particular relevant developments in anthropology, literary criticism, and philosophy. Topics include collective memory, the social construction of knowledge, theories of narrativity, the concept of post-modernity, and the historical formations of class, race, gender, and nation.

HSTY 473. Advanced Topics in American Women's History (3)
(See HSTY 373.)

HSTY 475. Nuclear Weapons and Arms Control (3)
(See HSTY 377.) Cross-listed as POSC 475.

HSTY 477. Modern Policy History of the United States (3)
This course offers a historical perspective on policy and policy making in the United States since the late nineteenth century. It emphasizes the increasing role of the federal government, the persisting importance of the states, the significance of the courts, the revolutionary impact of the women’s and civil rights movements, and the consequences of the growth and transformation of the American economy. Each student selects a policy area for detailed exploration; students often choose topics related to civil rights, women’s rights, health care, environmental reform, non-profit and non-governmental organizations, the arts, and education, but other topics are also appropriate. Prereq: Consent of department for undergrads.

HSTY 480. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

HSTY 481. City as Classroom (3)
(See HSTY 381.) Cross-listed as POSC 481 and SOCI 481.

HSTY 491. Food in History (3)
(See HSTY 391.)

HSTY 494. Seminar in Evolutionary Biology (3)
(See PHIL 494.) Cross-listed as PHIL 494.

HSTY 495. History of Medicine (3)
(See HSTY 395.)

HSTY 497. Graduate Independent Study (1-3)
Independent reading and research programs with individual members of the faculty.

HSTY 601. Independent Studies (1-18)
(Credit as arranged.)

HSTY 611. Introduction to Historiography (3)
Required seminar for all M.A. and Ph.D. students. Introduces students to historiographical and methodological issues.

HSTY 651. Thesis M.A. (1-18)
(Credit as arranged.)

HSTY 701. Dissertation Ph.D. (1-18)
(Credit as arranged.) Limited to Ph.D. candidates actively engaged in the research and writing of their dissertations.

HSTY 703. Dissertation Fellowship (1-8)

History and Philosophy of Science
106 Mather House
Phone 216-368-2614; Fax 216-368-4681
Alan Rocke, Director

PROGRAM FACULTY

Alan J. Rocke, Ph.D. (University of Wisconsin, Madison)
Henry Eldridge Bourne Professor of History and Director

James M. Edmonson, Ph.D. (University of Delaware)
Director, Dittrick Medical History Center, and Adjunct Associate Professor

Miriam R. Levin, Ph.D. (University of Massachusetts)
Associate Professor of History

Colin McLarty, Ph.D. (Case Western Reserve University)
Associate Professor of Philosophy

Patricia Princehouse, Ph.D. (Harvard University)
Lecturer in Philosophy

Jonathan Sadowsky, Ph.D. (Johns Hopkins University)
Theodore J. Casete Associate Professor of Medical History

UNDERGRADUATE PROGRAM

The Department of Philosophy and the Department of History together offer an undergraduate major in the history and philosophy of science. The purpose of the major is to develop a humanistic understanding of the nature and development of science through the combined use of philosophical and historical methods. The major provides a foundation for graduate study in a range of academic disciplines and for careers in such areas as business, medicine, law, public policy, and science journalism. It also may be profitably combined with a program in one of the sciences. Within the major, a student may seek an emphasis on philosophy of science, physical science, or biological and medically related science.

MAJOR

The History and Philosophy of Science major requires 30 credit hours from courses in philosophy and in history of science and technology. Required are PHIL 101, 204, and 302; HSTY 151 and 202; HSTY/PHIL 203; HSTY/PHIL 390; and three electives approved by the major advisor.

MINOR

The minor in History and Philosophy of Science consists of HSTY 202, PHIL/ HSTY 203, and PHIL 204, plus two electives approved by the minor advisor. Students who major in the history and philosophy of science are not permitted to take a second major in philosophy or to minor in philosophy.

International Studies
111 Mather House
Phone 216-368-2425; Fax 216-368-4681
Vincent E. McHale, Director
(vem@po.cwru.edu)

International studies is a multi-disciplinary program leading to the B.A. degree. Study in the program provides students with the ability to read beyond the head-
lines, to see world events in terms of how they got to be that way, how they fit into broader issues and systems, and how one might imagine their place in shaping the future. To attain this goal, students are introduced to the methods of conceptualizing international and global issues, as well as to study of a society other than their own. They will learn to think critically about contending and complementary methods and theories, developing an appreciation for both traditional disciplinary approaches and newer cross-disciplinary approaches. Students also will acquire skills that will allow them to recognize and deal with complexity; communicative and analytical skills in a language other than English (or other than their native language); and skills in statistics, in computer-based global analysis, or in negotiation.

It is strongly recommended that all international studies students participate in at least one of several off-campus programs which will facilitate the international perspective: junior year abroad, summer internships in Washington, D.C., or professional practicum-type work experiences in Cleveland which involve an international context. It also is recommended that students have a solid foundation in economics. In addition to forming the groundwork for an evolving understanding of and lifelong engagement with the modern world, a background in international studies provides excellent, practical preparation for careers that deal with the emerging needs of our world. International studies majors go on to careers in international marketing and management, diplomatic service, health, law, social services, and journalism, as well as careers within the academic disciplines. The professional schools of business, medicine, nursing, law, and applied social sciences at Case Western Reserve all have significant international foci, and our students can explore careers in these areas during their undergraduate years. The skills, analytic abilities, and critical approaches of international studies should equip students as well for new employment patterns which may not fit into existing career descriptions.

**INTERNATIONAL STUDIES STEERING COMMITTEE**

Vincent E. McHale, Ph.D. (Pennsylvania State University)
Professor and Chair, Political Science; Director, International Studies Program

William E. Unstad, Professor of Economics
Managerial economics; industrial economics

William E. Deal, Ph.D. (Harvard University)

Severance Associate Professor of the History of Religion

Religions of China and Japan; Asian civilizations

Elisabeth Koll, D.Phil. (Oxford University)
Assistant Professor of History; Director, Asian Studies Program

East Asian history; Chinese economic history; recent China

Kenneth F. Ledford, Ph.D. (Johns Hopkins University), J.D. (University of North Carolina)
Associate Professor of History; Secondary appointment, School of Law; Director, German Studies Program

Modern German history; European social history; German and European legal history

Mihajlo D. Mesarovic, Ph.D. (Serbian Academy of Science)

Cady Staley Professor of Systems Engineering

Large-scale systems theory; multilevel systems; world and regional modeling

**Undergraduate Program**

The major in international studies requires a minimum of 33 credit hours taken from the list of approved topical and area studies courses, plus satisfaction of a language competency requirement. Each student will prepare a program of study, indicating specific course selections to meet the six area requirements below, which must be approved by a faculty advisor drawn from the steering committee membership. Students also should discuss the choice of their minor or a second major with their advisor. Among the courses chosen should be at least one course which involves the development of skills in computer applications, economic analysis, statistics, or other quantitative methods. Normally no more than two courses taken for international studies credit may count simultaneously toward a minor or another major. Courses taken to satisfy the language competency requirement are exempted from this rule, and several international studies courses contribute to the completion of the Arts and Sciences General Education Requirements.

1. **Multi-disciplinary foundations (required courses, 12 credit hours):** An introduction to four major disciplinary understandings of society and culture, principles of economics, change over time, and interactions among nations, simultaneously exposing students to a variety of world societies and issues. International studies majors will be expected to have completed the multi-disciplinary foundations courses at the University before embarking on a study abroad program. These courses are:

   ANTH 102 Being Human: An Introduction to Social and Cultural Anthropology (3)

   ECON 102 Principles of Microeconomics (3)

   HSTY 113 Introduction to Modern World History (3)

   POSC 272 Introduction to International Relations (3)

2. **Area Focus (6 credit hours):** Two courses that concentrate on a single geographic or culture area. Examples include: Africa, North America, East Asia, Europe, Latin America, and the Middle East.

3. **Topical Focus (6 credit hours):** A related pair of courses to constitute a discrete perspective on global issues and to foster an appreciation for complexity through study of particular world issues and the methods appropriate to them. Examples include pairs of courses dealing with ethnicity, international health, international economics, global and environmental analysis, or international relations. Cross-disciplinary approaches are encouraged.
4. Elective Area or Topical Courses (6 credit hours): Two additional courses within the topical and area studies course listings, providing an opportunity to experiment or to tailor the program toward particular interests in international or global issues, methodology, or other cultures.

5. Senior Colloquium (required course, 3 credit hours): The integration of prior topical and area foci in a colloquium (INTL 398) taken in the fall semester of the senior year, involving the writing of a substantial research paper. Selection of the topic and the research and writing are under supervision of a faculty tutor. Peer evaluation will be attained through regular sessions, supervised by the colloquium coordinator, at which students present their initial concepts, outlines, research, and drafts. Students will be expected to identify their faculty directors and topics by the end of their junior year. Exceptional papers may be considered for honors.

6. Language Competency (0 to 16 credit hours): Completion of four semesters in a single language. Alternatively, completion of a 300-level or above course, or by the equivalent to the completion of a non-native language competency of Modern Languages and Literatures by demonstrating to the Department of Modern Languages and Literatures a non-native language competency equivalent to the completion of a 300-level or above course, or by the completion of four semesters in a single language.

APPROVED COURSES

The International Studies Steering Committee currently recognizes over 150 courses from which the student may choose to satisfy the area and topical foci requirements. Course lists are available from the program advisor. Additional courses may be selected on the basis of individual student interest, or the discretion of the faculty advisor. Courses also may be selected from within existing area studies programs:

- American Studies Program
- Asian Studies Program
- French Studies Program
- German Studies Program
- Japanese Studies Program

INTERNATIONAL STUDIES (INTL)

Undergraduate Courses

INTL 396. International Independent Study (1-3)
Study of a topic within the scope of international studies. The student must complete a prospectus form, approved and signed by the supervising faculty member, no later than the second week of classes. The prospectus must outline the goals of the project and the research methodology to be used and is part of the basis for grading. Open to juniors and seniors majoring in international studies. Prereq: Consent of program coordinator and program prospectus form.

INTL 398. International Senior Colloquium (3)
Individual work with a faculty tutor leading to the writing of a major research paper. Regular class sessions are supervised by the colloquium coordinator in which students present their initial concepts, outlines, research, and drafts. Open only to seniors majoring in international studies. Prereq: Consent of colloquium coordinator.

Japanese Studies

203 Guilford House
Phone: 216-368-6188; Fax 216-368-2216
Takao Hagiwara, Director

JAPANESE STUDIES PROGRAM COMMITTEE

Takao Hagiwara, Ph.D. (University of British Columbia) Associate Professor of Japanese and Comparative Literature, and program director
Comparative literature; classical and modern Japanese literature, especially prose and poetry; pre-modern Japanese sensibilities and (post) modernism; Japanese language.

Linda C. Ehrlich, Ph.D. (University of Hawaii/East-West Center) Associate Professor of Japanese, Comparative Literature, and Cinema Studies
Japanese and Asian cinema; classical and modern Japanese literature; introduction to film; traditional Asian theatre; (advanced) Japanese language.

Margaret M. Fitzgerald, M.A. (Ohio State University) Lecturer in Japanese
Japanese linguistics; popular culture.

Yoshiko Kishi, M.A. (New York University)
Lecturer in Japanese
Teaching English as a Second Language; Japanese pedagogy.

Other Program Advisors

William Deal, Ph.D. (Harvard University)
Associate Professor of the History of Religion
Religions of China and Japan; Asian civilizations.

Charlotte Ikels, Ph.D. (University of Hawaii) Professor (Anthropology)
Gerontology; health care; urban life; comparative bioethics; Hong Kong, China, United States.

Elizabeth Köll, Ph.D. (Oxford University)
Assistant Professor of Modern Chinese History
Chinese socio-economic history, especially late Imperial and Republican China; business history; modern Japanese socio-economic history; history of industrialization and technological development in East Asia; the history of the railway in China.

Leonard H. Lynn, Ph.D. (University of Michigan) Professor of Management Policy
Technology policy; Technology management; US-Japan comparative research; Technological innovation.

THE JAPANESE STUDIES PROGRAM

Today’s students find themselves in a world of increasingly multi-ethnic, multi-religious, multi-cultural contexts. Through a long history of receiving, reworking and incorporating influences from nearby cultural centers on the Asian mainland and surrounding Pacific islands and from the world beyond, including Europe and the Americas, the make-up of Japanese culture can be described as multi-cultural, and thus Japanese culture is highly interdisciplinary in itself. Following this thread, the Japanese Studies program aims at fostering the student’s global and interdisciplinary perspectives, while at the same time maintaining a flexibility that allows the individual student to pursue his or her own areas of interest. To further foster the student’s linguistic and cultural development, the Japanese Studies program strongly encourages study abroad in Japan for a year, a semester, or a summer program.
Our program offers both a Major and a Minor in Japanese Studies, and the student can take a variety of courses to fulfill the requirements, ranging from four levels of the Japanese language, cinema, literature, to pop culture. Besides these core courses, we encourage the student to take related courses in such interdisciplinary areas as Asian art, cinema, comparative literature of Japan and the West, Japanese religion and history, and international business. Taking advantage of the varied resources of the University and the University Circle institutions, the Japanese Studies program makes the study of Japanese culture an integral part of the student's undergraduate education. Furthermore, the Japanese Studies program provides an excellent foundation for graduate or professional school or careers in international business and finance, careers involving technological or medical exchange, and careers in law, journalism, foreign service, or the arts.

**Degree Requirements and Course Offerings**

The B.A. major in Japanese Studies requires a minimum of 33 credit hours in the following areas:

For students beginning the major at the 200 level:
- JAPN 201 and 202 – Intermediate Japanese I, II
- JAPN 301 and 302 – Advanced Japanese I, II
- JAPN 350 – Contemporary Japanese Texts
- JAPN 351 – Japanese in Cultural Context
- JAPN 357 and 398 – Honors Thesis I and II

Students beginning the major at the 300 level do not take JAPN 201/202, but do take one “directed reading” in Japanese in an area related to the student's major research paper for JAPN 397 and 398 – Honors Thesis I and II. All other requirements for the B.A. are the same.

Courses in other disciplines also form an important component of the Japanese Studies program. They provide an international, as well as interdisciplinary, perspective on Japanese culture. Each student's program of study is supervised by a faculty advisor.

In addition to the courses required for the major, the following courses are offered in the Japanese Studies program:
- JAPN 225 – Japanese Popular Culture
- JAPN 255 – Modern Japanese Literature in Translation
- JAPN 245 – Classical Japanese Literature in Translation
- JAPN 345 – Japanese Women Writers
- JASPN 397 and 398 – Honors Thesis I and II
- JAPN 399 – Independent Study

Also see WLIT 355 Modern Japanese Novels and the West, and ASIA 235/236, 237/238, 239/240, 245, 249/250, 255 Asian Cinema and Drama.

**Program Highlights**

Departmental honors – Exceptional papers written for the senior colloquium may qualify for departmental honors.

Study abroad – A year (or semester) of study in Japan is highly recommended, as is additional study in another language. All efforts are made to grant appropriate credit for courses taken at a Japanese university during study abroad.

**Judaic Studies**

110 Mather House
Phone: 216-368-2741; Fax: 216-368-4681
Prof. Peter J. Haas, Director

**JUDAIC STUDIES PROGRAM COMMITTEE**

William Deal
Associate Professor of Religion

Ellen Landau
Professor of Humanities and Art History

Miriam Levin
Associate Professor of History

Judith Neulander
Lecturer in Folklore and Mythology

Judith Oster
Professor of English

Gillian Weiss
Assistant Professor of History

Joseph White
Professor of Political Science

Omri Yavin
Lecturer in Modern Hebrew

The Judaic Studies Program offers an interdisciplinary approach to the study of the history, religion, social experience and culture of the Jewish people. By bringing a variety of fields and disciplines to bear on its subject, the program intends to convey to students the complex interaction of forces that create and express Jewish ethnic identity. Students completing the program will have broad knowledge of the field along with the tools necessary for continued study of Jewish civilization in all its manifestations.

**MINOR**

The minor consists of 5 or 6 courses, according to the following scheme, to be taken in consultation with the program director. Only one course may be in the Department of Religion. If the Rosenthal Visiting Professor's course is cross listed in RLGN, this will count as the one course:
A. Introduction to Judaic Studies (JDST 201);
B. Three credit hours taught by the Rosenthal Visiting Professor;
C. Six additional credit hours of courses with at least 1/3 Jewish content (no more than one from RLGN).

Currently offered courses that fulfill this requirement include:
- ENGL 365E Immigrant Experience
- ENGL 366G American Jewish Literature
- HBRW 201 Intermediate Modern Hebrew I
- HBRW 202 Intermediate Modern Hebrew II
HBRW 301 Advanced Hebrew I
HBRW 302 Advanced Hebrew II
HSTY/JDST 218 Jews in Early Modern Europe
HSTY 254 The Holocaust
HSTY 257 Immigrants in America
JDST 22?, 3? courses by the Rosenthal Visiting Professor
JDST 392 Independent Research in Judaic Studies

CERTIFICATE IN JEWISH COMMUNAL SERVICE

The Mandel School of Applied Social Science (MSASS) is offering a Certificate in Jewish Communal Service. The Certificate requires four courses and an internship. Undergraduates at Case can count some of the JDST courses toward fulfillment of the requirements of this certificate.

JUDAIC STUDIES (JDST)

Undergraduate Courses

JDST 201. Introduction to Judaic Studies (3)
An introduction to the academic study of Judaic religion and culture, this course does not presuppose any previous study of, or experience with, Judaism. The course takes an interdisciplinary approach to Judaic Studies, drawing on a variety of methods used in the Social Sciences and Humanities. Through the use of these methods, the students will examine the diverse issues and questions that are driving the current field of Judaic Studies and come to conclusions about the state of the question. There will be some "field" experience including a visit to a synagogue and to a Jewish museum. Required for the Minor in Judaic Studies.

JDST 220. Jewish Tradition in Art and Architecture (3)
Tradition and transformation in Jewish artistic expression over time and across space. Course will begin with the biblical period and continue down to the present day in Israel and America. Examination of how concepts such as “Jewish” and “art” undergo change within the Jewish community over this period. Cross-listed as ARTH 220.

JDST 392. Independent Study (1-3)
Up to three semester hours of independent study may be taken in a single semester. Perreq: Prior approval of faculty member directing the project.

Department of Mathematics

220 Yost Hall
Phone 216-368-2880; Fax 216-368-5163
James C. Alexander, Chair

The Department of Mathematics offers a variety of programs leading to both undergraduate (Bachelor of Arts and Bachelor of Science) and graduate (Master of Science and Doctor of Philosophy) degrees. Prospects for employment in mathematics are good. Because of the central role of mathematics in the physical and social sciences, in engineering, and in business, there should be continuing demand for mathematicians. Applied mathematicians are in demand in industry and government. A student with an undergraduate major in mathematics, including some computer science, and with some concentrated work in an allied field, has excellent career opportunities. There is a strong demand for high school teachers in mathematics. The bachelor's degree in mathematics furnishes a strong background for graduate study in many areas (e.g., computer science, medicine, law, economics, etc.). The master's degree is sufficient for many areas of non-academic employment. The Ph.D. is necessary for college teaching.

The Math Tutoring Center, located in Yost 321A, provides a place within the Mathematics Department where students could work together and receive help as needed. Along with individual assistance, the Math Tutoring Center also conducts supplemental instruction sessions for Math 121, 122, 125 and 126. In these sessions, upperclassmen work with small groups of students on the class material.

FACULTY

James C. Alexander, Ph.D. (Johns Hopkins University)
Levi Kerr Professor and Chair
Dynamics, applied mathematics

Alejandro D. de Acosta, Ph.D. (University of California, Berkeley)
Professor
Probability; stochastic processes

Christopher Butler, M.S. (Case Western Reserve University)
Instructor
Teaching of mathematics

Daniela Calvetti, Ph.D. (University of North Carolina)
Professor
Numerical linear algebra, numerical methods for image processing, orthogonal polynomials and quadrature rules, large-scale eigenvalue computations.

David Gurarie, Ph.D. (Hebrew University, Jerusalem, Israel)
Professor
Mathematical physics; differential equations; geophysical modeling; harmonic analysis

Michiel Hochstenbach, PhD. (University of Utrecht)
Assistant Professor
Numerical linear algebra; industrial mathematics

Michael G. Hurley, Ph.D. (Northwestern University)
Professor
Differentiable dynamical systems

Steven H. Izen, Ph.D. (Massachusetts Institute of Technology)
Associate Professor
Mathematics of imaging; image reconstruction

Peter Kotelnenez, Ph.D. (Universitat Bremen)
Professor
Probability theory, stochastic processes, particle systems

Joel Langer, Ph.D. (University of California, Santa Cruz)
Professor
Differential geometry; calculus of variations

Dong Hoon Lee, Ph.D. (Tulane University)
Professor
Lie groups and algebraic groups

Marshall J. Leitman, Ph.D. (Brown University)
Professor
Integral equations; continuum physics
BACHELOR OF ARTS DEGREE
Major in Mathematics

Freshman Year

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>Fall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>MATH 121 Calculus for Science and Engineering I .......... (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ......................................................... (3-4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ........................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGL 150 Expository Writing ...................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHED 101 Physical Education Activities ........................ (0)</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>MATH 122 Calculus for Science and Engineering II .......... (4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENGR 131 Elementary Computer Programming .................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 150 Mathematics from a Mathematician's Perspective .............................................. (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ........................................................... (3-4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ........................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PHED 102 Physical Education Activities ........................ (0)</td>
<td></td>
</tr>
</tbody>
</table>

Sophomore Year

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>Fall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>MATH 223 Calculus for Science and Engineering III .......... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 307 Abstract and Linear Algebra I ........................ (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ........................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course in selected minor held .................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (6)</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>MATH 224 Elementary Differential Equations ........................ (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 308 Abstract and Linear Algebra II ........................ (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ........................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (6)</td>
<td></td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>Fall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>MATH 321 Fundamentals of Analysis I ............................ (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approved elective in mathematics ................................. (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course in selected minor held .................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (6)</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>MATH 322 Fundamentals of Analysis II ............................ (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GER Course ........................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MATH 324 Introduction to Complex Analysis ..................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or MATH 425 Complex Analysis I ..................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (6)</td>
<td></td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Credit Hours</th>
<th>Fall</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td>Course in selected minor field ................................. (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approved elective in mathematics ................................. (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (9)</td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>GER Course ........................................................... (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approved elective in mathematics ................................. (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electives .................................................................... (9)</td>
<td></td>
</tr>
</tbody>
</table>
### Bachelor of Science in Applied Mathematics

#### Freshman Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td>Open elective or humanities/social science .................... (3-0-3)b</td>
</tr>
<tr>
<td>GER: Science Sequence I ........................................ (3-0-3)d</td>
</tr>
<tr>
<td>Approved Science Laboratory ......................................(1-3-2)e</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I ........... (4-0-4)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing ................................... (3-0-3)</td>
</tr>
<tr>
<td>PHED 100 Physical Education Activities ......................(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong> .................................................................(14-6-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>Humanities/social science or open elective .................... (3-0-3)a,b</td>
</tr>
<tr>
<td>GER: Science Sequence II (3-0-3)d</td>
</tr>
<tr>
<td>ENGR 131 Elementary Computer Programming ...................(2-2-3)</td>
</tr>
<tr>
<td>MATH 122 Calculus for Science and Engineering II ...... (4-0-4)</td>
</tr>
<tr>
<td>PHYS 121 General Physics I .....................................(4-0-4)</td>
</tr>
<tr>
<td>PHED 100 Physical Education Activities ......................(0-3-0)</td>
</tr>
<tr>
<td><strong>Total</strong> .................................................................(17-3-17)</td>
</tr>
</tbody>
</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td>GER: Humanities or Social Science Sequence I .............. (3-0-3)</td>
</tr>
<tr>
<td>PHYS 122 General Physics II ................................... (4-0-4)</td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III ...... (3-0-3)</td>
</tr>
<tr>
<td>MATH 304 Discrete Mathematics (3-0-3)</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td><strong>Total</strong> ..................(16-0-17)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GER: Humanities or Social Science Sequence II ............. (3-0-3)</td>
</tr>
<tr>
<td>PHYS 221 General Physics III ..................................(3-0-3)</td>
</tr>
<tr>
<td>MATH 224 Elementary Differential Equations ............... (3-0-3)</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td><strong>Total</strong> ..................(15-0-16)</td>
</tr>
</tbody>
</table>

#### Junior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td>GER: Humanities or Social Science Sequence III ........... (3-0-3)</td>
</tr>
<tr>
<td>MATH 307 Abstract and Linear Algebra I ....................(3-0-3)</td>
</tr>
<tr>
<td>MATH 321 Fundamentals of Analysis I ........................(3-0-3)</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td><strong>Total</strong> ..................(15-0-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GER: Humanities or Social Science Sequence IV ............. (3-0-3)</td>
</tr>
<tr>
<td>MATH 308 Abstract and Linear Algebra II ...................(3-0-3)</td>
</tr>
<tr>
<td>MATH 322 Fundamentals of Analysis II .......................(3-0-3)</td>
</tr>
<tr>
<td>MATH 324 Introduction to Complex Analysis .................(3-0-3)</td>
</tr>
<tr>
<td>or MATH 425 Complex Analysis I .............................(3-0-3)</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td><strong>Total</strong> ..................(15-0-15)</td>
</tr>
</tbody>
</table>

#### Senior Year

<table>
<thead>
<tr>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fall</strong></td>
</tr>
<tr>
<td>GER: Humanities or Social science elective ................(3-0-3)</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Open elective</td>
</tr>
<tr>
<td><strong>Total</strong> ..................(15-0-15)</td>
</tr>
<tr>
<td><strong>Spring</strong></td>
</tr>
<tr>
<td>GER: Humanities or Social science elective ................(3-0-3)</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td>Technical elective</td>
</tr>
<tr>
<td><strong>Total</strong> ..................(15-0-15)</td>
</tr>
</tbody>
</table>

### Total hours to graduate: Between 125-128 depending on option.

- **a.** A suitable open elective is MATH 150, Mathematics from a Mathematician’s Perspective. This course must be taken during the FRESHMAN year to count toward the 50 hours requirement for mathematics courses.
- **b.** One of these courses must be a humanities/social science elective.
- **c.** Selected students may be invited to take the honors sequence, PHYS 123, 124, 223, in place of PHYS 121, 122, 221.
- **d.** These two courses must be one of the following sequences: ASTR 201-202, CHEM 105-106, CHEM 107-108, GEOL 110 and one of GEOL 115, 210.
- **e.** BIOC 314, BIOL 111, CHEM 113, GEOL 119, PHYS 203 are appropriate.
BACHELOR OF SCIENCE IN MATHEMATICS DEGREE

Freshman Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open elective or humanities/social science ..................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>GER: Science sequence I .........................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>CMPS 131 Elementary Computer Programming ...................................</td>
<td>(2-2-3)</td>
</tr>
<tr>
<td>MATH 121 Calculus for Science and Engineering I ..........................</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing ..................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education Activities ......................................</td>
<td>(0-3-0)</td>
</tr>
<tr>
<td>Total .......................................................................................</td>
<td>(15-5-16)</td>
</tr>
</tbody>
</table>

Spring

| Humanities/social science or open elective .................................. | (3-0-3)                |
| GER: Science Sequence II ......................................................... | (3-0-3)                |
| Approved Science Laboratory ..................................................... | (1-3-2)                |
| MATH 122 Calculus for Science and Engineering II ........................ | (4-0-4)                |
| PHYS 121 General Physics I ...................................................... | (4-0-4)                |
| PHED 102 Physical Education Activities ...................................... | (0-3-0)                |
| Total ....................................................................................... | (15-6-16)              |

Sophomore Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER: Humanities or Social Science Sequence I ..................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 223 Calculus for Science and Engineering III ........................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 307 Abstract and Linear Algebra I ........................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>PHYS 122 General Physics II .....................................................</td>
<td>(4-0-4)</td>
</tr>
<tr>
<td>Open elective ............................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total .......................................................................................</td>
<td>(16-0-16)</td>
</tr>
</tbody>
</table>

Spring

| GER: Humanities or Social Science Sequence II ..................................| (3-0-3)                |
| MATH 224 Elementary Differential Equations ....................................| (3-0-3)                |
| MATH 308 Abstract and Linear Algebra II .......................................| (3-0-3)                |
| PHYS 221 General Physics III ....................................................| (3-0-3)                |
| Approved elective .......................................................................| (3-0-3)                |
| Total .......................................................................................| (15-0-15)              |

Junior Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER: Humanities or Social Science Sequence III ..................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>MATH 321 Fundamentals of Analysis I .............................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective .......................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective .......................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective ............................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total .......................................................................................</td>
<td>(15-0-15)</td>
</tr>
</tbody>
</table>

Spring

| GER: Humanities or Social Science Sequence IV ..................................| (3-0-3)                |
| MATH 322 Fundamentals of Analysis II ............................................| (3-0-3)                |
| MATH 324 Introduction to Complex Analysis .....................................| (3-0-3)                |
| or MATH 425 Complex Analysis I ..................................................| (3-0-3)                |
| Approved elective .......................................................................| (3-0-3)                |
| Approved elective .......................................................................| (3-0-3)                |
| Total .......................................................................................| (15-0-15)              |

Senior Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER: Humanities or social science elective ....................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective .......................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective .......................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective ............................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective ............................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total .......................................................................................</td>
<td>(18-0-18)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Class-Lab-Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>GER: Humanities or social science elective ....................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective .......................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Approved elective .......................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Open elective ............................................................................</td>
<td>(3-0-3)</td>
</tr>
<tr>
<td>Total .......................................................................................</td>
<td>(15-0-15)</td>
</tr>
</tbody>
</table>

Hours required for graduation: 126.

a. A suitable open elective is MATH 150, Mathematics from a Mathematician's Perspective. This course must be taken the FRESHMAN year to count towards the 50 hour requirement for mathematics courses.

b. One of these courses must be a humanities/social science elective.

c. Selected students may be invited to take the honors sequence, PHYS 123, 124, 223, in place of PHYS 121, 122, 221.

d. These two courses must be one of the following sequences: ASTR 201-202, CHEM 105-106, CHEM 107-108, GEOL 110 and one of GEOL 115, 210

e. BIOC 314, BIOL 111, CHEM 113, GEOL 119, PHYS 203 are appropriate.

The Bachelor of Science in Mathematics degree requires a minimum of 50 hours of mathematics courses, which must include MATH 121, 122, 223, 224, or an equivalent sequence and MATH 307, 308, 321, 322 or 323, 324, or 425.

“Approved electives” must be approved by the student's major advisor and may include no more than three courses from other departments. In addition the degree allows eleven open electives.

The following courses cannot be counted towards the 50 hours required for the major: MATH 120, 201, 470.

Students wishing to emphasize computing should take MATH 304, 343, and 410 along with suitable courses from the Department of Computer Engineering and Science.
(b) Core Mathematics for the B.A.
   (i) MATH 307, 308, 321, 322
   (ii) at least one of MATH 324, 425;
(c) Three approved technical electives (9 credit hours), no more than one of which can be from outside the department.

(2) Non-mathematics Requirements
A 3-credit hour course in computer science (ENGR 131 or other approved course).

Teaching Certification
High school teaching certification is available in the B.A. program in mathematics through a joint program with John Carroll University. The requirements are:
(a) Completion of the B.A. program in mathematics, including MATH 150, MATH 304, and STAT 312 as the three approved technical electives.
(b) The completion of a special minor in education. Students interested in this program should contact the director of teacher licensure for further information about eligibility and requirements.

Bachelor of Science in Mathematics Degree

(1) Mathematics Requirements
The B.S. degree in Mathematics requires at least 50 hours of mathematics courses, including
(a) MATH 121, 122, 223, and 224, or an equivalent sequence;
(b) Core Mathematics for the B.S. in Mathematics
   (i) MATH 307, 308, 321, 322
   (ii) at least one of MATH 324, 425;
(c) 21 hours (normally seven courses) of approved technical electives, no more than 9 hours of which may be from outside the department.

(2) Non-mathematics Requirements
The B.S. degree in mathematics requires the following non-mathematics courses:
(a) PHYS 121, 122, 221, or an equivalent sequence.
(b) A two-course science sequence from the following list of physical sciences: ASTR 201-202, CHEM 105-106, CHEM 111-ENGR 145, GEOL 110 and either 115 or 210.
(c) A 3-credit hour course in Computer Science (ENGR 131 or other approved course).
(d) An approved science lab (usually 2 credit hours). (BIOC 314, BIOL 111, CHEM 113, GEOL 119, PHYS 203 are appropriate.)

Bachelor of Science in Mathematics and Physics
Students with strong interests in both Mathematics and Physics may be interested in the joint Bachelor of Science degree in Mathematics and Physics, which is described under the Department of Physics in this Bulletin.

Bachelor of Science in Applied Mathematics Degree
The B.S. degree in Applied Mathematics requires at least 50 hours of mathematics and related subjects, in addition to a professional core that is specific to the area of application in which the student is interested. A student in this degree program must design a program of study (called a “track”) in consultation with his or her academic advisor. This program of study must explicitly list the technical electives and the professional core in the area of application. Some of the tracks offer the possibility of an integrated five year study leading to a B.S. in Applied Mathematics and an M.S. in the area of application. Currently there are four such tracks: computing and information science; operations research; systems engineering - systems; systems engineering - control theory. The general academic requirements for Integrated B.S./M.S. programs must be followed. (Since the graduate courses required for the M.S. degree are determined by the respective department, each student in the dual-degree program should have a secondary advisor in that department, starting no later than the junior year, and such consult with this advisor concerning requirements for the M.S. degree.)

(1) Mathematics Requirements
(a) MATH 121, 122, 223, and 224, or an equivalent sequence;
(b) Core Mathematics for Applied Mathematics
   (i) MATH 304, 307, 308, 321, 322
   (ii) at least one of MATH 324, 425;
(c) Technical Electives
18 credit hours (normally six courses) of technical electives as follows:
(i) Four approved courses, specific to the area of application in which the student is interested. (Lists of pre-approved courses for the four B.S./M.S. tracks are listed below.)
(ii) Two other courses of MATH at the 300 level or higher, except 470, 471.

Listed below are specific technical electives of the four B.S./M.S. tracks.

Computing and Information Sciences Track
Four of the following courses, of which at least two must be MATH courses. At least one numerical analysis course must be chosen. MATH 410, MATH/ECES 343, MATH 413/OPRE 514, MATH 431, PHIL 306, ECES 454, or another course with approval of the Department (note: at this writing, both new MATH and ECES courses are in development and some of these courses may be appropriate).

Operations Research Track
Four of the following courses, at least two of which must be MATH courses. MATH 431, MATH 423, MATH 491, MATH 492, MATH 495, MATH 487, MATH 489, STAT 403, STAT 406, STAT 408, STAT 484.

Systems Engineering - Control Theory Track
Four of the following MATH courses. 401, 402, 410, 413, 415, 423, 428, 431, 435, 436, 445, 465, 491,
Systems Engineering - Systems Track
Four of the following MATH courses 401, 410, 413, 423, 431, 445, 447, 469, 491, 495.

(2) Professional Core Requirements
The professional core requires 12 credit hours of course work specific to the area of application. Listed below are the professional cores for the four B.S./M.S. tracks.

Computing and Information Sciences Track
The following four courses: ECES 281, ECES 333, ECES 337, ECES 338.

Operations Research Track
MATH 380, OPRE 428, OPRE 411, and one of MATH 413, 487, 489 or another approved 400-level course.

Systems Engineering - Control Theory Track
The following four ESCI courses: 212, 304, 313, 306.

GRADUATE PROGRAMS

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees. At the master’s level there are two degrees: the degree of Master of Science in Mathematics and the degree of Master of Science in Applied Mathematics.

Doctor of Philosophy and Master of Science in Mathematics

The Ph.D. program is designed for students who intend to pursue a career in either pure or applied mathematics. The candidate must pass qualifying examinations in approved subjects; demonstrate a reading knowledge of an approved foreign language; and must present a doctoral dissertation representing significant original research. Candidates for the M.S. degree must complete 27 semester hours of approved courses and successfully pass a comprehensive examination. Throughout the student’s graduate career in the department, his or her work will be closely supervised by a faculty advisor.

Requirements for the M.S. in Applied Mathematics (except as modified for the Master’s in Entrepreneurial Mathematics, see below).

Each student, upon admission, will be assigned a committee of three members with a designated chairman, which will normally include a member from another department. This committee, with the approval of the departmental graduate committee, must approve the selection of courses the students takes, and will administer the student’s final oral examination for the MS.

1. Course hour requirements
Each M.S. student must take at least 27 hours of credit work of which at least 18 hours must be at the 400 level or higher. This credit work must occur in the following three disjoint groups:

* At least 15 hours in mathematics, applied mathematics, and statistics courses offered by the Department.
* At least 6 hours of courses outside the mathematics, applied mathematics, and statistics programs.
* Six hours of thesis work (see 3) below).

2. Breadth requirement
The courses taken with the Department must include three hours of course-work each in at least three of the following six topics. The courses listed in parentheses are suitable courses on the given topics (but some will have to be modified as remarked). We anticipate that as the interests of people in the Department change, and as new people are hired, the courses suitable for satisfying these requirements will change too, perhaps fairly frequently.

1. Analysis (Math 471 or Math 423.)
2. Probability. (Math 491.)
3. Numerical analysis. (Math 431.)
The following courses are also suitable for graduate students in Applied Mathematics. This list is not intended to be exhaustive.

Math 413  Graph Theory
Math 425  Complex Analysis
Math 432  Numerical Solution of Partial Differential Equations
Math 447  Integral Equations
Math 448  Applied Partial Differential Equations
Math 452  Continuum Mechanics
Math 469  Calculus of Variations
Math 475  Mathematics of Imaging
Math 495  Combinatorics

3. Thesis and final examination

A candidate for the MS in Applied Mathematics must write an expository or original thesis, the work for which will count as six hours graduate credit.

Toward the end of his or her work, the candidate must also pass an oral examination for the MS degree. The candidate will be questioned during this examination about the thesis and subjects related to the thesis.

Master of Science in Applied Mathematics-Entrepreneurial Track

The Master of Science in Applied Mathematics, Entrepreneurial Track, obtained through the Entrepreneurial Program in Mathematics and Computation, is a degree designed to provide training in applied mathematics for entrepreneurs who have a business idea which depends heavily on mathematics. They wish to learn enough mathematics to refine their business idea and, at the same time, acquire the business skills needed to bring this idea to the marketplace. The Master of Science in Applied Mathematics, Entrepreneurial Track, is also appropriate for industrial mathematicians who need to effectively utilize mathematical tools in a business context. It expands our basic Master of Applied Mathematics program by tightly integrating business training into the curriculum. The Entrepreneurial Track provides instruction and real business-world experience to students who have a background in mathematics and a vision for new and growing ventures.

Candidates for the M.S. in Mathematics, Entrepreneurial Track must complete at least 27 hours of course work and present a Master's thesis. It is expected that a business plan be an integral part of the thesis. The two year program includes these course requirements:

MATH 483-4 Mathematics for Innovation I and II, 6 hours
MATH 651 Thesis, 9 hours
ENTP 429 New Venture Creation, 3 hours
ENTP 441 Technology Entrepreneurship, 3 hours
Mathematics Technical Elective, 3 hours
Restricted Elective, 3 hours

The New Venture Creation and Technology Entrepreneurship courses will be offered by the Weatherhead School of Management. The Technical Elective is a 400-level or higher mathematics course or other technical elective appropriate to an individual student's program of study, as approved by the Mathematics Entrepreneurship Program Committee. The Restricted Elective is a course in mathematics, science, engineering or management appropriate to an individual student's program of study, as approved by the Mathematics Entrepreneurship Program Committee.

RESEARCH AND TEACHING

The Department of Mathematics at Case Western Reserve University is an active center for mathematical research. Faculty conduct research in algebra, applied mathematics, analysis, geometry and topology, and probability.

MATH 120. Elementary Functions and Analytic Geometry (3)

Polynomial, rational, exponential, logarithmic, and trigonometric functions (emphasis on computation, graphing, and location of roots) straight lines and conic sections. Primarily a precalculus course for the student without a good background in trigonometric functions and graphing and/or analytic geometry. Not open to students with credit for MATH 121 or MATH 125.
Prereq: Three years of high school mathematics.

MATH 121. Calculus for Science and Engineering I (4)

Functions, analytic geometry of lines and polynomials, limits, derivatives of algebraic and trigonometric functions. Definite integral, antiderivatives, fundamental theorem of calculus, change of variables. Prereq: Three and one half years of high school mathematics.

MATH 122. Calculus for Science and Engineering II (4)

Continuation of MATH 121. Exponentials and logarithms, growth and decay, inverse trigonometric functions, related rates, basic techniques of integration, area and volume, polar coordinates, parametric equations. Taylor polynomials and Taylor's theorem. Prereq: MATH 121.

MATH 123. Calculus I (4)

Limits, continuity, derivatives of algebraic and transcendental functions, including applications, basic properties of integration. Techniques of integration and applications. Prereq: Placement by the department.

MATH 124. Calculus II (4)


MATH 125. Math and Calculus Applications for Life, Managerial, and Social Sci I (4)

Discrete and continuous probability; differential and integral calculus of one variable; graphing, related rates, maxima and minima. Integration techniques, numerical methods, volumes, areas. Applications to the physical, life, and social sciences. Students planning to take more than two semesters of introductory mathematics should take MATH 121. Prereq: Three and one half years of high school mathematics.

MATH 126. Math and Calculus Applications for Life, Managerial, and Social Sci II (4)


MATH 150. Mathematics from a Mathematician's Perspective (3)

An interesting and accessible mathematical topic not covered in the standard curriculum is developed. Students are exposed to methods of mathematical reasoning and historical progression of mathematical concepts. Introduction to the way mathematicians work and their attitude toward their profession. Should be taken in freshman year to count toward a major in mathematics. Prereq: Three and one half years of high school mathematics.
MATH 201. Introduction to Linear Algebra (3)
Matrix operations, systems of linear equations, vector spaces, subspaces, bases and linear independence, eigenvalues and eigenvectors, diagonalization of matrices, linear transformations, determinants. Less theoretical than MATH 307. May not be taken for credit by mathematics majors. Only one of MATH 201 or MATH 307 may be taken for credit. Prereq: MATH 122 or MATH 126.

MATH 223. Calculus for Science and Engineering (3)

MATH 224. Elementary Differential Equations (3)

MATH 227. Calculus III (3)

MATH 228. Differential Equations (3)
Elementary ordinary differential equations: first order equations; linear systems; applications; numerical methods of solution. Prereq: MATH 227.

MATH 234. Differential Equations and Dynamical Systems (3)
An introductory course in discrete and continuous dynamics (difference and differential equations). One dimensional differential equations: dynamics; linear equations, separable equations; numerical methods. Systems of differential equations in two dimensions: dynamics of autonomous systems, numerical methods, solution of constant coefficient linear systems, with and without forcing. Laplace transforms and convolution. Discrete dynamics; introduction to chaos, numerical methods as difference equations. Linear difference equations in one and two dimensions, z-transform, convolution. Prereq: MATH 223.

MATH 301. Undergraduate Reading Course (1-3)
Students must obtain the approval of a supervising professor before registration. More than one credit hour must be approved by the undergraduate committee of the department.

MATH 302. Problem Solving Seminar (1)
A seminar devoted to methods of solving problems in various areas of mathematics. Content varies. Students may take this course for credit up to four times.

MATH 303. Elementary Number Theory (3)
Primes and divisibility, theory of congruencies, and number theoretic functions. Diophantine equations, quadratic residue theory, and other topics determined by student interest. Emphasis on problem solving (formulating conjectures and justifying them). Prereq: MATH 122.

MATH 304. Discrete Mathematics (3)
A general introduction to basic mathematical terminology and the techniques of abstract mathematics in the context of discrete mathematics. Topics introduced are mathematical reasoning, Boolean connectives, deduction, mathematical induction, sets, functions and relations, algorithms, graphs, combinatorial reasoning. Prereq: MATH 122 or MATH 126.

MATH 307. Introduction to Abstract Algebra I (3)
First semester of an integrated, two-semester theoretical course in abstract and linear algebra, studied on an axiomatic basis. The major algebraic structures studied are groups, rings, fields, modules, vector spaces, and inner product spaces. Topics include homomorphisms and quotient structures, the theory of polynomials, canonical forms for linear transformations and the principal axis theorem. This course is required of all students majoring in mathematics. Only one of MATH 201 or MATH 307 may be taken for credit. Prereq: MATH 122.

MATH 308. Introduction to Abstract Algebra II (3)

MATH 321. Fundamentals of Analysis I (3)
Abstract mathematical reasoning in the context of analysis in Euclidean space. Introduction to formal reasoning, sets and functions, and the number systems. Sequences and series; Cauchy sequences and convergence. Required for all mathematics majors. Prereq: MATH 223.

MATH 322. Fundamentals of Analysis II (3)

MATH 323. Advanced Calculus (3)

MATH 324. Introduction to Complex Analysis (3)

MATH 326. Geometry and Complex Analysis (3)
The theme of this course will be the interplay between geometry and complex analysis, algebra and other fields of mathematics. An effort will be made to highlight significant, unexpected connections between major fields, illustrating the unity of mathematics. The choice of text(s) and syllabus itself will be flexible, to be adapted to the range of interests and backgrounds of pre-enrolled students. Possible topics include: the Mobius group and its subgroups, hyperbolic geometry, elliptic functions, Riemann surfaces, applications of conformal mapping, and potential theory in classical physical models. Prereq: MATH 324 or consent of department.

MATH 327. Convexity and Optimization (3)
Introduction to the theory of convex sets and functions and to the extremes in problems in areas of mathematics where convexity plays a role. Among the topics discussed are basic properties of convex sets (extreme points, facial structure of polytopes), separation theorems, duality and polar properties of convex functions, minimax and maxima of convex functions over convex set, various optimization problems. Prereq: MATH 223 or consent.

MATH 330. Scientific Computing: Fundamentals and Applications (3)
An introductory survey to Scientific Computing, from principles to applications. Topics include accuracy and efficiency, conditioning and stability, numerical solution of linear and nonlinear systems, optimization, interpolation, quadrature rules, numerical solutions of ODEs and PDEs. Coreq: MATH 224.

MATH 338. Introduction to Dynamical Systems (3)
Nonlinear discrete dynamical systems in one and two dimensions. Chaotic dynamics, elementary bifurcation theory, hyperbolicity, symbolic dynamics, structural stability, stable manifold theory. Prereq: MATH 223.

MATH 343. Theoretical Computer Science (3)
Introduction to mathematical logic, different classes of automata and their correspondence to different classes of formal languages, recursive functions and computability, assertions and program verification, denotational semantics. MATH/EECS 343 and MATH 410 cannot both be taken for credit. Prereq: MATH 304 and EECS 340. Cross-listed as EECS 343.

MATH 345. Introduction to Applied Mathematics (3)

MATH 350. Domain Theoretic Methods for Artificial Intelligence (3)

MATH 351. Senior Project in Mathematics (6)
A two-semester course (6 credits total) in the joint B.S. in Mathematics and Physics program. Project based on numerical and/or theoretical research under the supervision of a mathematics faculty member, possibly jointly with a faculty member from physics. Study of the techniques utilized in a specific research area and of recent literature associated with the project. Work leading to meaningful results which are to be presented as a term paper and an oral report at the end of the second semester. Supervising faculty will review progress with the student on a regular basis, including detailed progress reports made twice each semester, to ensure successful completion of the work. Prereq: Consent of department.

MATH 363. Knot Theory (3)
An introduction to the mathematical theory of knots and links, with emphasis on the modern combinatorial methods. Reidemeister moves on link projections, ambient and regular isotopies, linking number tricolorability, rational tangles, braids, torus knots, seifert surfaces and genus, the knot polynomials (bracket, X, Jones, Alexander, HOMFLY), crossing numbers of alternating knots and amphicheirality. Connections to theoretical physics, molecular biology, and other scientific applications will be pursued in term projects, as appropriate to the background and interests of the students. Prereq: MATH 223.

MATH 380. Introduction to Probability (3)
MATH 410. Automata and Formal Languages (3)
Finite automata, Turing and Post machines, and pushdown automata. The languages generated, accepted, and decided by these machines. Closure properties. Decidability and undecidability. Regular expressions. Right linear, unrestricted, and context-free grammars. MATH 410 and MATH/ECECS 343 cannot both be taken for credit. Prereq: MATH 304. Cross-listed as ECECS 423.

MATH 413. Graph Theory (3)
Building blocks of a graph: trees, connectedness, transversal and connectivity, transversal, matching, coverings, planarity, and NP-complete problems; various applications and algorithms. Prereq: MATH 201 or MATH 308.

MATH 415. Group Representation Theory (3)
Representation and character theory of finite groups and certain (infinite) compact groups. Fundamental concepts and methods of the theory together with examples which are useful, particularly in quantum chemistry or physics. Suitable for undergraduates and graduates who have some acquaintance with linear algebra and group theory. Prereq: MATH 308.

MATH 421. Fundamentals of Analysis I (3)
(See MATH 321.) Additional work required. (May not be taken for credit by graduate students in the Department of Mathematics.) Coreq: MATH 223.

MATH 422. Fundamentals of Analysis II (3)
(See MATH 322.) Additional work required. (May not be taken for credit by graduate students in the Department of Mathematics.) Prereq: MATH 321.

MATH 423. Introduction to Real Analysis I (3)

MATH 424. Introduction to Real Analysis II (3)

MATH 425. Complex Analysis I (3)
Analytic functions. Integration over paths in the complex plane. Index of a point with respect to a closed path; Cauchy's theorem and Cauchy's integral formula; power series representation; open mapping theorem; singularities; Laurent expansion; residue calculus; harmonic functions; Poisson's formula; Riemann mapping theorem. More theoretical and at a higher level than MATH 324. Prereq: MATH 322.

MATH 426. Geometry and Complex Analysis (3)
(See MATH 326.)

MATH 427. Convexity and Optimization (3)
(See MATH 327.) Cross-listed as OPRE 427.

MATH 428. Fourier Analysis (3)

MATH 431. Introduction to Numerical Analysis I (3)

MATH 432. Numerical Differential Equations (3)

MATH 433. Numerical Solutions of Nonlinear Systems and Optimization (3)
The course provides an introduction to numerical solution methods for systems of nonlinear equations and optimization problems. The course is suitable for upper-undergraduate and graduate students with some background in calculus and linear algebra. Knowledge of numerical linear algebra is helpful. Among the topics which will be covered in the course are: Nonlinear systems in one variables; Newton's method for nonlinear equations and unconstrained minimization; Quasi-Newton methods; Global convergence of Newton's methods and line searches; Trust region approach; Secant methods; Nonlinear least squares. Prereq: MATH 223, MATH 201, MATH 431 or permission.

MATH 434. Optimization of Dynamic Systems (3)

MATH 445. Introduction to Partial Differential Equations (3)
Method of characteristics for linear and quasi-linear equations. Second order equations of elliptic, parabolic, hyperbolic types; initial and boundary value problems. Method of separation of variables, eigenfunction expansions, Sturm-Liouville theory. Fourier, Laplace, Hankel transforms; Bessel functions, Legendre polynomials. Green's functions. Examples include: heat diffusion, Laplace's equation, wave equations, one dimensional gas dynamics and others. Appropriate for seniors and graduate students in science, engineering, and mathematics. Prereq: MATH 201 and MATH 224.

MATH 448. Applied Partial Differential Equations (3)
Continuation of MATH 445. Linear and nonlinear partial differential equations, with emphasis on applications. Variational methods; asymptotic and
perturbation methods; regular and singular perturbations; boundary layer, multiple scales, method of geometric optics and stationary phase. Applications to fluid dynamics, elasticity; optics; wave propagation. Topics depend upon instructor and may vary from year to year. Appropriate for seniors and graduate students in science, engineering and mathematics. Prereq: MATH 445.


MATH 462. Algebraic Topology (3) The fundamental group and covering spaces; van Kampen's theorem. Higher homotopy groups; long exact sequence of a pair. Homology theory; chain complexes; short and long exact sequences; Mayer-Vietoris sequence. Homology of surfaces and complexes; applications. Prereq: MATH 461.

MATH 465. Differential Geometry (3) Manifolds and differential geometry. Vector fields; Riemannian metrics; curvature; intrinsic and extrinsic geometry of surfaces and curves; structural equations of Riemannian geometry; the Gauss-Bonnet theorem. Prereq: MATH 321.

MATH 467. Differentiable Manifolds (3) Differentiable manifolds and structures on manifolds. Tangent and cotangent bundle; vector fields; differential forms; tensor calculus; integration and Stokes' theorem. May include Hamiltonian systems and their formulation on manifolds; symplectic structures; connections and curvature; foliations and integrability. Prereq: MATH 322.

MATH 469. Calculus of Variations (3) Examples of variational problems; variation of a functional; linear spaces; Frechet derivative; Euler Lagrange equations; Lagrange multipliers; Hamiltonian formulation; canonical coordinates; Noether's theorem; second variation; conjugate points; direct methods. Other topics such as existence and regularity of solutions; Sobolev spaces; depending on audience. Prereq: MATH 224.


MATH 475. Mathematics of Imaging in Industry and Medicine (3) The mathematics of image reconstruction; properties of radon transform, relation to Fourier transform; inversion methods, including convolution, backprojection, rho-filtered layergram, algebraic reconstruction technique (ART), and orthogonal polynomial expansions. Reconstruction from fan beam geometry limited angle techniques used in NMR; survey of applications. Prereq: PHYS 431 and MATH 345 or MATH 471.

MATH 481. Introduction to Mathematical Methods in Finance (3) (See MATH 381.)


MATH 499. Special Topics (3) Special topics in mathematics.

MATH 501. Topics in Algebra (3) Selected topics from fields, rings, and modules. Prereq: MATH 527 or MATH 530.


MATH 563. Topology Seminar (1-3) Continuing seminar on areas of current interest in topology and geometry. Topics may include: minimal submanifolds; hyperbolic geometry and diffeomorphisms of surfaces; global analysis; discrete dynamical systems; gauge theory; symplectic geometry; closed geodesics. May be taken more than once for credit.

MATH 601. Reading and Research Problems (1-18) Presentation of individual research, discussion, and investigation of research papers in a specialized field of mathematics.

MATH 651. Thesis (M.S.) (1-18)

MATH 701. Dissertation (Ph.D.) (1-18)

MATH 703. Dissertation Fellowship (1-8)
M. Gabriela Copertari, Ph.D. (Georgetown University)
Assistant Professor of Spanish
Latin American literature and film, especially Argentina; women's writing; the modernista novel.

Margaret Mary Daley, Ph.D. (Yale University)
Associate Professor of German
Eighteenth- and nineteenth-century German literature; German women writers; women's studies; feminist literary criticism.

Gilbert Doho, Doctorat d’Etat (University of the Sorbonne Nouvelle)
Associate Professor of French
French drama; African Francophone theater and film; people theater and social movements; playwriting; African performing arts.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jennifer Colosimo, Ph.D. (Yale University)
Lecturer in French
Literature, especially Cameroon; women's writing; immigrant communities in France.

Peter Jianhua Yang, Ph.D. (University of Utah)
Associate Professor of German
German literature, emphasis on twentieth-century German literature; German theater; technology-enhanced language teaching; teaching pedagogy; business German; theatricality.

Tatiana Zilotina, Ph.D. (University of Virginia)
Instructor in Russian
Russian literature, especially poetry; the poetry of Marina Tsvetaeva; women writers; Russian culture.

Gilbert Doho, Doctorat d’Etat (University of the Sorbonne Nouvelle)
Associate Professor of French
French drama; African Francophone theater and film; people theater and social movements; playwriting; African performing arts.

Takao Hagiwara, Ph.D. (University of British Columbia)
Associate Professor of Japanese
Japanese literature, especially modern prose and poetry; classical and modern Japanese literature; pre-modern Japanese sensibilities and (post)modernism.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jorge Marturano, Ph.D. (Duke University)
Lecturer in Spanish
California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone language and culture; social theory.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jorge Marturano, Ph.D. (Duke University)
Lecturer in Spanish
California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone language and culture; social theory.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jorge Marturano, Ph.D. (Duke University)
Lecturer in Spanish
California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone language and culture; social theory.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jorge Marturano, Ph.D. (Duke University)
Lecturer in Spanish
California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone language and culture; social theory.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jorge Marturano, Ph.D. (Duke University)
Lecturer in Spanish
California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone language and culture; social theory.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.

Yuxiu Liang, M.A. (Cleveland State University, Case Western Reserve University)
Lecturer in Chinese
Chinese language and culture; social theory.

Jorge Marturano, Ph.D. (Duke University)
Lecturer in Spanish
California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Cheryl Toman, Ph.D. (University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone language and culture; social theory.

Jutta Ittner, Dr. Phil. (University of Hamburg)
Associate Professor of German
Twentieth-century German literature; contemporary women writers; poetry; literary translation; German culture; Berlin.
Subject Area Requirements (select from):

* Required only for students who begin their French Major at the Intermediate Level.

**Students at the Intermediate (200) Level select five courses (15 credit hours); students entering the program at the Advanced (300) Level select seven courses (21 credit hours).

DEPARTMENTAL OBJECTIVES

The Department of Modern Languages and Literatures at Case Western Reserve University is committed to helping students become informed and liberally educated citizens of a diverse world. By teaching students to participate fully in cultures other than their own, through the acquisition of language skills and cultural awareness, we prepare them for lifelong learning in an increasingly multilingual and multicultural world. We encourage study abroad as a means of reinforcing and strengthening language skills and of acquiring new cultural perspectives and appreciation. We offer the MA in select languages and we also encourage study abroad as a means of reinforcing and strengthening language skills and of acquiring new cultural perspectives and appreciation. We offer the MA in select languages and we also encourage study abroad as a means of reinforcing and strengthening language skills and of acquiring new cultural perspectives and appreciation.


PLACEMENT PROCEDURE

Students with prior experience in French, German, and or Spanish, however gained (e.g. in high school with or without AP courses, at another institution, via study abroad, etc.), must take a placement examination before the first week of the semester in which they enroll in one of those languages. Placement depends both on examination results and on consultation with individual faculty members.

The academic policy of Case Western Reserve University is to award credit for a 101 course in any language only upon completion of 102 in that language.

UNDERGRADUATE PROGRAMS

Major in French, German, Japanese Studies, or Spanish (30-32 hours)

Majors in French, German, Japanese Studies, and Spanish are expected: 1) to acquire the ability to understand, speak, read, and write the language(s) of their choice; and 2) to develop a sound understa nding of their cultures and literatures. The major in French, German, Japanese Studies, or Spanish consists of 30-32 hours of course work and will vary based on students’ background in the language. Individual counseling and placement tests are provided by the department.

For students placed into the 200-level: 201-202 and eight courses at the 300-level taught in the target language, or six 300-level courses plus two related courses.

For students placed into the 300-level: ten 300-level courses taught in the language, or eight 300-level courses plus two related courses.

Related courses are those outside the DMLL offerings which are closely related to French, German, Japanese, and Spanish cultures as well as those DMLL courses cross-listed with World Literature.

Minors in Modern Languages

(CHIN, FRCH, GRMN, ITAL, JAPN, RUSN, SPAN: 15-19 hours)

For students placed at the introductory level (no previous knowledge of the language): 101, 102, 201, 202 and one 300-level course.

For students placed at the 200-level or higher: five courses at the 200 and 300 levels.

Hebrew language courses may count toward the minor in Judaic Studies (described elsewhere in this Bulletin).

Undergraduate Honors in Modern Languages and Literatures

The Departmental Honors Program is for especially talented and dedicated majors. Requirements for Honors in Modern Languages and Literatures are: 1) a grade point average of at least 3.5 in the major; 2) an honors thesis (FRCH, GRMN, JAPN, or SPAN 397 and 398, beyond the 30-32 hours required for the major) devoted to the investigation of a literary, linguistic, or cultural topic. The thesis must be read and approved by two readers and will be accepted for honors only if it achieves a grade of B or better. It is written in the target language except in the case of Japanese Studies, which may permit papers in English. Students who qualify receive their degree “with Honors in Modern Languages and Literatures.” A registration form for students electing Honors in Modern Languages and Literatures is available in the departmental office.

Integrated Graduate Studies Program

The Department of Modern Languages and Literatures participates in the Integrated Graduate Studies Program, which makes it possible to complete both a B.A. and an M.A. in French within about five years of full-time study. The department
particularly recommends the program to qualified students who are interested in seeking admission to highly-competitive professional schools or Ph.D. programs. Interested students should note the general requirements and the admission procedures listed elsewhere in this publication.

GRADUATE PROGRAMS

The department offers the Master of Arts degree in French and, with English and Classics, the Master of Arts degree in World Literature.

ENGINEERING CORE REQUIREMENTS

Three courses in sequence beginning on the 100-level in any language; or, 201, 202, and one 300-level course in the same language; or, 202 and two 300-level courses in the same language; or three 300-level courses in the same language.

CHINESE COURSES (CHIN)

CHIN 101. Elementary Chinese I (4)
(Credit for CHIN 101 only upon completion of CHIN 102.) Introductory course in speaking, understanding, reading and writing Chinese. Students are expected to achieve control of the sound system and basic sentence patterns of standard Mandarin Chinese. The course emphasizes speaking and aural comprehension.

CHIN 102. Elementary Chinese II (4)
Continuation of CHIN 101.

CHIN 201. Intermediate Chinese I (4)
Emphasizes basic structures of standard Mandarin Chinese; helps students improve reading, writing, listening and speaking abilities. Chinese culture, society, and people introduced through supplementary materials and activities. Prereq: CHIN 102 or equivalent.

CHIN 202. Intermediate Chinese II (4)
Continuation of CHIN 201. Students must attend Language Resource Center in addition to class meetings. Prereq: CHIN 201.

CHIN 301. Advanced Chinese I (4)
Students work to achieve fluency in listening, speaking, reading and writing. Students must attend Language Resource Center in addition to class meetings. Prereq: CHIN 202 or equivalent.

CHIN 302. Advanced Chinese II (4)
Continuation of CHIN 301.

CHIN 303. Topics in Chinese (3)

CHIN 304. Topics in Chinese (3)

CHIN 399. Independent Study (1-3)
Directed study for those students who have progressed beyond available course offerings. Prereq: Permission of department.

FRENCH COURSES (FRCH)

Undergraduate

FRCH 101. Elementary French I (4)
(Credit for FRCH 101 only upon completion of FRCH 102.) Emphasizes conversational skills. Students expected to achieve control of sound system and basic sentence structures of French. Students must attend Language Resource Center in addition to scheduled class meetings.

FRCH 102. Elementary French II (4)

FRCH 201. Intermediate French I (4)
Intensive review of grammar and usage through readings, discussions and other activities that emphasize contemporary French life. Students must attend Language Resource Center in addition to scheduled class meetings. Prereq: FRCH 102 or equivalent.

FRCH 202. Intermediate French II (4)
A continuation of FRCH 201, the course focuses on the acquisition of intermediate-level skills in language and culture. Participation in multi-media activities in Language Resource Center is a requirement. Prereq: FRCH 201 or equivalent.

FRCH 295. The Francophone World (3)
Introduction to the Francophone communities of Canada, the Caribbean, Europe, Africa, and Asia. Emphasis on colonial and post-colonial periods through the study of history, literature, and film. Specific emphases will depend on faculty expertise. Counts toward French major only as related course. No knowledge of French required. Cross-listed as WLIT 295.

FRCH 308. The Paris Experience (3)
Three-week immersion learning experience living and studying in Paris. The focus of the course is the literature and culture of the African, Arab, and Asian communities of Paris. Students spend a minimum of fifteen hours per week visiting cultural centers and museums and interviewing authors and students about the immigrant experience. Assigned readings complement course activities. Students enrolled in FRCH 308 do course work in French. WLIT 308 students have the option of completing course work in English. Prereq: FRCH 202 for those enrolled in FRCH 308. Cross-listed as WLIT 308.

FRCH 310. Advanced Composition and Reading (3)
An initiation to the literature of Francophone expression with a focus on close reading. Students engage in the discussion of authentic, unbridled literary texts of compelling interest and progressive length and learn how to express their ideas both orally and in written form. Prereq: FRCH 202 or equivalent.

FRCH 311. Advanced Conversation I (3)
Designed to enhance pronunciation, speaking and listening comprehension through the discussion of French literature and media for children. Required for Teacher Licensure candidates. Prereq: FRCH 202 or equivalent.

FRCH 312. Advanced Conversation II (3)
A functional approach to conversation. Students work to develop fluency in spoken French using current colloquial vocabulary and focusing on current issues. Practice in using speech appropriate to a variety of situations, including public debates. Prereq: FRCH 202 or equivalent.

FRCH 314. Translation Techniques (3)
Contrastive grammar analysis and stylistics are used to foster linguistic awareness and to introduce students to the methods and skills of translation. Prereq: FRCH 202 or equivalent.

FRCH 315. Business French (3)
Business French is an upper-level course with a focus on the economic life of France and other Francophone countries. Students gain knowledge of the economic structures and the business organization of Francophone countries as they enhance the linguistic skills used in professional communication. Prereq: FRCH 202.

FRCH 316. Contemporary France (3)
A study of contemporary France, this course features discussions and lectures on a variety of topics (geography, political and social life, contemporary culture) to develop factual knowledge about France and a sound understanding of current issues as presented in the media. Prereq: FRCH 202 or equivalent.

FRCH 317. French Cinema (3)
An exploration of contemporary France, its images and values as presented in French films. French press reviews are used for discussion. A unique linguistic and cultural immersion. Prereq: FRCH 202 or equivalent.

FRCH 318. The Origins of France (3)
Examination through texts, films, and other media of major historical, intellectual, and artistic influences that have shaped the evolution of French civilization. Students will attempt to identify the values and myths that have contributed to the formation of modern France and continue to influence French actions. Prereq: FRCH 202 or equivalent.

FRCH 319. Modern France (3)
A study of France’s political, social and cultural history from the French Revolution to World War II, with emphasis on the events, movements, and people that have shaped Modern France. Highly recommended for students of Nineteenth- and Twentieth-Century French Literature. Prereq: FRCH 202 or equivalent.

FRCH 320. Introduction to French Literature (3)
Major literary movements, principal writers and outstanding works of French literature. Prereq: FRCH 202 or equivalent.

FRCH 321. French Literature to 1600 (3)
Faith. Honor. Passion. Politics. An exploration of these issues in French literature from 900 to 1600 in the context of the development of narrative, lyric and theater and as an expression of culture and thought. Prereq: FRCH 320; may be taken concurrently.

FRCH 331. Seventeenth-Century French Literature (3)
The Age of Classicism, from Descartes to Mme de Lafayette. Emphasis on Baroque literature and Classical drama. Authors, works, and topics may vary. One 300-level French course suggested prerequisite. Prereq: FRCH 320; may be taken concurrently.

FRCH 341. Eighteenth-Century French Literature (3)
Le siecle des Lumières in representative texts of the Enlightenment and pre-Romanticism. Authors, works, and topics vary. Prereq: FRCH 320; may be taken concurrently.
FRCH 351. Nineteenth-Century French Literature (3)
Romanticism, realism, and naturalism in the novel and drama. Authors, works, and topics vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 361. Twentieth-Century French Literature (3)
Study of representative novelists (e.g., Proust, Gide, Colette, Sartre, Beauvoir) and playwrights (e.g., Claudel, Beckett, Genet) in historical context. Authors, works, and topics vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 371. Topics in French Poetry (3)
Nineteenth- and twentieth-century poetry. Topics include French romanticism, symbolism, and surrealism. Prereq: FRCH 320; may be taken concurrently.

FRCH 372. Topics in French Drama (3)
A topical approach to issues and problems specific to drama. Plays, playwrights, aesthetic theories, and historical periods studied in this course may vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 373. The Novel and the Novella (3)
A study of narrative fiction focused on either the analysis of a particular genre (the novel, the short story) or a particular type of novel (e.g., psychological novel, realist novel, detective novel); the tale (the fantastic tale, the fairytale) or novella. Prereq: FRCH 320; may be taken concurrently.

FRCH 374. Major Writers and Literary Movements (3)
In-depth study of the work of a major writer, filmmaker, or intellectual figure; or of a significant literary, intellectual, or artistic movement. Approaches, content, and instructor will vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 375. Francophone Literature (3)
An examination of Francophone literature focused on the problems of identity within the colonial and post-colonial context. Writers and works may vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 376. Women Writers (3)
Examination of literary texts by French women writers; emphasizes women's important contributions to French literature. Critical essays are also studied to address women's relation to literature and to evaluate its importance from historical and theoretical perspectives. Prereq: FRCH 320; may be taken concurrently.

FRCH 377. Special Topics (3)
The special topics course is designed to respond to students' and faculty's interest in specific themes or issues not otherwise covered in the curriculum. Approaches, content, and instructor will vary. Maximum 6 credits. Prereq: FRCH 320; may be taken concurrently.

FRCH 395. French Literature in Translation (3)
Topics vary according to student and faculty interest. May include Francophone literature, literature and cinema, women writers, contemporary literature. Counts toward French major only as related course. No knowledge of French required. Cross-listed as WLIT 395.

FRCH 397. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in French. Limited to senior majors. Permit required. Prereq: Consent of department.

FRCH 398. Honors Thesis II (3)
Continuation of FRCH 397. Limited to senior majors. Permit required. Prereq: FRCH 397 and consent of department.

FRCH 399. Independent Study (1-3)
For majors and advanced students under special circumstamces. Prereq: Consent of department.

Graduate
FRCH 421. French Literature to 1600 (3)
(See FRCH 321.)
FRCH 431. Seventeenth-Century French Literature (3)
(See FRCH 331.)
FRCH 441. Eighteenth-Century French Literature (3)
(See FRCH 341.)
FRCH 451. Nineteenth-Century French Literature (3)
(See FRCH 351.)
FRCH 461. Twentieth-Century French Literature (3)
(See FRCH 361.)
FRCH 471. Topics in French Poetry (3)
(See FRCH 371.)
FRCH 472. Topics in French Drama (3)
(See FRCH 372.)
FRCH 473. The Novel and the Novella (3)
(See FRCH 373.)
FRCH 474. Major Writers and Literary Movements (3)
(See FRCH 374.)
FRCH 475. Francophone Literature (3)
(See FRCH 375.)
FRCH 476. Women Writers (3)
(See FRCH 376.)
FRCH 477. Special Topics (3)
(See FRCH 377.)
FRCH 495. French Literature in Translation (3)
(See FRCH 395.) Cross-listed as WLIT 495.
FRCH 590. Seminar: Topics in Modern Literature and Culture (3)
French literature and culture since the Revolution of 1789. Topics vary depending on student and instructor interests; may include realism and naturalism, Proust, contemporary film, Paris, feminist theory. Maximum 9 credits. Prereq: Graduate standing.
FRCH 595. Independent Research (1-3)
Graded independent work on a literary topic arranged individually with the instructor. Prereq: Graduate standing.
FRCH 601. Independent Study (1-18)
For individual students or larger groups with special interests. Prereq: Consent of department.

GERMAN COURSES (GRMN)

Undergraduate
GRMN 101. Elementary German I (4)
(Credit for GRMN 101 only upon completion of GRMN 102.) Introductory course emphasizing conversational skills. Students achieve control of the sound system and basic sentence structures of spoken and written German. Students must attend the Language Resource Center in addition to class meetings.
GRMN 102. Elementary German II (4)
Continuation of GRMN 101, emphasizing conversational skills. Prereq: GRMN 101 or equivalent.

GRMN 201. Intermediate German I (4)
Emphasizes both language and culture and is taught in German. Review of grammar and usage of German while studying texts and videotapes which focus on contemporary life in Germany. Prereq: GRMN 102 or equivalent.

GRMN 202. Intermediate German II (4)
Continuation of GRMN 201; conducted in German. Study of texts and videotapes which focus on contemporary life in Germany. Prereq: GRMN 201 or equivalent.

GRMN 208. The Munich Experience: Intermediate Level (3)
A semester seminar class, conducted in German, which culminates with a three-week immersion learning experience spent living and studying in Munich. Students reside with German families, study German daily in a formal setting, and practice comprehension, speaking, reading, and writing. Regular visits to museums, galleries, and cultural events; first-hand observation of history, life, and architecture of a major cultural center; day trips to cultural phenomena and events in the German countryside. Prereq: GRMN 201 or equivalent.

GRMN 303. German Culture and Civilization (3)
Examines aspects of contemporary Germany, including political and social systems and cultural life through study of texts, films, and other media. Prereq: GRMN 202.

GRMN 308. The Munich Experience: Spring Course/Summer Study Advanced Level (3)
A semester seminar class, conducted in German, which culminates with a three-week immersion learning experience spent living and studying in Munich. Students reside with German families, study German daily in a formal setting, and practice comprehension, speaking, reading, and writing. Regular visits to museums, galleries, and cultural events; first-hand observation of history, life, and architecture of a major cultural center; day trips to cultural phenomena and events in the German countryside. Prereq: GRMN 202 or equivalent.

GRMN 310. Advanced Composition and Reading (3)
An advanced-level skills course focusing on reading and writing for students who have already studied intermediate German. Develops abilities to read authentic, unabridged texts and to produce increasingly sophisticated expository compositions in German. Read contemporary newspaper and magazine articles; practice composition skills by composing objective summaries, reviews, precius, letters, e-mail, short creative texts, and other miscellaneous written forms. Readings increase progressively in length and vary in genre. Includes instruction on use of English-German and German-German language research tools, German-German dictionaries, and study guides. Concludes with a short, sophisticated literary work, such as Fontaine’s Effi Briest or Mann’s “Death in Venice.” Satisfies prerequisite for upper-level Germanics seminars or may be taken simultaneously with an upper-level course (321 or higher); taught in German. Prereq: GRMN 202 or equivalent.

GRMN 311. Advanced Conversation (3)
Students work to improve fluency in spoken German. Topics include contemporary issues; current vocabulary is stressed. Students practice using speech appropriate to various situations. Prereq: GRMN 202 or equivalent.
GRMN 312. German Proficiency Through Drama (3)
Focus on reading, enacting, and discussing of authentic dramatic texts. Readings begin with single scenes and progress to full-length radio plays and theater plays which gradually increase in linguistic difficulty and complexity of central themes. Although we will pay attention to the cultural and theatrical milieu from which each play arose, we will focus on the dramatic text as literature and as a text written for performance. Elements of drama, such as dialogue, character and dramatic structure, as well as the genres of tragedy, comedy, and tragicomedy are introduced. Prereq: GRMN 202 or equivalent.

GRMN 313. Introduction to German Literature (3)
Introduction to German literature and the cultural issues it addresses. Prereq: GRMN 202 or equivalent.

GRMN 320. Topics in Narrative (3)
This course examines representative prose works (tales, novellas, short novels, letters, and essays) chosen to present reactions and impressions to social and aesthetic conditions in German-speaking countries and to introduce students to different styles and varieties of German prose. Prereq: One 300-level GRMN course.

GRMN 326. Witches, Weddings, and Wolves (3)
Intensive study of German Folk Tales as collected and altered by the Brothers Grimm. The Maerchen as both children's and adult literature. Prereq: One GRMN 300-level course.

GRMN 331. Topics in German Cinema (3)
Overview of German Cinema from the beginning to the present. Film selection representative of major directors, major periods (such as expressionism or The New German Cinema), particular themes from different historical perspectives, and literature in film. All films are in German. Taught in German. Prereq: One GRMN 300-level course.

GRMN 340. Topics in German Drama (3)
Overview of German drama from the beginning to the present. Explores German plays by applying different disciplinary approaches such as historical, cultural, and literary analyses. All plays are in German. Taught in German. Prereq: One GRMN 300-level course.

GRMN 350. Topics in German Lyric (3)
This course presents a detailed study of German lyric literature through the frequent writing of critical papers and literary analysis of the formal elements of poetry: rhyme schemes, diction, meter, figures of speech. The poems selected cover a variety of styles, a range of historical periods, and a sampling of authors. Readings and discussions in German. Prereq: One 300-level GRMN course.

GRMN 360. Topics in Major German Authors (3)
Concentrates on a specific author or small group of authors within an aesthetic or historical context, for example: Goethe, Heine, Bachmann, Junges Deutschland, or die Gruppe 47. Examines the breadth of themes and styles and may include literary, philosophic, biographical, and other kinds of texts. Readings and discussions in German. Prereq: One 300-level GRMN course.

GRMN 365. German Literature in Translation (3)
Goethe defined “World Literature” (Weltliteratur) as “Intellectual Trade Relations” (geistiger Handelsverkehr). This course gives students the opportunity to study German literary works in translation and thus to trade intellectual relations with a literary culture previously unknown to them. Counts toward the German major only as a related course. No knowledge of German required. Cross-listed as WLIT 365.

GRMN 366. From Lessing to Young Goethe (3)
Theory and literature of the mid-eighteenth century. Focus on the works of Lessing, young Goethe and young Schiller and the writers of the Storm and Stress. Readings and discussions in German. Prereq: GRMN 202 or equivalent.

GRMN 367. German Classicism/Romanticism (3)
Selected works of Goethe, Schiller, Hoelderlin, von Kleist, and others. Prereq: GRMN 202.

GRMN 370. Topics in Literary Periods (3)
Overview of German literary periods from the beginning to the present. Explores German literary works in all three major genres from the historical, social, and literary perspectives. All works are in German. Taught in German. Prereq: One 300-level GRMN course.

GRMN 375. 19th-Century German Literature (3)
Major works chosen to present prominent themes and problems and/or important developments within the period; topic varies. Prereq: GRMN 202.

GRMN 380. 20th-Century German Literature I (3)
Study of major works chosen to present themes and problems in naturalism, expressionism, and other important literary and cultural developments within the period before World War II. Prereq: GRMN 202 or equivalent.

GRMN 381. Topics in Advanced German Culture Studies (3)
Exploration of the culture of the arts, political culture, and the cultural self-expression of the German-speaking countries from their beginnings to the present. Focus: The cultural changes within certain historical periods. Examination of particular aspects such as culture as mass deception in fascist Germany and the GDR, the reflection of contemporary culture in literature and cinema, problems of cultural identity and multiculturalism, and the role of postmodern culture industry and the critical discourse today. Taught in German. Prereq: One 300-level GRMN course.

GRMN 386. 20th-Century German Literature II (3)
Post World War II German literary and cultural developments. Focus on efforts to come to grips with German history from 1933 to German reunification. Prereq: GRMN 202.

GRMN 389. Special Topics (3)
Special topics in German literature, literary criticism, and culture. Prereq: GRMN 202 or equivalent.

GRMN 397. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in German. Limited to senior majors. Permit required. Prereq: Consent of department.

GRMN 398. Honors Thesis II (3)
Continuation of GRMN 397. Limited to senior majors. Permit required. Prereq: GRMN 397 and consent of department.

GRMN 399. Independent Study in German (1-3)
For majors and advanced students under special circumstances. Permit required. Prereq: Consent of department.

GRMN 408. Supervised Study in Germany (3)
(See GRMN 308.)

GRMN 426. Witches, Weddings, and Wolves (3)
(See GRMN 326.)

GRMN 466. From Lessing to Young Goethe (3)
(See GRMN 366.)

GRMN 467. German Classicism/Romanticism (3)
(See GRMN 367.)

ITALIAN COURSES (ITAL)

ITAL 101. Elementary Italian I (4)
(Credit for ITAL 101 only upon completion of ITAL 102.) Introductory course: stress on mastery of the sound system and basic sentence structure of spoken and written Italian.

ITAL 102. Elementary Italian II (4)
Continuation of ITAL 101; attendance in the language laboratory is required in addition to scheduled class meetings. Prereq: ITAL 101.

ITAL 201. Review and Progress in Italian (4)
Emphasizes language and culture. Review of Italian grammar and usage while studying written forms. Language laboratory attendance required in addition to scheduled class meetings. Prereq: ITAL 102 or equivalent.

ITAL 202. Read and Discuss Italian Texts (4)
Focus on improving linguistic skills acquired in elementary Italian and on mastering short narratives. Review of Italian grammar and usage through reading, conversation, and media. Language laboratory attendance required in addition to scheduled class meetings. Prereq: ITAL 201 or equivalent.

ITAL 311. Conversation in Italian (3)
Solely focused on oral communication, ITAL 311 is designed to enhance listening/comprehension skills in Italian. Using audio-visual materials, students acquire the skills necessary to understand conversations between native-speakers and to emulate them. The situational and functional approach to the course facilitates progress towards advanced-level fluency in Italian. Prereq: ITAL 202 or equivalent.

ITAL 399. Independent Study (1-3)
For students under special circumstances. Prereq: Consent of department.

JAPANESE COURSES (JAPN)

JAPN 101. Elementary Japanese I (4)
(Credit for JAPN 101 only upon completion of JAPN 102.) Introduction to understanding, speaking, reading, and writing Japanese. Students learn to read and write hiragana and katakana syllabaries and 50 kanji characters. Students expected to achieve control of the sound system and basic structure of the language. Emphasizes aural comprehension and speaking.

JAPN 102. Elementary Japanese II (4)
Continuation of JAPN 101. Emphasizes aural comprehension, speaking, reading, and writing. Students learn approximately 100 new kanji characters. Prereq: JAPN 101.

JAPN 201. Intermediate Japanese I (4)
Further study of fundamental structures of Japanese. Students improve aural comprehension, speaking, reading, and writing abilities and learn approximately 100 new characters. Prereq: JAPN 102 or equivalent.

JAPN 202. Intermediate Japanese II (4)
Continuation of JAPN 201. Students learn an additional 100 kanji characters. With the completion of JAPN 201 - 202, students should have control of the fundamentals of modern Japanese and a firm
JAPN 225, Japanese Popular Culture (3)
This course highlights salient aspects of modern Japanese popular culture as expressed in animation, comics, and literature. The works examined include films by Hayao Miyazaki, writings by Kenji Miyazawa and Banana Yoshimoto, among others. The course introduces students to essential aspects of modern Japanese popular culture and sensibility. Cross-listed as WLIT 225.

JAPN 245, Classical Japanese Literature in Translation (3)
Readings, in English translation, of classical Japanese poetry, essays, narratives, and drama to illustrate essential aspects of Japanese culture and sensibility before the Meiji Restoration (1868). Lectures explore the sociohistorical contexts and the character of major literary genres; discussions focus on interpreting the central images of human value within each period. Japanese sensibilities compared/contrasted with those of Western and other cultures. Cross-listed as WLIT 245.

JAPN 255, Modern Japanese Literature in Translation (3)
Focus on the major genres of modern Japanese literature, including poetry, short story, and novel (short novels). No knowledge of Japanese language or history is assumed. Lectures, readings, and discussions are in English. Films and slides complement course readings. Cross-listed as WLIT 255.

JAPN 301, Advanced Japanese I (4)
Emphasizes conversational proficiency and reading. Students must attend the language lab in addition to class meetings. Prereq: JAPN 202 or equivalent.

JAPN 302, Advanced Japanese II (4)
Continuation of JAPN 301; emphasizes conversational proficiency and reading. Japanese life and culture introduced through supplemental materials and activities. Students must attend the language lab in addition to regular scheduled class meetings. Prereq: JAPN 301 or equivalent.

JAPN 303, Topics in Japanese I (3)
Students in this course will work with authentic materials to improve proficiency in Japanese. Subject matter varies but emphasis is on contemporary culture of Japan. Prereq: JAPN 302 or equivalent.

JAPN 345, Japanese Women Writers (3)
Contributions of women writers to the literature of pre-modern and modern Japan; investigations of how their works exemplify and diverge from "mainstream" literary practices. Emphasis on the social and cultural contexts of the texts. Cross-listed as WLIT 345.

JAPN 350, Contemporary Japanese Texts (3)
Stress on development of sophisticated communication skills in Japanese. Reading and discussion of various texts in the original, such as comics (manga), video scripts, essays, news scripts, and literary works. Enhancement of writing and aural/oral proficiency through presentations, listening drills, viewing of videos, and classroom discussion. Prereq: JAPN 302 or permission.

JAPN 351, Japanese in Cultural Context (3)
Exploration and analysis of selected Japanese writers and the cultural and popular media around them. Focus on continued development of skills from JAPN 350 and on representative examples of various genres; drama, fiction, autobiographical prose, interview, poetry, and journalistic writing. Prereq: JAPN 350 or permission.

JAPN 397, Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in English or Japanese. Limited to senior majors. Permit required. Prereq: Consent of department.

JAPN 398, Honors Thesis II (3)
Continuation of JAPN 397. Limited to senior majors. Permit required. Prereq: JAPN 397 and consent of department.

JAPN 399, Independent Study (1-3)
Directed study for students who have progressed beyond available course offerings. Prereq: Permission of department.

RUSSIAN COURSES (RUSN)

RUSN 101, Elementary Russian I (4)
(Credit for RUSN 101 only upon completion of RUSN 102.) Introductory course emphasizing conversational skills. Students achieve control of alphabet, sound system, and basic sentence structures in spoken and written Russian. Students must spend one hour a week on audio materials in addition to class meetings.

RUSN 102, Elementary Russian II (4)
Continuation of RUSN 101, emphasizing aural/oral proficiency. Students work to improve fluency in spoken Russian. Students must attend the language lab in addition to regular scheduled class meetings.

RUSN 201, Intermediate Russian (4)
Furthers students' ability in four basic language skills: understanding, speaking, reading and writing; expands knowledge of Russian grammar and vocabulary. Prereq: RUSN 102.

RUSN 202, Introduction to Contemporary Civilization (4)
Continuation of RUSN 201; introduces contemporary Russian culture through readings and discussion.

RUSN 311, Advanced Conversation (3)
Students work to improve fluency in spoken Russian. Topics of conversation include aspects of contemporary civilization; current vocabulary is stressed. Prereq: RUSN 202.

RUSN 319, Life in Modern Russia (3)
Examines aspects of life in modern Russia, between the 1917 Revolution and the present, including political and social systems and cultural life through the study of texts, films and other media. Prereq: RUSN 202.

RUSN 320, Introduction to Russian Literature (3)
Introduction to major literary movements, principal writers, and outstanding works of Russian literary works. Prereq: RUSN 202 or equivalent.

RUSN 375, Russian Literature in Translation (3)
Topics vary according to student and faculty interest. May include Russian classical and modern literature, cinema, women writers, individual authors. May count towards Russian minor. No knowledge of Russian required. Cross-listed as WLIT 375.

RUSN 399, Independent Study (1-3)
Prereq: Permission of department.

SPANISH COURSES (SPAN)

Undergraduate

SPAN 101, Elementary Spanish I (4)
(Credit for SPAN 101 only upon completion of SPAN 102.) Introductory course. Students achieve control of the sound system and basic sentence structures of spoken and written Spanish. Students must attend the Language Resource Center in addition to class meetings.

SPAN 102, Elementary Spanish II (4)
Continuation of SPAN 101, emphasizing conversational skills. Prereq: SPAN 101.

SPAN 201, Intermediate Spanish I (4)
Intensive review of grammar and usage through readings, discussions, and other activities. Prereq: SPAN 102 or equivalent.

SPAN 202, Intermediate Spanish II (4)
Continues grammar review of SPAN 201. Students will study texts and cultural documents which focus on contemporary life in Hispanic countries. Prereq: SPAN 201 or equivalent.

SPAN 285, The Hispanicophone World (3)
A survey of the imaginative literatures in a variety of genres from the Spanish-speaking world, including texts authored by Hispanics living in the United States. The selections will help students gain a greater understanding and appreciation of the impact and adaptation of Spanish language and culture among widely diverse populations of the world over the past centuries. Counts towards Spanish major as related course. No knowledge of Spanish required. Cross-listed as WLIT 285.

SPAN 310, Advanced Composition and Reading (3)
Designed to facilitate the transition between lower and upper division courses in Spanish, and focus upon the simultaneous development of the reading and writing skills expected of students in all advanced Spanish courses. Prereq: SPAN 202.

SPAN 311, Advanced Spanish Conversation (3)
Engages students in conversation so that they develop oral proficiency. Short essays and newspaper articles dealing with everyday activities, socio-cultural roles and experiences, and self-awareness and life goals discussed; some literary materials discussed. Prereq: SPAN 202.

SPAN 314, Practice of Translation (3)
Students learn necessary skills and techniques for solving linguistic problems in translation. Texts with a variety of contents, including articles from current press, will be translated from English into Spanish and occasionally from Spanish into English. Prereq: SPAN 202.

SPAN 315, Latin American Cultural Conflicts (3)
Evolution of Latin American socioeconomic characteristics and artistic production up to the present. Class discussions of diverse literary works, social research essays, and testimonial narratives focused on conflicting elements in class structures, ethnicity, and urban modernization as well as family ethos, religious trends, cultural identity, and educational problems. Prereq: SPAN 202.

SPAN 316, Studies in Civilization (3)
Major historical, intellectual, and artistic influences that have shaped the evolution of Spanish civilization. Prereq: SPAN 202.
SPAN 317. Contemporary Latin American Culture (3)
An intensive study of Latin American culture and civilization through the examination of its arts: literature, music, film, painting, photography, popular art. Designed to bring together the various strands of Latin American realities, emphasis is placed on the predominant view among Latin American intellectuals that artists and intellectuals have the power and the obligation to modify society. Prereq: SPAN 202.

SPAN 318. Contemporary Spanish Culture (3)
Study of several key historical moments and several key aspects in contemporary Spain: Spanish civil war, Franco's dictatorship, and democratic Spain; rural-urban differences, industrialization and migratory movements; nationalism and terrorism; foreign immigration and tourism, the cultural renaissance and the cultural wars in Madrid and Barcelona. Feature films and literary texts will illustrate the issues under study. Prereq: SPAN 202.

SPAN 320. Introduction to Readings in Spanish Literature (3)
Introduction to major literary movements and outstanding works of Spanish literature. Prereq: SPAN 202.

SPAN 322. Latin American Short Story (3)
The history and development of the Latin American short story from the sixteenth century to the present. Intertextuality, rise of the Nuevo Cuento, and major characteristics of the works. Male and female authors. Prereq: SPAN 320.

SPAN 326. The Fantastic in Latin American Prose (3)
Introduction to a distinctive trend in contemporary Latin American literature, the prose portrayal of the “fantastic,” a new narrative mode in Latin America. Critical examination of selected texts reveals new concepts of space and time and an increasing complexity of structure and style, one which juxtaposes and analyzes fantasy and reality. Prereq: SPAN 320.

SPAN 331. Spanish Golden Age Literature (3)
Through close reading and discussion of representative texts, we will study different examples of Spanish and Latin American writing from the Middle Ages, Renaissance and Baroque periods. We will stress connections between Spain and Latin America, as well as cultural and literary topics of special relevance for contemporary Hispanic cultures. Prereq: SPAN 320.

SPAN 333. Contemporary Caribbean Literature (3)
In addition to developing a general familiarity with the literature and history of this region, students will acquire an awareness of the interrelation of national identity, memory, and language in the texts produced by contemporary Caribbean authors, and of the cultural hybridity characteristic of this production. The themes treated by these authors include colonialism and postcolonialism, cultural and religious syncretism, and sexual politics. Prereq: SPAN 320.

SPAN 336. Chicana/o Literature (3)
An introduction to Chicana/o literature written after 1943. Literary history, clarification of linguistic terminology, and an examination of the cultural components of each work. Readings, discussions, and lectures in Spanish. Prereq: SPAN 320.

SPAN 339. Latin American Poetic Revolt (3)
Introduction to most important poets in contemporary Latin America, a region home to a significant number of eminent poets, including Nobel Laureates from Chile, Gabriela Mistral and Pablo Neruda. The course focuses on detailed textual analysis of pivotal works, combined with historical-literary perspective, so students gain insight into the diverse styles and tendencies that reflect the tumultuous history of poetry’s development in a relentless search for a Latin American cultural identity. Prereq: SPAN 320.

SPAN 340. Contemporary Latin-American Narrative (3)
Students explore the most significant narrative techniques since 1945 in Latin American fiction: Borges, Cortazar, Garcia Marquez, Vargas Llosa, Isabel Allende. Prereq: SPAN 320.

SPAN 342. Latin American Feminist Voices (3)
Examination of the awakening of feminine and feminist consciousness in the literary production of Latin American women writers, particularly from the 1920s to the present. Close attention paid to the dominant themes of love and dependency; imagination as education; alienation and rebellion; sexuality and power; the search for identity and the self-preservation of subjectivity. Readings include prose, poetry, and dramatic texts of female Latin American writers contributing to the emerging of feminist ideology through the mapping of feminist identities. Prereq: SPAN 320.

SPAN 345. The New Drama in Latin America (3)
Representative works of contemporary Latin American drama. Critical examination of selected dramatic works of nineteenth-century Latin America provides students insight into the nature of drama and into the structural and stylistic strategies utilized by Latin American dramatists to create the “new theater,” one which is closely related to Latin American political history. Prereq: SPAN 320.

SPAN 346. Hispanic Autobiographical Writing (3)
The course studies issues of self-representation through the reading of autobiographical works from different periods from Latin America, Spain, and the U.S., and of theoretical works that address topics of first-person narratives, autobiography, and sub-alternity. Prereq: SPAN 320.

SPAN 350. Spanish Fiction (3)
Narrative masterpieces from Cervantes and the picaresque (El Lazarillo) to the short stories and novels of 19th and 20th century authors. Prereq: SPAN 320.

SPAN 351. Hispanic Turn of the Century Literature (3)
Cultural and political transitions between 19th and 20th Century, between Spain and Latin America, and between literary models. Study of Spanish and Latin American writers and their literary connections (Generation of 1898, modernistas) in the context of colonial conflicts and economic changes. Prereq: SPAN 320.

SPAN 353. Transatlantic Vanguard (3)
Presentation of transatlantic tendencies of the early vanguard movements represented by poets from Spain, Central and South America. Beginning with the advent of Modernism in Latin America and Symbolism in Spain, this course will trace the development of resulting movements in the early twentieth century. Surrealism, Creacionismo, Futurism, Ultraísm and Dadaism forged a vital link between poets and artists from the Americas and their European counterparts. We will focus on the similarities and differences between these “isms” while drawing conclusions about the uniqueness of vanguard movements on both sides of the Atlantic. Prereq: SPAN 320.

SPAN 360. Hispanic Self-Conscious Literature (3)
Since the Seventeenth Century, Hispanic literature has revealed its fictional nature, commented on the building of its fictional world, mirrored itself (fiction within a fiction), and invited and compelled the reader to participate in the work of art. The texts of the course, selected from Peninsular and Latin-American literatures, show the most relevant characteristics of Contemporary Hispanic self-conscious art and allow students to become acquainted with some of the main concepts of literary criticism today. Prereq: SPAN 320.

SPAN 370. Special Topics in Spanish (3)
This course is designed to respond to students’ and faculty interest in specific themes or issues not otherwise covered in the curriculum. Approaches, content, and instructor will vary and this course may have a focus that crosses generic, artistic, historical, disciplinary, and geographical boundaries. The honing of analytical and interpretative skills as well as the further development of Spanish language skills also are integral objectives of this course. The class is conducted in Spanish. Prereq: SPAN 320 or equivalent.

SPAN 385. Hispanic Literature in Translation (3)
Critical analysis and appreciation of representative literary masterpieces from Spain and Latin America, and by Hispanics living in the U.S. Texts cover a variety of genres and a range of literary periods, from works by Cervantes to those of Gabriel Garcia Marquez. The course will examine the relationship between literature and other forms of artistic production, as well as the development of the Hispanic literary text within the context of historical events and cultural production of the period. Counts toward Spanish major only as related course. No knowledge of Spanish required. Cross-listed as WLIT 385.

SPAN 397. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in Spanish. Limited to senior majors. Permit required. Prereq: Consent of department.

SPAN 398. Honors Thesis II (3)
Continuation of SPAN 397. Limited to senior majors. Permit required. Prereq: SPAN 397 and consent of department.

SPAN 399. Independent Study (1-3)
Prereq: Permission of department.

Graduate

SPAN 426. The Fantastic in Latin American Prose (3)
(See SPAN 326.)

SPAN 430. Landmarks of Spanish Literature (3)
(See SPAN 331.)

SPAN 431. Spanish Golden Age Literature (3)
(See SPAN 331.)

SPAN 433. Contemporary Caribbean Literature (3)
(See SPAN 333.)

SPAN 439. Latin American Poetic Revolt (3)
(See SPAN 339.)

SPAN 440. Contemporary Latin-American Narrative (3)
(See SPAN 340.)

SPAN 445. Hispanic Autobiographical Writing (3)
(See SPAN 345.)
Department of Music

Music Education
Music History
Early Music Performance
Applied Music

Haydn Hall
Phone 216-368-2400; Fax 216-368-6557
Georgia J. Cowart, Chair
Robert E. Dunn (Music Education)

The Department of Music is committed to creating the best possible educational opportunities and professional programs in music. The department’s aim is to offer superior programs that balance humanistic knowledge of music with excellence in performance. Individual professional interests are encouraged and promoted. To foster this aim, the Department of Music has established major degree programs in music and music education and has collaborated with the Cleveland Institute of Music in a Joint Music Program.

FACULTY
Georgia J. Cowart, Ph.D. (Rutgers University)
Associate Professor and Chair
17th and 18th centuries; music and society
William I. Bauer, Ph.D. (Kent State University)
Assistant Professor
Music Teacher Education; Research; Technology
Gary M. Ciepluch, Ph.D. (University of Wisconsin, Madison)
Associate Professor
Director of bands; conducting; Music Teacher Education
Mary E. Davis, Ph.D. (Harvard University)
Assistant Professor
Robson Junior Professor
20th century; music and fashion; world music
Ross W. Duffin, D.M.A. (Stanford University)
Fynette H. Kulas Professor
Medieval; Renaissance; Baroque; performance practices; Collegium Musicum
Robert E. Dunn, Ph.D. (Northwestern University)
Associate Professor; Director of Music Education
Music Teacher Education; general and choral music
Stephen E. Hefling, Ph.D. (Yale University)
Professor
18th and 19th centuries; chamber music; analysis
Kathleen A. Horvath, Ph.D. (Ohio State University)
Assistant Professor
Music Teacher Education; string education and pedagogy
Dana Gooley, Ph.D. (Princeton University)
Assistant Professor
19th century; Liszt; Jazz
Quentin W. Quereau, Ph.D. (Yale University)
Associate Professor
Medieval; Renaissance; opera; art song

ASSOCIATE FACULTY

Cleveland Institute of Music Academic Faculty Offering Courses for University Students
Alan Bise
Margaret Brouwer
David Brown
Jo Anne Caputo
Eric Charnofsky
Jeanette Davis
David Gilson
Mark George
Marshall Griffith
Dean Guy
Steven Kohn
Richard Nelson
Lisa Rainsong

Daniel Shapiro
Nadia Tarnawsky
Jim Yates

ARTIST FACULTY OF THE CLEVELAND INSTITUTE OF MUSIC
(Consult the current CIM catalog)

DEGREE OFFERINGS AND AREAS OF CONCENTRATION

Areas of Degree Offerings
Music education (Bachelor of Science, Master of Arts, Doctor of Philosophy)
Early music performance practices (Master of Arts, Doctor of Philosophy, Doctor of Musical Arts)
Music (within the context of liberal arts; see subsequent list of concentrations) (Bachelor of Arts)
Music history (Master of Arts)
Musicology (Doctor of Philosophy)

Concentrations within the Bachelor of Science:
Music Education
Early music performance practices
Performance
General musicianship (particularly suitable for students interested in music as part of a double major or double degree)
Audio recording technology

Students interested in these programs should apply to the University with the understanding that many courses in music performance, music theory, and related studies will be taken at the Cleveland Institute of Music.
CIM Joint Music Program

The Cleveland Institute of Music and Case Western Reserve University participate in an integrated music program at both the undergraduate and the graduate levels. Students at either institution have the benefit of pursuing studies at both schools, thus enjoying the intimacy and intense specialization of a professional conservatory, together with access to the resources of a major university. Both institutions share a campus setting in University Circle. Severance Hall (home of the Cleveland Orchestra), the Cleveland Museum of Art, the Cleveland Music School Settlement, and several other cultural organizations are within a short walking distance of both schools.

The Cleveland Institute of Music concentrates on the education of students whose professional interests include the following:

- Performance (Bachelor of Music, Master of Music, and Doctor of Musical Arts)
- Composition (Bachelor of Music, Master of Music, and Doctor of Musical Arts)
- Eurhythmics (Bachelor of Music)
- Music theory (Bachelor of Music)
- Audio recording (Bachelor of Music)
- Piano accompanying (Master of Music, Doctor of Musical Arts)
- Suzuki Pedagogy (Master of Music)

Students who are interested in these majors in the context of intensive conservatory training should matriculate at the Cleveland Institute of Music with the understanding that courses in music history, music education, and the liberal arts will be taken at the University. Contact the Admissions Officer, Cleveland Institute of Music, 11021 East Boulevard, Cleveland, Ohio 44106, for a description of programs and the appropriate admissions materials.

DEPARTMENTAL SPECIALTIES

The Department of Music is distinctive in offering special areas of concentration to the student on both the undergraduate and the graduate level.

Early Music Performance Practices

One such area of special interest is early music performance practices, where musical research in early music, instruments, and performance problems is directly applied to performance. The supporting performance organizations are the Case Western Reserve University Collegium Musicum and Baroque Orchestra, which are devoted to the performance of early music on authentic reproductions of Medieval, Renaissance, and Baroque instruments. Faculty, staff and visiting artists provide professional instruction and coaching. The Collegium Musicum and Baroque Orchestra use the Kulas Collection of Historical Instruments.

Music Education

The mission of the Music Education Program at Case Western Reserve University is to prepare committed, knowledgeable, and creative professional music educators who will develop into leaders, teachers, and outstanding musicians in the field of music education. In both the undergraduate and graduate programs, the faculty emphasize practical and philosophical foundations regarding music in education. The nationally recognized music education faculty specialize in research in music education, the pedagogy of teaching and learning, music technology, string pedagogy, and wind conducting and repertoire. The faculty are active in their respective professional organizations and as clinicians, conductors, lecturers, and authors. The mission of the Music Education Program is to prepare committed, knowledgeable, and creative professional music educators who will develop into leaders, teachers, and outstanding musicians in the field of music education.

UNDERGRADUATE PROGRAMS

Students who wish to major in music must pass a performance audition on an acceptable instrument or in voice and take a music theory placement test. Arrangements for this audition and test must be made directly with the department. Once admitted as a music major, students are required each semester to participate in one or more of the University musical organizations and to attend recital class. Performance juries are required during each semester that the music major is enrolled in applied music instruction.

Double Major and Double Degree Opportunities

The department encourages qualified students to consider a double major in music and another subject. As many as 1/3 to 1/2 of music majors are pursuing a double major. Typical combinations include the Bachelor of Arts in music with theater, English, classics, psychology, sociology, and the natural sciences. Once the Arts and Sciences General Education Requirements (39 hours) have been met, a B.A. student can add another major by meeting the course and hour requirements found in this bulletin under the appropriate department. In most cases, it is possible to finish a double major with music in four years.

It is also possible to receive two degrees, although this usually takes five years. Typical combinations of double degrees include the Bachelor of Arts in music with the Bachelor of Science in Engineering, or the Bachelor of Science in Music Education with the Bachelor of Music degree from the Cleveland Institute of Music. All admissions requirements must be met for each school, and course and hour requirements for each degree must be fulfilled. Students interested in double degrees should declare their intent as early as possible and receive advice from faculty about both degrees.

Bachelor of Arts in Music

The Bachelor of Arts degree in music is concerned with studies in music and the liberal arts. This degree program stresses an essentially humanistic orientation.

Approximately one half of the total 120 semester credit hours necessary for the degree is devoted to music study, with the remaining credit devoted to the General
Education Requirements (39 hours), a possible minor program, and a liberal selection of elective courses. This arrangement differs from student to student. The department offers several concentrations within the music portion of the degree (described below). Core music courses for these programs are: (1) Music theory: MUSC 107, 108, 207, 208 (or 101/105, 102/106, 201/205, 202/206), and 318 for a total of 19 semester hours; (2) Music history and literature: MUSC 321, 322, and 336 (the first two of these courses fulfill the Arts and Sciences General Education Requirements for Music Majors) for a total of 9 semester hours; (3) additional course work in music is required for a minimum of 15 semester hours; and (4) Additional Requirements:

- Participation in assigned musical ensemble every semester of major
- Participation in additional musical ensemble for one year
- Recital Class attendance and performance every year of major
- Two semesters of eurhythmics (fulfills physical education requirement)

Additional course work in music is required for each concentration as follows:

Music History

Additional Applied Music study at the 300 level (3); MUSC 393, Introduction to Early Music Performance Practices (3); Two electives from music literature courses at the 300 level (6); Foreign language (6)

MUSIC THEORY

Additional Applied Music study at the 300 level (3); MUSC 311, 312, Counterpoint I and II (4); One elective from music literature courses at the 300 level (3)

Early Music Performance Practices

Additional Applied Music study at the 300 level (3); MUSC 393, Introduction to Early Music Performance Practices (3); MUSC 394, Seminar in Early Music Performance Practices (3); One elective from music literature courses at the 300 level (3); Foreign language (6)

Performance

Additional Applied Music study at the 300 and 400 levels (9); One elective from music literature courses at the 300 level (3); Foreign language (6)

General Musicianship

One elective from music literature courses at the 300 level (3)

Audio Recording Technology

MUSC 151B, 251B, Audio internship (4 sem. of each req.) (4); MUSC 383, 384, Audio Recording I and II (2,2); MUSC 385, 386, Advanced Recording Techniques I and II (2,2); MUSC 387, 388, Multi-track Recording Techniques I and II (2,2); MUSC 391, MUSC 392, Recording Studio Maintenance I and II (1,1); MUSC 350B, Junior Audio Recording Thesis (3); MUSC 351C, Senior Audio Recording Thesis (6); MUSC 399C, Acoustics of Music (1 credit hr., taken 3 times) (3); MUSC 451, Recording Studio Internship (Commercial) (4)

A Minor in Electronics is available from the Electrical Engineering and Computer Science Department. A five-year, double degree program is also available where the student earns a B.A. in music/audio and a B.S. in an elective field of engineering. See double-degree section above.

Career Opportunities within the Bachelor of Arts Degree

Students choosing the audio recording technology concentration are prepared to enter professional positions in that field immediately upon graduation. Graduates of the other concentrations are prepared to enter programs of advanced study in music or in other professional programs such as those in medicine, law, and management. Because of the humanistic orientation of the degree and the stress on the liberal arts, students are also able to pursue careers in a wide assortment of fields such as communications, publications, business, and arts criticism.

BACHELOR OF SCIENCE IN MUSIC EDUCATION

The program in Music Education, which leads to the Bachelor of Science degree, requires a total of 124 credits and is designed to educate professional teachers of music education for public and private schools. The program meets requirements of the Ohio Department of Education to prepare students to take the state teacher exam (Praxis II) and apply for teaching licensure. Most states recognize the Ohio teaching license through reciprocity.

Music education students benefit from a wide range of instrumental, vocal, and general classroom methods courses. As an additional part of the program, students benefit from plentiful “hands-on” experiences by teaching sample lessons and conducting rehearsals in actual teaching situations. Requirements for the Bachelor of Science in Music Education degree:

Music, Music Education and Education Courses

Applied Music (primary and secondary areas) .................................................. 15
Music Theory (MUSC 107, 108, 207, 208, 318) .............................................. 19
Music History (MUSC 321, 322 and 336) ................................................... 9
Elements of Conducting (MUSC 275) ......................................................... 2
Advanced Conducting (MUSC 276) .......................................................... 2
Arranging for Voices and Instruments (MUSC 310) .................................... 3
Introduction to Education (EDUC 301) ................................................... 3
Educational Psychology (EDUC 304) .................................................... 3
Literacy Across the Curriculum (EDJC 255) ............................................... 3
Foundations of Music Education (MUSC 241) ........................................... 3
General Music Methods A or B (MUSC 341 or 342) ................................... 3
Technology Assisted Music Teaching (MUSC 347) .................................... 3
Instrumental Music Methods and Materials (MUSC 377) ............................ 3
Choral Methods and Materials (MUSC 378) ............................................. 3

Electives from various instrument pedagogy classes

(1 credit for each class) ................................................................. 5
Practice Teaching in Music (MUSC 396) ........................................... 12
Recital class
(APMU 011, every semester) .................. 0
Primary Ensemble .............................. 7
Secondary Ensemble ........................... 2
TOTAL ............................................. 97

Courses to fulfill graduation requirements and the general requirements of the Ohio Department of Education:
ENGL 150 ............................................. 3
GER: Mathematics ............................... 3
GER: Natural Sciences ............................ 3
GER: Science and Society, or Natural Science ............. 3
GER: History, Philosophy or Religion ............. 3
GER: Literature/Language ........................ 3
GER: Global and Cultural Diversity ............. 3
Eurhythmics I and II (MUSC 153, 154) (Counts as PE requirement) .......... 0
General Psychology I (PSCL101) ............... 3
EDJC 255 Literacy Across the Curriculum .......... 3
TOTAL ............................................. 27
TOTAL HOURS FOR THE DEGREE ........... 124

Admission, Retention, and Advanced Standing in Music Education

Students are required to pass an interview and audition with the music education faculty to be admitted into the program. Evaluations will take place after each methods course to monitor student progress. Students who expect to meet licensure requirements must apply for Advanced Standing by first semester junior year. To apply, students must submit to the music education faculty information about grade point average, personal goals, and self-analysis of performance in the program up to the point of evaluation. Music education faculty may (1) accept a student for advanced standing; (2) accept student with reservation, with a remedial plan; or (3) reject a student and recommend a change in major.

To enter student teaching, requirements are a 2.5 cumulative University grade point average, a 3.0 cumulative G.P.A. average in professional education courses, and the appropriate number of hours of clinical/field-based experience acquired in a variety of educational settings as required by the State of Ohio. Fingerprinting for a criminal background check by the Ohio Bureau of Criminal Identification is required. For students who have not lived in Ohio consecutively for the past five years, a background check through the Federal Bureau of Investigation is also required.

To be recommended by the university's director of teacher licensure for State Teacher Licensure, a 3.0 cumulative G.P.A. must be maintained in all professional education courses and overall University G.P.A. of 2.5 must be maintained. In addition, the Ohio Department of Education requires passing scores on the Praxis II Principles of Learning and Teaching, and Music Content Knowledge exams. Completion of the Bachelor of Science degree exists separately from the State of Ohio Music Teacher License will be awarded. Additional information on this program is available in the office of the director of teacher licensure.

Minor

A minor in music requires five courses, two in music theory (generally MUSC 103, 104), two in music history (either MUSC 221 and MUSC 222, or MUSC 321 and MUSC 322), and one other, which may be in applied music. A minor in music education may be devised in consultation with a music education advisor. The department welcomes students' initiative in the development of minor programs suited to their needs.

Sequences for students in the Engineering Core

A sequence requires three courses. The department welcomes students' initiatives in developing sequences suited to their needs. The following are sample sequences:

Music and its theory
MUSC 103, 104, 222
MUSC 221, 103, 104

Music and its history
MUSC 103, 104, and 321 or 322
MUSC 221, 103, 222

Music and computers
MUSC 103, 104, 308
MUSC 221, 103, 308

Music history and jazz
MUSC 103 or 104, 222, 229
MUSC 221, 222, 229

Music and performance
MUSC 103, 221, APMU
MUSC 103 or 104, 222, APMU

Electives for Non-Music Majors

Electives designed for students not majoring in music are MUSC 103, 104, 221, 222, and 229. MUSC 308 is designed for music majors but is open to non-music majors with the permission of the instructor. MUSC 221 and 222 are offered as courses which satisfy the Arts portion of the GER. APMU 380, 382, 383, and 385 are available, normally by audition. Individual instruction in piano, harpsichord, organ, voice, violin, and all other orchestral instruments is available with consent of the department.

See further information under Applied Music.

Departmental Honors

Departmental Honors Programs for the Bachelor of Arts and Bachelor of Science degrees have the following admission and completion requirements:

Bachelor of Arts Students

Admission to honors status:
1. Second-semester sophomore or junior standing
2. Overall grade point average of 3.2, with music grade point average no lower than overall grade point average
3. Evidence of exceptional musicianship and scholarly interests
4. Nomination by a faculty member and acceptance by the music faculty

Program description—successful completion of the following:
1. Final overall grade point average of 3.2
2. Project in research or performance (to be arranged with each student)
3. MUSC 399, Undergraduate Independent Studies or MUSC 390, Undergraduate Seminar in Music for three credits

Bachelor of Science Students

Admission to honors status:
1. Junior or Senior standing
2. Overall grade point average of 3.2 and music grade point average of 3.2
3. Evidence of strong interest in becoming a teacher and of originality in teaching
4. Nomination by a faculty member and acceptance by the music faculty.

Program description—successful completion of the following:
1. Final overall grade point average of 3.2 and music grade point average of 3.2
2. Special project in teaching methods and materials. Students register for MUSC 399, Undergraduate Independent Studies.

GRADUATE PROGRAMS

The following graduate degree programs, administered by the University, are offered as part of the Joint Music Program with the Cleveland Institute of Music. General descriptions are given here; however, complete information on all degrees is available from the department. Admission to each degree follows established guidelines of the School of Graduate Studies. Scores from the Graduate Record Examination are required for programs in Music History, Musicology, and Early Music Performance Practices, and an audition is necessary for students interested in the Early Music Performance Practices programs.

Master of Arts Degree

The Master of Arts degree is offered in the fields of music history and music education. Within music history, students may choose concentrations in music history and literature or in early music performance practices. Master’s degree candidates in music education may also choose to add coursework to quality them to take teaching licensure exams for the State of Ohio.

Master of Arts in Music History

The concentration in music history and literature emphasizes research, history, literature, and the theory of music. The early music performance practices program presupposes the same strong liberal arts training as the music history and literature concentration plus a strong performance interest and background. Research and its application to music performance are stressed.

Within the 30 hours required for either concentration, the following are minimum requirements: music history, 9 hours; research, 6-9 hours; theory-analysis, 6 hours; electives, 6-9 hours.

Remaining hours are more freely elected with advisor’s approval, but 9 hours of applied music are required for performance practices students. Ensemble participation is required for performance practices students but does not earn credit hours toward the degree. Examinations include initial placement tests in history and theory, a reading test in German or French, and final written and oral examinations. In addition, performance practices students must audition as part of the admissions process and must present a lecture-recital near the completion of the degree program. At least 18 credit hours must be at the 400 level or higher.

Master of Arts in Music Education

This degree is built on a set of foundation courses in philosophy, curriculum, and research (12 hours); a music core of history, theory (3-9 hours), and performance (0-6 hours); and electives (0-9 hours). Persons in Plan A receive 6 credit hours for thesis research. A comprehensive written examination at the conclusion of course work is required for persons in Plan B. A comprehensive oral exam at the conclusion of course work is required for persons in Plan C. A minimum of 30 credit hours is required for Plans A and B. Plan C combines music education methods courses (10 hours), general education courses (6 hours), the graduate music education core (12 hours), the graduate music core (9 hours), and practice teaching (12 hours). The music education advisor may allow certain music education and general education courses taken as an undergraduate to count towards the degree requirements. (Plan C requires a minimum of 51 hours.)

Master of Music Performance Practices

The Master of Music Performance Practices degree is offered in two fields: musicology, with concentrations in music history and early music performance practices.
music performance practices; and music education.

Doctor of Philosophy in Musicology
This doctorate is granted in recognition of superior scholarly ability and attainment. Award of the degree is based not only on computation of time or enumeration of courses, but also upon distinguished work. Highly qualified applicants may enter this program directly upon completion of a bachelor’s degree.

All programs are formulated to suit the individual needs of the student and require the consent of the advisor. A minimum of 48 hours (36 for students with a master’s degree) of course work, seminars, and tutorials is required. The last 36 hours (24 for students with masters degree) must be completed at the University.

For performance practices students, course work distribution is as follows: applied music, 9-12 hours (6-9 with master’s degree); course work, 36-39 hours (27-30 with master’s degree).

For other musicology students, private lessons at the 400 level, although not required, may be counted to a maximum of six credits at the discretion of the advisor.

Examinations include initial placement tests in history, theory, and an audition for performance practices students; reading tests in German and one other foreign language; qualifying examinations in history and theory prior to admission to candidacy; and a general examination with history, theory, style analysis, and oral sections. Upon completion of the dissertation, an oral defense is held. In addition, performance practices students must audition as part of the admissions process and must present a lecture-recital in conjunction with the dissertation. The candidate must teach a college-level course in music history and literature (or early music performance practices) under the supervision of a faculty member, or have had the equivalent experience before the dissertation is completed.

Normally all performance practices students will participate in the Collegium Musicum or Baroque Orchestra during each semester in which they are on campus. Credit hours obtained for this participation are not applicable toward the degree.

Doctor of Philosophy in Music Education
The doctorate in music education is offered to persons who have shown a strong and continuing dedication to music teaching and scholarship. Applicants must have completed three years of full-time music teaching, usually in the public schools. The degree is designed to prepare professionals to assume positions of leadership in elementary, secondary, and collegiate instruction. Prior to graduation, doctoral students demonstrate competency in teaching, research, and musicianship. Every effort will be made to plan a program based on individual student needs and interests while maintaining standards of musical and scholarly excellence. Electives, therefore, will be chosen in consultation with a major advisor in order to ensure a balance between individual interests and traditional graduate expectations.

A total of 54 credit hours is required for the doctoral degree beyond the master’s level.

A typical division would be:
- Music education: philosophy, psychology, curriculum, research, measurement (15 hours)
- Music: theory (3-6), history (3-6), performance (0-6) (category total 9-15)
- Non-music electives: psychology, art, education, sociology, others (0-3)
- Seminars and special readings (6-12)
- Dissertation (18)

A comprehensive examination follows the completion of coursework, prior to beginning work on the dissertation. Upon completion of the dissertation, an oral defense is held. The dissertation topic is chosen by the student in consultation with the faculty.

Doctor of Musical Arts in Early Music
This doctorate is granted in recognition of outstanding performing ability in early music combined with superior scholarly ability in the field of early music performance practices. All programs are formulated to suit the needs of the individual student and require the consent of the major advisor. A minimum of 24 hours (after the master’s degree) of course work, seminars, and tutorials is required. Ensemble participation is required but does not earn credit hours toward the degree.

Examinations include a performance audition; initial placement tests in history and theory; reading tests in German and one other foreign language; an advisory examination after one year of full-time study and a comprehensive examination with history, theory, performance practices, and oral sections. Three juried recitals are required, each to be accompanied by a research document and preceded by a short lecture. Exceptional students may be admitted to a combined M.A./D.M.A. degree program in early music.

SPECIAL FACILITIES

Harkness Chapel, the setting for concerts presented by the Case Music Department, features neo-Gothic architecture, antique oak and Georgia pine woodwork and Tiffany windows. It is a warm, intimate yet acoustically resonant space deal for the performance of vocal and instrumental chamber music. The building provides space for music classes, department recitals and concerts, and is the home of the department’s early music concert series.

Kulas Music Library, a branch of the University Library, is located on the first floor of Haydn Hall, the home of the Department of Music. The library contains approximately 40,000 music scores, books on music, sound recordings, videos, bound periodical volumes, and microforms. Particularly strong are the collections in historical musicology and early music performance practice. Equipment is available in the library in order to listen to or view the sound recording and video collections. The music library
participates in the OhioLINK consortium of academic libraries, which shares a central on-line catalog and liberal interlibrary lending policies. Access to interlibrary loan from libraries outside of Ohio is also available. The music library is connected to CWRUnet, the University’s fiber optic network, which provides access to many on-line databases. The collections and services of the Kulas Music Library are available to all University students, whether or not they are music majors. Music majors at the University also have access to the library of the Cleveland Institute of Music, which collects performing materials for solo and chamber music of all kinds and scores for large orchestral, vocal, and dramatic works, as well as selected musical works.

Center for Music and Technology
The department supports a computer laboratory/resource center devoted to furthering the use of technology in music. The Center for Music and Technology houses Macintosh-based music workstations that are linked by CWRUnet, the University’s vast fiber optic network system and gateway to the Internet. This state-of-the-art network allows extremely fast access to a multitude of resources both on and off campus. Using CWRUnet, students working in the center are able to access computers and databases as well as share ideas and research with colleagues around the world. Through the use of MIDI (Musical Instrument Digital Interface) keyboards, users may explore computer-assisted composition and sequencing, music synthesis and sampling, and computer-generated music calligraphy. By supporting the most current music copying software, the center provides a resource for the production of professional typeset-quality scores and papers by faculty and students. The center works closely with faculty in providing support facilities for the department’s technology-related courses. For example, students enrolled in Computers and Music use the center to explore sequencing, MIDI communication, and musical score production. Designed to meet the specific needs of music students and faculty, the center supports an array of non-musical software including word processing, database, and graphics applications. As the department becomes increasingly technology-oriented, and CWRUnet is increasingly utilized by the faculty in their curricula, the Center for Music & Technology plays an ever increasing role by providing technical support and a necessary focal point for the interchange of ideas and creative solutions.

Kulas Collection of Early Music Instruments
The Department of Music maintains an impressive collection of modern reproductions of medieval, Renaissance, and baroque instruments. The instruments are used by the Collegium Musicum and the department’s program in Early Music Performance Practices. The collection includes recorders, crumhorns, shawms, sackbuts, cornetti, viols, and baroque strings and woodwinds.

Music Education Resource Center
The department provides a resource center for music education students to prepare educational materials and research projects. The center contains a variety of audio-visual media, including a library of education-oriented music software. Students may borrow items from a large collection of music textbooks, educational recordings, testing materials, vocal and instrumental books, curriculum guides, and classroom instruments.

The Music Education & Technology Software Registry (MET) is a collection of instructional software packages designed for all ages of learners and for a wide range of musical tasks. Both Macintosh and PC workstations are available to all music education students and area music teachers so they can use and evaluate most of the music software that is commercially marketed today. Use of the MET is encouraged, and sometimes required for many of the projects and assignments in courses throughout the music education curriculum.

Applied Music

Private Instruction
The Department of Music offers private instruction on Renaissance and Baroque instruments, as well as the usual orchestral instruments, piano, and voice. Students have the unique opportunity to study with outstanding teachers, many of whom are faculty at the Cleveland Institute of Music. Students interested in private instruction should come to the department prior to registration in order to complete the Applied Music Permit form and to learn of further details.

Private lessons carrying credit are available to all University students. Permission for study, level of study, and amount of credit are determined by the faculty of the Department of Music in consultation with the Cleveland Institute of Music. Charges for private lessons are covered by the University tuition rate for undergraduate music and music education majors only; all other students pay an additional fee. The amount of the fee depends on the faculty involved and the length of the lessons. The minimum is $300 per semester and can be substantially higher. Students normally earn 1.5 or 3 semester hours of credit for private instruction based on either half-hour or hour lessons. All Master of Arts and Doctor of Philosophy degree students in the department must satisfy the applied music requirements specified in their degree requirements. Graduate students who anticipate private lesson instruction in their programs should consult an advisor before registration. Students register for individual applied music instruction in courses titled Principal Performance Area and Secondary Performance Area.

Ensembles
A number of music ensembles are available within the Joint Music Program. These ensembles are available to qualified University students. Entrance into ensembles may also be subject to space limitations. Students may elect to earn one credit per semester for participation. Auditions for ensembles are held during
the first week of classes of each semester. Dates and times are available from the department.

Undergraduate Courses

Courses in musical interpretation and practical understanding are offered under the APMU classification. Those courses which have a direct role in University degree programs are provided with descriptions. Consult the catalog of the Cleveland Institute of Music for additional offerings in this classification. CIM courses other than applied music lessons are open only to music and music education majors.

MUSIC (MUSC)

Undergraduate Courses

MUSC 003. Pre-conservatory Theory (3) Development of security in knowledge and skills related to basic materials of musical structure (scales, key signatures, intervals, triads, etc.); general introduction to literature of Western music. Preparation for MUSC 101/105. Credit not applicable toward fulfillment of degree requirements in music major. MUSC 088. Composition Seminar (0)

MUSC 101. Harmony-Keyboard I (2) Scales, intervals, triads, seventh chords, and their inversions. Harmonization of melodies and bases, chorale study, modulation, analysis. Creative use of material. Correlated and taken concurrently with MUSC 201 and 202. Both aspects of the course must be passed in order to complete requirements. MUSC 102. Harmony-Keyboard II (2) (See MUSC 101.)

MUSC 103. Theory I (3) Music theory for the nonmusic major. Intervals, scales, rhythmic drill, sight singing, eartraining, keyboard work, and harmony through inversions of triads and seventh chords. Not open to music majors.

MUSC 104. Theory II (3) (See MUSC 103.) Prereq: MUSC 103 or consent of department.

MUSC 105. Sightsinging-Eartraining I (2) Aural and vocal study of isolated and contextual rhythmic patterns, scales, intervals, triads, seventh chords, and traditional and contemporary songs in treble and bass clefs. Correlated and taken concurrently with MUSC 101 and 102. Both aspects of the course must be passed in order to complete requirements.

MUSC 106. Sightsinging-Eartraining II (2) (See MUSC 105.)

MUSC 107. Theory for Music Majors I (4) This course is the first of four semesters of music theory requirements for Case music majors. It will include the study of harmony, analysis, eartraining, and keyboard skills. Prereq: Placement exam through department.

MUSC 108. Theory for Music Majors II (4) This course is the second of four semesters of music theory for Case music majors. It includes further study of harmony, analysis, eartraining, sight singing, and keyboard. Prereq: MUSC 107 or placement exam through department.

MUSC 150. Beginning Audio Recording (3) Basic principles and techniques of sound recording through practical experience. Emphasizes effects of different sound environments through acoustic analysis, and concepts of music in business pertaining to performers rights, recording copyrights, and publishing.

MUSC 151B. Case Audio Internship I (1) Development of recording engineering skills through professional level work in the Harkness audio service. Prereq: Open only to audio recording majors.

MUSC 153. Eartraining I (0) Physical expression of rhythm in which large bodily movements form the reference for rhythmic analysis. Study of pulse, meter, patterns, crossrhythms, improvisation, rhythmic canons, and bodily coordination emphasizing proper tension and relaxation.

MUSC 154. Eartraining II (0) (See MUSC 153.)

MUSC 201. Harmony-Keyboard III (2) Continuation of MUSC 101 and 102. Chromatically altered triads and 7th chords; 9ths, 11th, 13th; Neapolitan and augmented 6th chords, regular and irregular solutions. Correlated and taken concurrently with MUSC 205 and 206. Both aspects of the course must be passed in order to complete requirements. Prereq: MUSC 102 or placement examination.

MUSC 202. Harmony-Keyboard IV (2) (See MUSC 201.) Prereq: MUSC 102 or placement examination.

MUSC 205. Sightsinging-Eartraining III (2) Aural and vocal study using alto and tenor clefs, in addition to treble and bass. Correlated and taken concurrently with MUSC 201 and 202. Both aspects of the course must be passed in order to complete requirements. Prereq: MUSC 106 or placement examination.

MUSC 206. Sightsinging-Eartraining IV (2) (See MUSC 205.) Prereq: MUSC 205 or placement examination.

MUSC 207. Theory for Music Majors III (4) This course is the third of four semesters of music theory for Case music majors. Continued study of harmony, analysis, eartraining, sight singing, and keyboard, including use of dissonance and chromaticism, diatonic modulation. Prereq: MUSC 108 or placement exam through department.

MUSC 208. Theory for Music Majors IV (4) This course is the fourth of four semesters of music theory for Case music majors. Continued study of harmony, analysis, eartraining, sight singing, and keyboard. Use of dissonance and chromaticism, chromatic voice leading technique. Prereq: MUSC 207 or placement exam through department.

MUSC 221. Introduction to Music Listening Experience I (3) A flexible approach to the study of the materials and literature of music. Aural and analytical skills primarily for classical music.

MUSC 222. Introduction to Music Listening Experience II (3) Application of the skills developed in MUSC 221 to the understanding of historical and stylistic content of Western music. Focus is on particular works in context of the era of composition. Prereq: MUSC 221 or consent of department.

MUSC 229. History and Styles of Jazz (3) Musical styles and structures of jazz and American popular music since 1900. Prereq: MUSC 221.


MUSC 251B. Case Audio Internship II (0) Professional level work in the Case Western Reserve University Harkness audio service.

MUSC 253. Eartraining III (0) Continuation of MUSC 154. Material of increased difficulty as well as study of syncopation, rhythmic counterpoint, and conducting movements.

MUSC 254. Eartraining IV (0) (See MUSC 253.)

MUSC 271. Choral Conducting I (1) Study of the techniques of choral conducting and a general survey of choral literature.


MUSC 274. Orchestral Conducting II (1) (See MUSC 273.)

MUSC 275. Elements of Conducting (2) This course is designed to develop the physical tools, and philosophical and aesthetic ideologies necessary for students to conduct in an effective and appropriate manner. Students develop baton technique through systematic physical pattern exercises, and class and field conducting experiences (elementary through adult). Observations and written evaluations of Cleveland Orchestra rehearsals and concerts, along with video analysis/self-evaluation of personal conducting experiences are among the activities required in this course. Topics and content include: philosophical foundations for the conductor, considerations for selecting repertoire and creating a supportive learning environment; rehearsal techniques; planning for the rehearsal and record keeping; rehearsal management; group motivation; score analysis and preparation; participation in professional activities; effective use of technology for the conductor; and national, state, and professional standards. Clinical/Field experiences (all ages) required.

MUSC 276. Advanced Conducting (2) This course continues in-depth development of the physical tools, and philosophical and aesthetic ideologies presented in MUSC 275. Students develop baton techniques (with experiences in complex and changing time signatures) through systematic physical/pattern exercises, along with continuous evaluations, from their class and field conducting experiences (elementary through adult), observations and written evaluations of Cleveland Orchestra Rehearsals and Concerts, written critiques from historically significant Master Conductors (from videos in the University's Music Library), along with video analysis of personal class and field conducting, are among the activities required in this course. Topics and content include: philosophical foundations for the conductor, considerations for
selecting repertoire and creating a supportive learning environment; rehearsal techniques; planning for the rehearsal and record keeping; rehearsal management; group motivation; score analysis and preparation; participation in professional activities; effective use of technology for the conductor; and national and state standards. Clinical/Field experiences (all ages) required.

MUSC 301. Introduction to Analysis of 20th Century Music (2)
A study of compositional techniques as used in selected works by major 20th century composers. Prereq: MUSC 202 and MUSC 206.

MUSC 305. Sight-Singing/Eartraining V (3)
Continuing emphasis on the development of aural and vocal skills in all clefs, with particular attention to contemporary music, and increased emphasis on performance at sight of a wide range of literature. Prereq: MUSC 206.

MUSC 308. Computers and Music (3)
Emphasis on development of music notation and sequencing skills with some attention to word-processing and graphics. Introduction to data management and page layout software. Designed primarily for music majors but also open to non-majors with sufficient background in music theory. Use of the University's software library, CWRUnet and the music department's Center for Music and Technology. No formal training in computers required. Prereq: Music majors only.

MUSC 310. Instrumentation and Choral Arranging (3)
Techniques of writing and arranging for instruments of the band and orchestra and voice. Study of scoring problems for school instrumental and vocal groups of all ages and abilities.

MUSC 311. 16th Century Counterpoint (2)
Sixteenth century modal counterpoint. Exercises in the five species. Writing of short compositions and motets in two, three and four voices. Prereq: MUSC 202 or MUSC 206.

MUSC 312. 18th Century Counterpoint (2)
Eighteenth century tonal counterpoint. Analysis and writing of inventions in two parts, and fugues in three and four parts. Prereq: MUSC 202 or MUSC 206.

MUSC 315. Orchestration I (2)
The problems and techniques of scoring for strings and woodwinds, for brasses and percussion. Transcriptions and scoring for diverse combinations from chamber group to full orchestra.

MUSC 316. Orchestration II (2)
(See MUSC 315.)

MUSC 318. Form and Analysis (3)
Aural and visual analysis of structural and stylistic features of 16th through 20th century music. Prereq: MUSC 202 or MUSC 206.

MUSC 321. History of Western Music I (3)
Developments in Western music from Early Christian times to the present, especially great periods and composers. Reference to life and thought; illustrated lectures; style analysis. Prescribed listening and reading. Prereq: MUSC 102 or MUSC 106.

MUSC 322. History of Western Music II (3)
(See MUSC 321.) Prereq: MUSC 102 or MUSC 106.

MUSC 323. Piano Literature (3)
Chronological survey of keyboard literature from the 17th century to the present (may focus on more limited repertoire). Detailed analysis of representative works; study and comparison of keyboard styles. Prereq: Either MUSC 202 and 206 or MUSC 208, plus MUSC 322.

MUSC 324. Chamber Music Literature (3)
Chronological survey of important chamber literature. Analysis of representative sonatas, trios, quartets, and large ensembles. Prereq: MUSC 202 or MUSC 322.

MUSC 326. Symphonic Literature (3)
Representative masterworks of symphonic literature. Analysis and discussion of essential details, form, style, and instrumentation. Prereq: MUSC 202 or MUSC 322.

MUSC 327. Vocal Literature (3)

MUSC 328. Opera Literature (3)
Historical development of opera from the 17th century to the present. Detailed analysis of representative works. Prereq: MUSC 322.

MUSC 329. Jazz and American Popular Music Literature (3)
Musical styles and structures of jazz and American popular music; emphasis on music since 1900. Prereq: MUSC 202 or MUSC 322.

MUSC 336. History of Western Music III (3)
Music of the twentieth century, covering history, analysis, and aesthetic issues. Prereq: MUSC 322.

MUSC 337. Music Cultures of the World: Music of Asia and Africa (3)
A one-semester introduction to musics of Asia and Africa, focusing on the relationship of musical traditions and practices to culture and society. Prereq: MUSC 106.

MUSC 338. Music Cultures of the World II: Music of the Americas (3)
Introduction to selected multicultural musics of North America and Latin America, focusing on the relationship of musical traditions and practices to culture and society. Prereq: MUSC 106.

MUSC 339. Topics in Music History (3)
Close study of a theme or aspect of music such as “Music and Gender,” “Symphonies of Mahler,” and “Wagner’s Ring.” Prereq: Permission of department.

MUSC 341. General Music Methods A (3)
General Music A introduces student to methods and materials for planning and implementing general music experiences for all ages, with concentration on PreK through sixth grade children. Topics of the course include: multiple meanings of music for children; characteristics/needs of young children and creating a supportive learning environment; theories of music learning and teaching; learning styles and collaborative learning; assorted teaching methods, rhythm, pitch, listening, movement, performing, composing; curriculum design; technology for music instruction; multicultural music; music for exceptional children; integrating music with the arts and other curricula; motivation and classroom management; lesson planning and record keeping; developing a personal philosophy of music education; national, state, and professional standards; and assessment. Clinical/Field experiences (Clinical—all ages; Field-focus on PreK through elementary) required.

MUSC 342. General Music Methods B (3)
General Music B provides a more in-depth exploration of general music methods and materials for all ages, with concentration in grades 7 through adults. Topics of the course include: characteristics/needs of children, especially adolescents and young adults; creating a supportive learning environment through curriculum planning and design; instructional planning, implementation, and record keeping; involving students in moving, performing, creating and listening experiences with music, including individual and collaborative learning; music for exceptional children; using technology for music instruction; developing a personal philosophy of music education; teaching the arts together and integrating music into the school curriculum; multicultural musical experiences; motivation and classroom management; national, state, and professional standards; and assessments. Clinical/Field experiences (Clinical—all ages; Field-focus on middle school through adults) required.

MUSC 347. Technology Assisted Music Teaching and Learning (3)
Fundamental concepts and skills for using technology in music teaching and learning. This project-oriented class will develop knowledge and competencies related to electronic musical instruments, MIDI sequencing, music notation software, computer-assisted instruction, digital media, the Internet, information processing, computer systems, and lab management as they relate to music education in K-12 schools. Prereq: MUSC 241.

MUSC 350B. Junior Recording Techniques Thesis (3)
MUSC 351C. Senior Recording Techniques Thesis (6)

MUSC 353. Eurhythmics V (1)

MUSC 354. Eurhythmics VI (1)

MUSC 363. Principles of String Playing and Teaching I (2)
This course is designed to give an overview of historical pedagogy and its relationship to contemporary teaching practice. Students will survey teaching methodologies in relation to the foundational elements of performance technique for their instrument and investigate how to impart this information in an instructional setting. All students enrolled in the course will have the opportunity to teach students in a supervised situation and implement the concepts covered in class. Prereq: Consent of department.

MUSC 364. Principles of String Playing and Teaching II (2)
This course is a continuation of MUSC 363/463 and will foster further integration of the application of pedagogy to the teaching environment by the development of a conceptual rubric for instruction. This will include: expanding teaching strategies for a specific instructional environment or element of technique; principles of delivery; picking repertoire; diagnostic evaluation and assessment; and the creation of a personal style of teaching and reflection. Prereq: Consent of department.

MUSC 365. Eurhythmics Pedagogy I (2)
Investigation of objectives and methods for teaching children. Preparation of lesson plans, motivation, and development of physical skills. Observation and student teaching of children’s classes.

MUSC 366. Eurhythmics Pedagogy II (2)
(See MUSC 365.) Prereq: MUSC 365.

MUSC 367. Eurhythmics Pedagogy III (2)
Practice teaching; discussion of problems in class organization, interdepartmental integration; application of Dalcroze principles to the teaching of adults. A comprehensive paper illustrative of application of Dalcroze principles in music education and the arts
must be submitted and approved for completion of pedagogy requirements.

MUSC 368. Eurythmics Pedagogy IV (2)
(See MUSC 367.) Prereq: MUSC 367.

MUSC 377. Instrumental Methods and Materials (3)
This course acquaints students with effective ways to develop, organize and maintain a successful instrumental program for any age group, based on a comprehensive instrumental music education model. Students are given a “womb to tomb” view of the instrumentalists’ development, including physiological development and age appropriate instrumental exceptions. Topics and content include: philosophical basis for music education, considerations for selecting repertoire including multicultural music, rehearsal techniques, assessment and record keeping; planning for the rehearsal; recruitment, auditioning, and placement; motivation and classroom management; team teaching and collaborative learning; managing an instrumental program; participation in professional activities; effective use of technology in the instrumental program; philosophy; and national, state, and professional standards. Clinical/Field experiences (all ages) required.

MUSC 378. Choral Methods and Materials (3)
This course acquaints students with effective ways to develop a successful choral program for any age group, based on a comprehensive choral music education model. Students are given a “womb to tomb” view of the instrumentalists’ development, including physiological development and age appropriate vocal expectations, and establishing and maintaining vocal health. Topics include: philosophical basis for vocal music education; the child voice, the adolescent voice, and the adult voice; vocal tone; considerations for selecting repertoire including ensemble assessment, music evaluation, and multicultural music; rehearsal techniques, collaborative learning, and motivation; planning for the rehearsal; developing conducting technique; recruitment, auditioning, placement, score analysis and preparation; classroom management; managing a choral program; participation in professional activities; effective use of technology in a choral program; and national state, and professional standards. Clinical/Field experiences (all ages) required. Prereq: MUSC 276.

MUSC 381. Composition for Non-Majors I (2)
Techniques of motive development and composition in small forms. Prereq: Consent of department.

MUSC 383. Audio Recording I (2)
A study of basic recording principles and systems and techniques of recording and editing. Prereq: Audio recording majors only.

MUSC 384. Audio Recording II (2)
Further study of basic recording principles and systems with an introduction to digital recording. Prereq: MUSC 383.

MUSC 385. Advanced Recording Techniques I (2)
A study of advanced microphone, recording, and monitoring systems and techniques with an emphasis on two track digital recordings of classical music and critical listening. Prereq: MUSC 384.

MUSC 386. Advanced Recording Techniques II (2)
Further study of advanced microphone, recording, and monitoring systems and techniques, with an emphasis on two track digital recordings of large ensemble classical music. Prereq: MUSC 385.

MUSC 387. Multitrack Recording Techniques I (2)
A study of multitrack recording and mixdown techniques. Prereq: MUSC 386. Audio recording majors only.

MUSC 388. Multitrack Recording Techniques II (2)
Further study of multitrack recording and mixdown techniques, with an emphasis on synchronization to video. Prereq: MUSC 387.

MUSC 390. Undergraduate Research Seminar (3)
Special projects appropriate to individual interests and needs.

MUSC 390E. Seminar in Music Theory (1)
Study of pedagogical, practical, and speculative aspects of music theory, with special projects. Limited to theory majors; others with consent of department.

MUSC 391. Recording Studio Maintenance I (1)
Study of techniques for optimizing professional recording equipment performance. Prereq: MUSC 384. Audio recording majors only.

MUSC 392. Recording Studio Maintenance II (1)

MUSC 393. Introduction to Early Music Performance Practice (3)
Summary and perspective of the problems and issues associated with the field of early music performance practices. Prereq: MUSC 321 and MUSC 322.

MUSC 394. Seminar in Early Music Performance Practice (3)
Seminar in a specific instrument and/or vocal area of performance practices, such as baroque vocal, instrumental, or keyboard practices. May be repeated because topics vary. Prereq: MUSC 393.

MUSC 396. Practice Teaching in Music (12)
Teaching music in both elementary and secondary schools, full time five days a week for 15 weeks. Closely supervised field experiences of all types with a wide variety of students. Emphasis on planning lessons and organizing materials, teaching methodologies, motivation, and student assessment. Topics addressed include communications and the arts, technology in learning, interdisciplinary learning, collaborative learning and teaching, creating a supportive learning environment, and professional development. Development of skills needed for self-assessment as well as student assessment. Clinical/Field experiences (all ages) required. Prereq: MUSC 399. Undergraduate Independent Studies (1-3)
Each student develops a topic of interest to be explored with a faculty member.

MUSC 399C. Acoustics of Music (1)
A seminar in the basic concepts of musical acoustics and research in this area. The students actively participate in experiments exploring various topics in musical acoustics.

Graduate Courses

MUSC 400A. Review of Musical Structure (3)
Instruction of fundamentals of form, counterpoint, and four-part harmony. Designed for graduate students; credit not applicable toward degree requirements.

MUSC 400B. Sightreading and Eartraining Review (2)
Background in fundamentals of sight reading in four clefs; melodic and harmonic dictation including chromatic harmony and modulation. Designed for graduate students; credit not applicable toward degree requirements.

MUSC 408. Analysis of Musical Styles (3)
Analysis of selected musical compositions from various periods of the common practice era. Emphasis on traditional structures, stylistic features, and the relationship of analysis and performance.

MUSC 416. Pre-common Practice Theory and Analysis (3)
An exploration of treatises and analytical methods appropriate to music of the Medieval and Renaissance eras.

MUSC 417. Analytic Techniques I (3)
Exploration of several approaches to the examination of musical structures, emphasizing hierarchical functional analysis and the interaction of the elements. Focus on music in traditional forms.

MUSC 421. Methodologies of Music History (3)
Introduction to the scholarly study of music, including principles of music bibliography, techniques of library research, and evaluation of editions. Special emphasis given to the relationship between musical performance and research in the history and criticism of music. Attention will also be given to design of program notes and essays. Required of first-year students in the Master of Music degree program.

MUSC 423. Music History and Ideas (3)
Music aesthetics in relation to historical trends in cultural and intellectual thought.

MUSC 430. Music History for Educators (3)
Examines the intersections of composers’ musical output as it overlaps with theories of general education, music education, and pedagogy.

MUSC 431. Medieval Music: Early Christian to 1425 (3)
The mass, liturgical drama, and early polyphony through the Ars Nova.

MUSC 432. Music of the Renaissance (3)
Vocal polyphonic music from the Burgundian school through the Elizabethan madrigal.

MUSC 433. Music of the Baroque (3)
Musical developments from Monteverdi to Bach and Handel.

MUSC 434. Viennese Classicism (3)
Development of the symphony, concerto, chamber music, and opera in the works of the Mannheim composers, Haydn, Mozart, and Beethoven.

MUSC 435. Nineteenth Century Music (3)
Romanticism and other 19th century trends in music up to impressionism.

MUSC 436. Twentieth Century Music (3)
Critical and analytical study of music since 1900. Examination and discussion of stylistic characteristics and aesthetic aims of contemporary composers.

MUSC 439. Topics in Music History (3)
(See MUSC 339.) Prereq: Permission of department.

MUSC 441. Philosophical Foundations of Music Education (3)
In this course, students explore major aesthetic philosophies that have influenced contemporary music education, and discuss current issues central to our field. Among topics include: basic views about art/music; creating art/music; meaning in art/music, experiencing art/music; music and aesthetic education; criticism in music; multicultural music; and critical theories and inquiry regarding music education. Students are asked to assess their own roles in music education, as well as their obligations and potential capacities for leadership in the profession. Students will work toward development of a personal professional philosophy of music education.
MUSC 442. Learning and Curriculum Development in Music (3)
Students explore (1) different theories regarding how people learn from birth through adulthood, including learning styles and special learners; (2) what is known regarding how children and adults acquire musical understanding/skill; (3) curriculum content, including the use of technology; (4) approaches to the organization of instructional content, including national and state standards; (5) development of music curricula. Students will work toward development of a curriculum in an area of their interest and expertise.

MUSC 443. Cognitive Psychology of Music (3)
Survey and critical review of the literature as it relates to music teaching and learning, and music performance. Specific topics may include basic psychoacoustic processes, auditory perception, cognitive organization of musical sound, tonal and musical memory, neuromusical research, affective and physiological responses to music, learning theory, musical aptitude, developmental processes, and motivation.

MUSC 444. Research and Measurement in Music Education I (3)
Paradigms and methods in music education research. Specific topics and assignments include research-related resources, tools and materials; research problems; research literature; research procedures, research proposals; qualitative and quantitative research studies; computer-assisted data analysis; and empirical research reports.

MUSC 445. Research and Measurement in Music Education II (3)
Advanced studies in models and methods of music education research. Research projects using data analysis. In-depth examination of selected quantitative and/or qualitative research designs according to student interests. Discussion of thesis and dissertation proposal format process. Prereq: MUSC 444.

MUSC 447. Technology Assisted Music Teaching and Learning (3)
(See MUSC 347.)
MUSC 451. Recording Studio Internship (4)
MUSC 453. Eurhythmics VII (1)
Problems of musical rhythm as expressed in words of Classical and Contemporary composers; participation in all areas of eurhythmics. Discussion and experimentation with various methods, approaches and ideas.

MUSC 454. Eurhythmics VIII (1)
(See MUSC 453.)
MUSC 461. Theory Pedagogy I (2)
Principles of the teaching of theory at all levels, with examination and appraisal of teaching methods, textbooks, recent concepts, etc.

MUSC 462. Theory Pedagogy II (2)
(See MUSC 461.)
MUSC 463. Principles of String Playing and Teaching I (2)
(See MUSC 363.)
MUSC 464. Principles of String Playing and Teaching II (2)
(See MUSC 364.)
MUSC 471. Graduate Choral Conducting I (1)
Study of the techniques of choral conducting and a general survey of choral literature.

MUSC 483. Electronic Sound Production I (2)
A practical study of computer assisted electronic music composition covering traditional concepts of analog and digital synthesis, midi sequencing, sampling techniques, and video soundtrack production.

MUSC 484. Electronic Sound Production II (2)
A practical study of computer assisted electronic music composition covering traditional concepts, analog and digital synthesis, midi sequencing, sampling techniques and video soundtrack production. Prereq: MUSC 483.

MUSC 490. Medieval/Renaissance Notation (3)
Theory of chant, modal, mensural, and tablature notation. Practice in making literal transcriptions, editing, and preparing scores for performances.

MUSC 493. Introduction to Early Music Performance Practice (3)
(See MUSC 393.)
MUSC 494. Seminar in Early Music Performance Practice (3)
(See MUSC 394.)
MUSC 496. Practice Teaching in Music (12)
Teaching music in both elementary and secondary schools, full time five days a week for 15 weeks. Closely supervised field experiences of all types with a wide variety of students. Emphasis on planning lessons and organizing materials, teaching methodologies, motivation, and student assessment. Topics addressed include communication and the arts, technology in learning, interdisciplinary learning, collaborative learning and teaching, creating a supportive learning environment, and professional development. Development of skills needed for self-assessment as well as student assessment. Clinical/Field experiences (all ages) required.

MUSC 499. Clinical/Field Experience (3)
This provides clinical/field experiences with all ages of students in all teaching areas. Students from a variety of socioeconomic and cultural backgrounds are encountered. Clinical/Field experiences (all ages) required.

MUSC 501. Special Reading (M.A. and M.M.) (1-18)
MUSC 529. Bibliography and Research Methods in Music (3)
Seminar in research methods and techniques, stressing the analytic and functional approaches to bibliography.

MUSC 539. Doctor of Musical Arts Seminar (3)
Prereq: MUSC 529.
MUSC 540A. Effective Teaching in General Music: Ideas that Work (2)
Designed for elementary and middle school general music teachers, this hands-on course will focus on a variety of effective and practical teaching approaches for music teaching and learning, among them: enactive/iconic/symbolic approach to conceptual learning; active participation techniques; creating visual maps for listening lessons; teaching musical concepts through children’s literature; using the generative approach learning rhythms and melodies; sound compositions, and song games. In addition, four areas of understanding that are critical to successfully teaching general music in school situations will be addressed: (1) importance of music for every child; (2) developmental characteristics of children that must be considered in designing learning experiences; (3) age-appropriate learning goals and objectives (including National Standards in Music) and how they may be assessed; and (4) sequencing of curriculum.

MUSC 590. Seminar in Musicology (3)
Problems in musical criticism, aesthetics, and analysis, as well as interdisciplinary methodologies.

MUSC 591A. Music Education Seminar: Creativity (3)
In this seminar, we will explore issues and theories involving creative thinking in general, and examine how creative thinking and musical experience interact.

Topics include: definitions and theories of creativity; the creative process; the creative product; assessment; creativity in gifted education; teaching for creative growth; creative thinking and music composition (including improvisation), performance and listening; designing creative activities for the music classroom and rehearsal; available resources and professional organizations; and creativity as encouraged by state/national standards. Students will work toward development of a personal definition of creative thinking and how it can be applied to teaching in the music classroom.

MUSC 591C. Music Education Seminar: Conducting (3)
In this course, students focus on advanced score study, preparation, and analysis. In depth conducting techniques on contemporary music and mixed meter compositions, along with the development of a comprehensive conducting bibliography are the major components in this seminar. Historical research, analytical evaluation, and the practical elements of the physical techniques required for one to conduct a chosen composition are all addressed for each composition studies. Seminar discussions include aesthetic and philosophical ideologies, and the practical issues a conductor faces when put in control of the advanced ensemble.

MUSC 595A. Seminar in Music Theory: Analytical Projects (1-2)
Individual projects in analysis for graduate students only.

MUSC 601. Special Readings (Ph.D./D.M.A.) (1-18)
MUSC 651. Thesis: (M.A. and M.M.) (1-6)
MUSC 696. College Teaching Practicum (0)
MUSC 701. Dissertation Ph.D. (1-18)
MUSC 703. Dissertation Fellowship (1-8)
MUSC 751. Recital Document I-D.M.A. (1-3)
MUSC 752. Recital Document II - D.M.A. (1-3)
MUSC 753. Recital Document III-D.M.A. (1-6)
MUSC 782. Composition Document-D.M.A. (3)

APPLIED MUSIC (APMU)

Undergraduate Courses
APMU 011. Recital Class (0)
APMU 101. Principal Performance Area I (1.5-3)
Limited to music and music education majors.
APMU 102. Principal Performance Area II (1.5-3)
Limited to music and music education majors.
APMU 111. Secondary Performance Area I (1.5-3)
Open to all university students.
APMU 112. Secondary Performance Area II (1.5-3)
Open to all university students.
APMU 120B. Music Methods: Voice (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.
APMU 120D. Music Methods: Guitar (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.
APMU 120G. Music Methods: Trumpet (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 120H. Music Methods: Violin (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 120J. Music Methods: String (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 120K. Music Methods: Brass (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 120L. Music Methods: Clarinet (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 120M. Music Methods: Woodwind (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 120N. Music Methods: Percussion (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

APMU 201. Principal Performance Area III (1.5-3)
Limited to music and music education majors.

APMU 202. Principal Performance Area IV (1.5-3)
Limited to music and music education majors.

APMU 211. Secondary Performance Area III (1.5-3)
Open to all university students.

APMU 212. Secondary Performance Area IV (1.5-3)
Open to all university students.

APMU 241. Piano Pedagogy I (1)
APMU 242. Piano Pedagogy II (1)

APMU 301. Principal Performance Area V (1.5-3)
Limited to music and music education majors.

APMU 302. Principal Performance Area VI (1.5-3)
Limited to music and music education majors.

APMU 311. Secondary Performance Area V (1.5-3)
Open to all university students.

APMU 312. Secondary Performance Area VI (1.5-3)
Open to all university students.

APMU 326. Introduction to the Harpsichord (2)
Introduction to the harpsichord technique and the interpretation of 17th- and 18th-Century Baroque keyboard music. Study of national styles, ornamentation, articulation, tempi, dynamics, fingering, and registration. Focus is on short representative works of Byrd, Couperin, Rameau, Duphly, Bach, Scarlatti, and Soler, as well as other works chosen by participating students. Limited to six students. Prereq: Open to CIM and Case music majors with keyboard background; consent of department; not open to harpsichord majors.

APMU 327. Accompanying at the Harpsichord (2)
A practical introduction to accompanying a variety of Baroque vocal and instrumental works in a stylistically appropriate manner. Particular emphasis on the Bach sonatas for flute, violin, and viola da gamba. Students who are accompanying in recitals are encouraged to perform in class and receive coaching. Limited to six students. Prereq: APMU 326 and consent of department.

APMU 333F. Guitar Seminar (1)

APMU 333G. Organ Practicum (1)

APMU 341. Piano Pedagogy III (1)
Organizing piano literature into levels of difficulty; appropriate use of published materials; in-depth study of psychological/developmental differences in the various age groups; problems pertaining to the adult pupil and the pupil who has had inadequate previous training; teaching of secondary piano at the collegiate level. The class meets one hour weekly. Class members observe instruction within the CIM Conservatory and Preparatory Departments.

APMU 342. Piano Pedagogy IV (1)
(See APMU 341.)

APMU 366. Wind Ensemble (0-1)
Designed for the most advanced woodwind, brass, and percussion players. Stresses the single-performance concept utilizing only players needed for a given piece. Audition required.

APMU 368A. String/Piano Chamber Music (1)

APMU 368B. Intensive Quartet Seminar (2)

APMU 369A. Miscellaneous Ensembles (0-2)

APMU 369B. Contemporary Music Ensemble (1-2)

APMU 380A. Collegium Musicum (0-1)

APMU 380B. Early Music Singers (0-1)

APMU 380D. Baroque Orchestra (0-1)

APMU 381A. CIM Symphony Orchestra (0-1)

APMU 382A. Case Concert Choir (0-1)
This select choral group performs a wide variety of a cappella and accompanied choral works. Membership is gained only through an audition with the director. Prereq: Audition required.

APMU 382C. Cleveland Orchestra Chorus (0-1)

APMU 382D. University Singers (0-1)
Chorus performing a wide variety of traditional and popular choral works. Open to all Case students. No audition required.

APMU 383A. Jazz Ensemble I (0-1)

APMU 383B. Jazz Ensemble II (0-1)

APMU 383C. Symphonic Winds (0-1)
Performance of advanced symphonic band repertoire. Open to all Case students, faculty and staff. Audition required for part placement only.

APMU 383D. Spartan Marching Band (0-1)
APMU 383F. Handbell Choir (0)

APMU 385. Case/University Circle Orchestra (0-1)
The orchestra is comprised of Case students, faculty, staff and community players who play strings, woodwinds, brass and percussion. Audition required.

APMU 386. Keyboard Repertory Seminar (0-1)
Intensive study of the repertory for keyboard instruments, including solo literature, chamber music, and other collaborative genres. Master class format with regular performances by enrolled students. Enrollment limited to Case keyboard majors.

APMU 401. Principal Performance Area VII (1.5-3)
Limited to music and music education majors.

APMU 402. Principal Performance Area VIII (1.5-3)
Limited to music and music education majors.

APMU 411. Secondary Performance Area VII (1.5-3)
Open to all university students.

APMU 412. Secondary Performance Area VIII (1.5-3)
Open to all university students.

APMU 501. Principal Performance Area IX (1.5-3)
Limited to music and music education majors.

APMU 502. Principle Performance Area X (1.5-3)
Limited to music and music education majors.

APMU 511. Secondary Performance Area IX (1.5-3)
Open to all university students.

APMU 512. Secondary Performance Area X (1.5-3)
Open to all university students.

APMU 602. Principal Performance Area XI (1.5-3)
Limited to D.M.A. Students.

Natural Sciences
Academic Representative
Dr. Joanne Westin
214 DeGrace Hall, Phone: 368-3566
E-mail: jwx3@case.edu

UNDERGRADUATE PROGRAMS

Major

The Natural Sciences major is an interdisciplinary science program that leads to the Bachelor of Arts degree. It is intended to serve students whose interests and objectives call for a major in the humanities or social sciences that is accompanied by broad background in the natural sciences; e.g. history and philosophy of science and technology. Natural Sciences is available only as a second major for the B.A.; the first major for the B.A. must be in one of the departments within the arts and humanities or the social sciences, excluding the programs in American Studies, Asian Studies (Track 2), Environmental Studies, Gerontological Studies, Pre-Architecture, and Women's Studies. For a student who completes a B.S. degree in management or accounting, Natural Sciences may serve as the sole major for the B.A. degree.

The program requires a minimum of 50 semester hours of work in natural sciences and mathematics. The departments included in the major are astronomy,
biology, chemistry, geological sciences, and physics. The student must complete
a minimum of 20 hours in one of the
departments, a minimum of 8 hours each
in each of two other of these depart-
ments listed, and 3 hours in each in of the
remaining two departments. In addition,
all natural sciences majors must complete
MATH 125 and 126 or MATH 121 and
122. The courses selected in each of these
departments must generally be courses
that also satisfy major or related course
requirements of an existing science major.
(However, ASTR 201 and 202 are accept-
able for the Natural Sciences major.)

Minor
A minor is achieved through completion
of the requirements specified below for
any four of the five departments listed.

Biology
Any two of BIOL 214, 215, 216

Chemistry
Completion of one of the following
sequences:
CHEM 105, 106, 113
or
CHEM 111, 113, ENGR 145

Geological Sciences
Any one of GEOL 101, 110, 115 or 117;
and GEOL 119; and any one additional
GEOL course (can be one of those listed
or any other GEOL course).

Mathematics
Completion of one of the following
sequences:
MATH 125, 126
or
MATH 121, 122

Physics
Completion of one of the following
sequences:
PHYS 115, 116
or
PHYS 121, 122, 221

Department of Nutrition
2123 Abington Road, Room 201
Phone 368-2440; Fax 368-6644
Website: http://www.cwru.edu/med/
nutrition/home/html
Henri Brunengraber, Chair

The department's focus is on human
nutrition and the application of the
science of nutrition to the maintenance
and improvement of health. Undergradu-
ate programs are designed for students
interested in nutritional biochemistry and
metabolism, molecular nutrition, profes-
sional study in dietetics, public health
nutrition, medicine, dentistry or nursing.
Graduate programs emphasize dietetics,
public health nutrition, nutritional bio-
chemistry and molecular nutrition.

The Department of Nutrition offers pro-
grams leading to the following: Bachelor
of Science degree in Nutrition, Bachelor
of Arts degree in Nutrition, Bachelor of
Arts degree in Nutritional Biochemistry
and Metabolism, Bachelor of Science
degree in Nutritional Biochemistry and
Metabolism, Master of Science degree in
Nutrition, Master of Science degree in
Public Health Nutrition, and Doctor of
Philosophy degree. A nutrition minor is
available. Specialty programs are available
in areas such as maternal and child nutrition
or gerontology. The specialty is in
addition to the basic graduate degree.

Special announcements describing the
various programs and providing addi-
tional information are available from the
department.

FACULTY
Henri Brunengraber, M.D., Ph.D.
(Universite de Liege)
Professor and Chair of Department
Edith Lerner, Ph.D. (University of
Wisconsin _ Madison)
Associate Professor and Vice_Chair of
Department
Hope Barkoukis, Ph.D. (Case Western
Reserve University)
Assistant Professor

Margaret M. Cicirella, M.A., M.S. (Case
Western Reserve University)
Instructor
Colleen Croniger, Ph.D. (Case Western
Reserve University)
Assistant Professor
Paul Ernsberger, Ph.D. (Northwestern
University)
Associate Professor
Maria Hatzoglou, Ph.D. (University of
Athens)
Associate Professor
Takhir Kasumov, Ph.D. (Moscow State)
Instructor
Mary Beth Kavanagh, M.S, (Case Western
Reserve University)
Instructor
Janos Kerner, Ph.D. (Hungarian Academy
of Sciences)
Assistant Professor
Jane Korsberg, M.S. (Case Western Reserve
University)
Instructor
Duna Massillon, Ph.D. (Montreal)
Assistant Professor
Laura Nagy, Ph.D. (University of
California-Berkeley)
Associate Professor
Patricia Papsidero, M.S. (Case Western
Reserve University)
Associate Professor
Stephen Previs, Ph.D. (Case Western
Reserve University)
Assistant Professor
Alison Steiber, M.S. (University of Kansas)
Assistant Professor
James Swain, Ph.D. (Iowa State University)
Associate Professor
Kou-Yi Tserng, Ph.D. (Illinois at Chicago)
Associate Professor
Jonathan Whittaker, M.R.C.P . (University
College School of Medicine, London, U.K.)
Associate Professor
Associate Faculty
Secondary Appointments
Saul Genuth, M.D. (Case Western Reserve
University)
Professor
Sharon Groh-Wargo, Ph.D. (Case Western Reserve University)
*Assistant Professor*

Richard W. Hanson, Ph.D. (Brown University)
*Professor*

Douglas S. Kerr, M.D., Ph.D. (Case Western Reserve University)
*Professor*

John Kirwan, Ph.D. (Ball State)
*Associate Professor*

William Stanley, Ph.D. (University of California-Berkeley)
*Associate Professor*

Anthony Tavill, M.D. (Manchester-England)
*Professor*

Phyllis Allen, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Kimberly Altman, M.P.H. (Case Western Reserve University)
*Adjunct Instructor*

Judith Anderson, Dr. Ph. (North Carolina)
*Adjunct Instructor*

Nancy Arnold, B.S. (Ohio University)
*Adjunct Instructor*

Anika Avery-Grant, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Dolores Badar, M.P.H. (Case Western Reserve University)
*Adjunct Instructor*

Cynthia Bayerl, M.A. (Boston University)
*Adjunct Instructor*

Cynthia Blackburn, M.S. (Kent State University)
*Adjunct Instructor*

Carmen Blakely-Adams (Michigan State University)
*Adjunct Instructor*

Elizabeth Boone, B.S. (Ohio University)
*Adjunct Instructor*

Josephine Ann Cialone, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Sharon Groh-Wargo, Ph.D. (Case Western Reserve University)
*Adjunct Instructor*

Cheri Collier, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Susan Comfort, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Janice Davis, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Tabitha Desz, B.S. (Notre Dame College)
*Adjunct Instructor*

Sharon B. Doughten, M.S. (Kent State University)
*Adjunct Instructor*

Helen Dumski, B.S. (Ohio State University)
*Adjunct Instructor*

Denise Ferris, Ph.D. (University of Pittsburgh)
*Adjunct Instructor*

Karen M. Fiedler, Ph.D. (University of Tennessee)
*Adjunct Associate Professor*

Diane Foreman-Peck, M.P.H. (University of Berkeley, California)
*Adjunct Instructor*

Evangelina Fowler, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Lorna Fuller, M.S. (Kent State University)
*Adjunct Instructor*

Deborah Gammell, M.S. (Miami University of Ohio)
*Adjunct Instructor*

Brenda Gattison, M.S. (Texas Womenís University)
*Adjunct Instructor*

Peggy Gates, M. Ed. (Cleveland State University)
*Adjunct Instructor*

Melinda Gedeon, B.S. (Ohio State University)
*Adjunct Instructor*

Martha Halko, M.S. (University of Akron)
*Adjunct Instructor*

Cathy Hastings, M.P.H. (South Florida)
*Adjunct Instructor*

Valerie Heimbach, M.S. (Indiana University of Pennsylvania)
*Adjunct Instructor*

Karen Horvath, B.S. (University of Akron)
*Adjunct Instructor*

Claire Hughes, Dr.PH (University of Hawaii)
*Adjunct Instructor*

Lisa Isham, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Elvira Jarka, M. PH. (University of Illinois)
*Adjunct Instructor*

Jan Kallio, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Jennifer Kernc, B.S. (University of Akron)
*Adjunct Instructor*

Natalia Kliszczuk-Smolio, B.S. (University of Cincinnati)
*Adjunct Instructor*

Richard Koletsky, M.D.
*Adjunct Assistant Clinical Professor*

Jennifer Kravec, B.S. (Ohio State University)
*Adjunct Instructor*

Perri Kushan, B.S. (University of Akron)
*Adjunct Instructor*

Willie L. Lee, M.S. (University of Michigan)
*Adjunct Instructor*

Diane Foreman-Peck, M.P.H. (University of Berkeley, California)
*Adjunct Instructor*

Evangelina Fowler, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Lorna Fuller, M.S. (Kent State University)
*Adjunct Instructor*

Deborah Gammell, M.S. (Miami University of Ohio)
*Adjunct Instructor*

Brenda Gattison, M.S. (Texas Womenís University)
*Adjunct Instructor*

Peggy Gates, M. Ed. (Cleveland State University)
*Adjunct Instructor*

Melinda Gedeon, B.S. (Ohio State University)
*Adjunct Instructor*

Martha Halko, M.S. (University of Akron)
*Adjunct Instructor*

Cathy Hastings, M.P.H. (South Florida)
*Adjunct Instructor*

Valerie Heimbach, M.S. (Indiana University of Pennsylvania)
*Adjunct Instructor*

Karen Horvath, B.S. (University of Akron)
*Adjunct Instructor*

Claire Hughes, Dr.PH (University of Hawaii)
*Adjunct Instructor*

Lisa Isham, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Elvira Jarka, M. PH. (University of Illinois)
*Adjunct Instructor*

Jan Kallio, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Jennifer Kernc, B.S. (University of Akron)
*Adjunct Instructor*

Natalia Kliszczuk-Smolio, B.S. (University of Cincinnati)
*Adjunct Instructor*

Richard Koletsky, M.D.
*Adjunct Assistant Clinical Professor*

Jennifer Kravec, B.S. (Ohio State University)
*Adjunct Instructor*

Perri Kushan, B.S. (University of Akron)
*Adjunct Instructor*

William Lee, M.S. (University of Michigan)
*Adjunct Instructor*

Tanya Loncar, M.S. (Rush University)
*Adjunct Instructor*

Mary A. McGuckin, M.S. (Case Western Reserve University)
*Adjunct Instructor*

Anita Martin, M.P.H. (University of North Carolina)
*Adjunct Instructor*

Linda Novak-Eedy, B.S. (Bowling Green State University)
*Adjunct Instructor*

Lisa Ogg, B.S. (Kent State University)
*Adjunct Instructor*

Punam Ohri-Vashaspati, Ph.D. (Tufts University)
*Adjunct Instructor*

Ermin Olive, M.S. (University of Puerto Rico)
*Adjunct Instructor*

Christine Polisena M.S. (Case Western Reserve University)
*Adjunct Instructor*

Barbara Pryor, M.S. (Ohio State University)
*Adjunct Instructor*
**BACHELOR OF SCIENCE DEGREE IN NUTRITION: HUMAN NUTRITION MAJOR**

**Freshman Year**

**Fall**
- CHEM 105 Principles of Chemistry I ........................................ (3)
- ENGL 150 Expository Writing .............................................. (3)
- MATH ................................................................................ (3-4)
- GER: Social Sciences .............................................................. (3)
- GER: Arts/Humanities ........................................................... (3)
- PHED 101 Physical Education .............................................. (0)

**Spring**
- CHEM 106 Principles of Chemistry II .................................. (3)
- CHEM 113 Principles of Chemistry Laboratory .................... (2)
- NTRN 201 Nutrition ............................................................ (3)
- MATH ................................................................................ (3-4)
- BIOL 214 Genes and Evolution ............................................ (4)
- PHED 102 Physical Education .............................................. (0)

**Sophomore Year**

**Fall**
- NTRN 342 Food Science ..................................................... (5)
- STAT 201 Basic Statistics for the Social and Life Sciences I .... (3)
- CHEM 223 Introductory Organic Chemistry I .................... (3)
- CHEM 233 Introductory Organic Chemistry Laboratory * ... (2)
- GER: Social Sciences ............................................................ (3)

**Spring**
- NTRN 343 Dietary Patterns ................................................ (3)
- CHEM 224 Introductory Organic Chemistry II* .................. (3)
- CHEM 234 Introductory Organic Chemistry Laboratory II* (2)
- GER: Social Sciences ............................................................ (3)
- GER: Arts/Humanities ........................................................... (3)

**Junior Year**

**Fall**
- BIOL 348 Human Anatomy and Physiology ....................... (4)
- DEND 307 Biochemistry .................................................... (4)
- GER: Arts/Humanities .......................................................... (3)
- GER: Global Diversity ......................................................... (3)

**Spring**
- BIOL 343 Microbiology* .................................................... (3)
- BIOL 344 Laboratory for Microbiology* ............................ (2)
- NTRN elective .................................................................. (3)
- GER: Arts/Humanities ......................................................... (3)
- Elective ................................................................................ (6)

**Senior Year**

**Fall**
- NTRN 363 Energy, Protein, and Minerals ......................... (3)
- NTRN Elective .................................................................. (3)
- Electives ............................................................................ (12)
  * Strongly recommended but not required.

**Spring**
- NTRN 364 Vitamins ............................................................ (3)
- NTRN elective .................................................................. (3)
- Electives ............................................................................ (9)

---

**Anne Raguso, Ph.D. (Case Western Reserve University)**
- Adjunct Assistant Professor

**Tamara Kurtis Randall, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Mary Ellen Rivero, M.S. (Northern Illinois University)**
- Adjunct Instructor

**Anna Rostafinski, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Jo Ann Ruggeri, B.S. (Ohio State University)**
- Adjunct Instructor

**Joanne Samuels, B.S. (State University of New York)**
- Adjunct Instructor

**Sharon Schwartz, M.S. (Indiana University School of Medicine)**
- Adjunct Instructor

**Miriam Seidel, M.S. (Boston University)**
- Adjunct Instructor

**Najeeba Shine, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Ruth Shrock, M.S. (Ohio State University)**
- Adjunct Instructor

**Suzanne Silverstein, M.A. (George Washington University)**
- Adjunct Instructor

**Donna Skoda, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Sara Snow, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Lara Beth Spinks, M.S. (Ohio State University)**
- Adjunct Instructor

**Virginia Siver, M.S. (University of Tennessee)**
- Adjunct Instructor

**Carol Stojkov, B.S. (Ohio State University)**
- Adjunct Instructor

**Michelle Stopa, M.S.**
- Adjunct Instructor

**Tanya Sussman, B.S. (University of Cape Town, South Africa)**
- Adjunct Instructor

**Margaret Tate, M.S. (Colorado State)**
- Adjunct Instructor

**Norliza Tayag, B.S. (San Diego State University)**
- Adjunct Instructor

**Sharon Schwartz, M.S. (Indiana University School of Medicine)**
- Adjunct Instructor

**Miriam Seidel, M.S. (Boston University)**
- Adjunct Instructor

**Najeeba Shine, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Ruth Shrock, M.S. (Ohio State University)**
- Adjunct Instructor

**Suzanne Silverstein, M.A. (George Washington University)**
- Adjunct Instructor

**Donna Skoda, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Sara Snow, M.S. (Case Western Reserve University)**
- Adjunct Instructor

**Lara Beth Spinks, M.S. (Ohio State University)**
- Adjunct Instructor

**Virginia Siver, M.S. (University of Tennessee)**
- Adjunct Instructor

**Carol Stojkov, B.S. (Ohio State University)**
- Adjunct Instructor

**Michelle Stopa, M.S.**
- Adjunct Instructor

**Tanya Sussman, B.S. (University of Cape Town, South Africa)**
- Adjunct Instructor

**Margaret Tate, M.S. (Colorado State)**
- Adjunct Instructor

**Norliza Tayag, B.S. (San Diego State University)**
- Adjunct Instructor

---
Case Western Reserve University General Bulletin 2004–2006

BACHELOR OF ARTS DEGREE IN NUTRITION:
Nutritional Biochemistry and Metabolism Major

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>MATH 125 Mathematics I</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 105 Principles of Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>ENGL 150 Expository Writing</td>
<td>(3)</td>
</tr>
<tr>
<td>GER: Arts/Humanities</td>
<td>(3)</td>
</tr>
<tr>
<td>GER: Social Sciences</td>
<td>(3)</td>
</tr>
<tr>
<td>PHED 101 Physical Education</td>
<td>(0)</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>MATH 126 Mathematics II</td>
<td>(4)</td>
</tr>
<tr>
<td>CHEM 106 Principles of Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 113 Principles of Chemistry Laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td>NTRN 201 Nutrition</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOL 214 Cells and Proteins</td>
<td>(4)</td>
</tr>
<tr>
<td>PHED 102 Physical Education</td>
<td>(0)</td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>CHEM 223 Introductory Organic Chemistry I</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 233 Introductory Organic Chemistry Laboratory</td>
<td>(2)</td>
</tr>
<tr>
<td>NTRN 342 Food Science</td>
<td>(5)</td>
</tr>
<tr>
<td>BIOL 215: Cells and Proteins</td>
<td>(4)</td>
</tr>
<tr>
<td>GER: Social Sciences</td>
<td>(3)</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>CHEM 224 Introductory Organic Chemistry II</td>
<td>(3)</td>
</tr>
<tr>
<td>CHEM 234 Introductory Organic Chemistry Laboratory II</td>
<td>(2)</td>
</tr>
<tr>
<td>GER: Arts/Humanities</td>
<td>(3)</td>
</tr>
<tr>
<td>GER: Social Sciences</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>BIOL 348 Human Anatomy and Physiology</td>
<td>(4)</td>
</tr>
<tr>
<td>PHYS 115 Introductory Physics I</td>
<td>(4)</td>
</tr>
<tr>
<td>BIOC 307 General Biochemistry</td>
<td>(4)</td>
</tr>
<tr>
<td>GER: Arts/Humanities</td>
<td>(3)</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>PHYS 116 Introductory Physics II</td>
<td>(4)</td>
</tr>
<tr>
<td>GER: Global Diversity</td>
<td>(3)</td>
</tr>
<tr>
<td>GER: Arts/Humanities</td>
<td>(3)</td>
</tr>
<tr>
<td>Elective</td>
<td>(6)</td>
</tr>
<tr>
<td>Senior Year</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
</tr>
<tr>
<td>NTRN 363 Energy, Protein, Minerals</td>
<td>(3)</td>
</tr>
<tr>
<td>NTRN 452 Nutritional Biochemistry</td>
<td>(3)</td>
</tr>
<tr>
<td>BIOC 334 Protein and Enzymes</td>
<td>(3)</td>
</tr>
<tr>
<td>Electives</td>
<td>(6)</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
</tr>
<tr>
<td>NTRN 364 Human Nutrition II: Vitamins</td>
<td>(3)</td>
</tr>
<tr>
<td>Nutrition electives</td>
<td>(6)</td>
</tr>
<tr>
<td>Elective</td>
<td>(3)</td>
</tr>
</tbody>
</table>

UNDERGRADUATE PROGRAMS

Major Programs

The undergraduate degree in nutrition is appropriate for students who wish to:
(1) pursue graduate programs in nutritional biochemistry, molecular nutrition, dietetics, public health nutrition or other biomedical sciences; (2) enter professional schools of dentistry, medicine, or nursing; (3) apply to dietetic internships or approved experience programs in order to prepare for the professional practice of dietetics; (4) pursue technical careers in the food or pharmaceutical industry. This major offers flexibility in course selection within a framework of general program requirements. The selection of courses depends on the student’s choice of emphasis. Students wishing to qualify for admission to professional or graduate programs need to include specific courses considered prerequisites for admission. Students interested in applying to dietetic internships must meet specific course requirements (Didactic Program in Dietetics) as required by the Commission on Accreditation for Dietetics Education of the American Dietetic Association. These requirements are met in the courses that comprise the Didactic Program in Dietetics (DPD). The DPD at Case Western Reserve University is currently granted Accreditation by the Commission on Accreditation for Dietetics Education of the
NTRN 201, 342, 363, 364, 452 and one course:
GER, PHED 101, 102, and the following:

NUTRITION (NTRN)

Undergraduate Courses

NTRN 201. Nutrition (3)
The nutrients, their functions, food sources, and factors affecting human needs throughout life.

NTRN 328. Child Development and Health (3)
Growth and development of the child from prenatal through adolescence, including individuality, maturation, and biological needs.

NTRN 342. Food Science (5)
Chemical, physical and biological properties of food constituents and their interactions in food preparation and processing and practical application of processing methods and their effect on nutritional quality and acceptability. Laboratory and lecture. Prereq: CHEM 106.

NTRN 343. Dietary Patterns (3)
Examination of the food supply in the United States as it is affected by production, processing, marketing, government programs, regulation, and consumer selection. Nutritional evaluation of dietary patterns of different cultures. Prereq: NTRN 201 or consent.

NTRN 351. Food Service Systems Management (3)
The application of organizational theory and skills in the preparation and service of quantity food. Laboratory experience in professional food services are included. Prereq: Nutrition major or consent of instructor.

NTRN 360. Guided Study in Nutrition Practice (3)
Methods for the provision of nutrition services to individuals and groups. Principles of professional practice including ethics, standards, and regulatory issues. Prereq: NTRN 363 or NTRN 433 or consent.

NTRN 363. Human Nutrition I: Energy, Protein, Minerals (3)
Chemical and physiological properties of specific nutrients, including interrelationships and multiple factors, in meeting nutritional needs throughout the life cycle. Prereq: NTRN 201, CHEM 223 and BIOL 348 or equivalent.

NTRN 364. Human Nutrition II: Vitamins (3)
Chemical and physiological properties of vitamins, including interrelationships and multiple factors, in meeting nutritional needs throughout the life cycle. Prereq: NTRN 363 or consent.

NTRN 365. Nutrition in Disease (4)
Application of nutrition principles to the problems of diet in disease. Prereq: NTRN 363 and BIOL 307 or equivalent.

NTRN 371. Special Problems (1-3)
Independent reading, research, or special projects supervised by a member of the nutrition faculty.

NTRN 372. Special Problems (1-3)
Independent reading, research, or special projects supervised by a member of the nutrition faculty.

NTRN 388. Seminar in Nutrition (1-3)
Prereq: Junior or Senior standing.

NTRN 390. Undergraduate Research (3-9)
Guided laboratory research in nutritional biochemistry or molecular nutrition under the sponsorship of a faculty sponsor. Prereq: Written consent of faculty sponsor.

NTRN 399. Senior Project (3)
Formal investigation of a topic in nutrition culminating in a paper and oral presentation. Requires definition of a problem, evaluation of the scientific literature and delineation of problem-solving approaches. Prereq: Twenty-one hours of Nutrition and consent of supervising instructor.

Graduate Courses

NTRN 433. Advanced Human Nutrition I (4)
Emphasis on reading original research literature in energy, protein and minerals with development of critical evaluation and thinking skills. Prereq: NTRN 201 and CHEM 223 and BIOL 348 or equivalent.

NTRN 434. Advanced Human Nutrition II (3)
Emphasis on reading original research literature on vitamins with development of critical evaluation and thinking skills. Prereq: NTRN 433 or consent.

NTRN 435. Maternal and Child Nutrition (3)
Study of current research literature on nutrition for pregnancy, lactation, infancy and childhood, including assessment and requirements. Prereq: Nutrition major or consent of instructor.

NTRN 437. Evaluation of Nutrition Information for Consumers (3)
Reading and appraisal of food and nutrition literature written for the general public, including books, periodicals, and audio and visual sources. Prereq: Nutrition major or consent of instructor.

NTRN 438. Trends in Diet Therapy (3)
Evaluation and interpretation of modern concepts of nutrition related to abnormalities requiring dietary modifications. Prereq: NTRN 365 or equivalent.

NTRN 440. Nutrition for the Aging and Aged (3)
Consideration of the processes of aging and needs which continue throughout life. The influence of food availability, intake, economics, culture, physical and social conditions and chronic disease as they affect the ability of the aged to cope with living situations. Prereq: Nutrition major or consent of instructor.

NTRN 446. Advanced Maternal Nutrition: Special Topics (3)
Analysis of the problems commonly associated with high-risk pregnancies and fetal outcome. Discussion of causes, mechanisms, management and current research. Prereq: NTRN 435 or consent.
NTRN 451. Food Service Systems Management (3)
Application of organizational theory and skills in the preparation and service of quantity food. Laboratory experiences in professional food services are included. Students will analyze one aspect of food service management in depth. Prereq: Nutrition Major or consent.

NTRN 452. Nutritional Biochemistry and Metabolism (3)
Mechanisms of regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Prereq: BIOC 307 or equivalent. Cross-listed as BIOC 452.

NTRN 454. Isotope Tracer Methodology (3)
Stable and radioactive isotopes in metabolic research concentrating on the design of in-vitro and in-vivo investigative protocols using mostly stable isotopes and mass spectrometric analysis; critical interpretation of data from the recent literature; and pathway identification and kinetics. Prereq: BIOC 407.

NTRN 455. Molecular Nutrition (3)
Nutrient control of gene expression in mammalian cells and deregulation of expression of these genes. The molecular basis of nutrition-related diseases, such as diabetes mellitus, PKU, and LDL-receptor deficiency, will be discussed. The application of genetic manipulation to metabolism and nutrition will be evaluated. Prereq: BIOC 407.

NTRN 460. Foods Nutrition (3)
Study of the relationships of nutrition and food intake to body composition and human performance. Laboratory sessions include demonstrations of body composition and fitness measurements and participation in a research project. Prereq: NTRN 363 or NTRN 433 or consent.

NTRN 516. Seminar in Dietetics I (4)
Study of scientific basis for clinical and community nutrition practice and developments in food service systems management. Prereq: Dietetic internship.

NTRN 517. Seminar in Dietetics II (4)
Study of scientific basis for clinical and community nutrition practice and developments in food service systems management. Prereq: Dietetic internship.

NTRN 528. Introduction to Public Health Nutrition (3)
Philosophy, objectives, organization, and focus of government and voluntary agencies with emphasis on nutrition components. Prereq: Public health nutrition majors only.

NTRN 530. Public Health Nutrition (3)
Analysis of public health programs in government and voluntary health agencies and the effect of legislation. Emphasis on integration with other disciplines working in public health settings and the role of a public health nutritionist. Prereq: Consent of instructor.

NTRN 531. Public Health Nutrition Field Experience (1-6)
Individually planned public health experience. May be concurrent with course work in local agencies or in blocks of full-time work with a city, county, or state health agency. Prereq: Open to public health nutrition students only.

NTRN 532A. General Nutrition Care (1-3)
Individually arranged clinical experience.

NTRN 532C. Specialized Public Health Nutrition Field Experience (1-3)
Individually arranged clinical experience. Prereq: Public Health Nutrition students only.

NTRN 532D. Hospital Dietetics (1-3)
Individually arranged clinical experience.

NTRN 532E. Clinical Research: Methods in Nutrition and Metabolism (3)
Individually arranged.

NTRN 533. Nutritional Care of Neonate (3)
Nutritional assessment and management of high-risk newborns with emphasis on prematurity and low birth weight. Review of current literature coordinated with clinical experience in the neonatal intensive care unit. Issues on follow-up included. Prereq: NTRN 435 or consent.

NTRN 550A. Advanced Community Nutrition (3)
Development of skills needed by the community dietician. Emphasis on effective tools for service development and delivery. Recommended courses of action for the professional.

NTRN 550B. Seminar: Dietetics (1)

NTRN 551. Seminar in Advanced Nutrition (2-3)

NTRN 561. Investigative Methods in Nutrition (1-4)
Research methods appropriate for nutrition. Methods for conducting research in nutrition and food sciences, food service management and dietetics. Designing research proposals. Prereq: Nutrition major or consent of instructor.

NTRN 601. Special Problems (1-18)

NTRN 651. Thesis M.S. (1-18)

NTRN 701. Dissertation Ph.D. (1-18)

NTRN 703. Dissertation Fellowship (1-8)

Department of Philosophy

203 Clark Hall
Phone 216-368-2810; Fax 216-368-0814
Colin McLarty, Chair

The Department of Philosophy offers an undergraduate major leading to the Bachelor of Arts degree. A student majoring in philosophy must satisfy the requirements of the Arts and Sciences General Education Requirements. It offers minor programs and sequences for the undergraduate along with graduate-level courses for candidates for the Master of Arts degree in other fields such as biomedical, ethics, history, English, math, and science. The department’s course offerings are designed not only to provide knowledge and skills required for students whose main interest is in philosophy but also to educate students in general about the intellectual issues that a reflective person is likely to encounter in various contexts of civilized life. The department emphasizes the relevance of philosophy to mathematics, computer science, and disciplines in the natural sciences, the social sciences, the humanities and arts, and law.

The major program in philosophy, besides offering a solid foundation for advanced study in philosophy and enriching programs in other disciplines, develops the skills for analytical and critical thinking, effective communication and rational decision needed in a wide range of endeavors.

The program thus provides majors with unusual flexibility in the choice of subsequent careers, including law, medicine, and management while complementing the pursuit of career objectives with a greater perspective and a richer quality of intellectual life.

The department participates in an interdisciplinary major program in the history and philosophy of science and technology leading to the Bachelor of Arts degree in collaboration with the Department of History. The department also participates in, and contributes courses to, the interdisciplinary minor in artificial intelligence.

FACULTY

Colin McLarty, Ph.D. (Case Western Reserve University) Associate Professor and Chair

Logic; philosophy of logic; philosophy of mathematics; philosophy of science; contemporary French philosophy

Laura E. Hengehold Ph.D. (Loyola University) Assistant Professor Political and social philosophy; philosophy of feminism; Foucault; contemporary continental philosophy

Chin-Tai Kim, Ph.D. (Harvard University) Professor History of philosophy (17th-, 18th-, and 19th-century philosophy); theory of knowledge, metaphysics; ethics; phenomenology

Caroline A. Whitbeck, Ph.D. (Massachusetts Institute of Technology) The Elmer G. Beamer-Hubert H. Schneider Professor of Ethics Ethics; practical ethics; professional ethics
ASSOCIATE FACULTY
Patricia Princehouse, Ph.D (Harvard University)
Lecturer in History and Philosophy History
and philosophy of science (19th and 20th centuries), biology, geology, race, gender and cultural history.

ADJUNCT FACULTY
Joel Levin, Ph.D (University of Oxford)
Adjunct Associate Professor of Philosophy
Adjunct Professor of Law
Stephen Post, Ph.D (University of Chicago) Associate Professor of Biomedical Ethics Biomedical ethics; applied ethics

UNDERGRADUATE PROGRAMS

MAJOR
The major consists of 30 hours (ten 3-credit courses) in philosophy, including PHIL 101, 201, 301, 302, and six other courses to be determined in consultation with the department’s undergraduate advisor. However, a student may request of the advisor that up to 6 hours (two 3-credit courses) of the required 18 hours in six 3-credit philosophy electives be taken in another field or other fields. Such a request should be supported by considerations showing how the substitution(s) would strengthen the student’s major in philosophy. The advisor must approve the substitution(s) in advance.

MINOR
The department offers a range of possible minor programs, each of which must include PHIL 101 and four other courses in philosophy at the 200- or 300-level (excluding PHIL 390 and 399) chosen to meet the specific needs of students majoring in other fields. The undergraduate advisor will assist students in devising minor programs.

SEQUENCES FOR STUDENTS IN THE ENGINEERING CORE
All sequences must include PHIL 101 and two other philosophy courses at the 200- or 300-levels (excluding PHIL 390 and 399) as approved by the undergraduate advisor. A typical sequence, for example, will consist of PHIL 101 and two courses from one of the following groups:

- Logic and Scientific Methodology
  PHIL 201, Introduction to Logic (3)
- PHIL 203, Natural Philosophy I (3)
- PHIL 204, Natural Philosophy II (3)
- PHIL 303, Evolution, Creation and Science (3)
- PHIL 309, Philosophical Issues in Genetics (3)

- Logic, Formal Systems, and Philosophy of Mathematics
  PHIL 201, Introduction to Logic (3)
- PHIL 306, Mathematical Logic (3)
- PHIL 313, Philosophy of Mathematics (3)

- Value Theory
  PHIL 102, Ethics-An Interdisciplinary Introduction (3)
- PHIL 305, Ethics (3)
- PHIL 205, Contemporary Moral Problems (3)
- PHIL 304, Science and Engineering Ethics (3)
- PHIL 325, Philosophy of Feminism (3)
- PHIL 354, Political and Social Philosophy (3)
- PHIL 335, Philosophy of Law (3)
- Language, Mind and Cognition
  PHIL 201, Introduction to Logic (3)
- PHIL 345, Epistemology and Metaphysics (3)
- PHIL 365, Philosophy of Mind (3)
- PHIL 385, Philosophy of Language (3)

- Philosophy and Culture
  PHIL 225, Evolution (3)
- PHIL 301, Ancient Philosophy (3)
- PHIL 320, Phenomenology, Existentialism, and Hermeneutics (3)
- PHIL 333, Philosophy of Religion (3)
- PHIL 345, Epistemology and Metaphysics (3)
- PHIL 355, Nineteenth and Twentieth-Century Philosophy (3)
- PHIL 356, Comparative Philosophy (3)
- PHIL 370, Philosophy and Literature (3)

- There are other possible sequences.

- Philosophy Courses for the General Education Requirement: PHIL 201 may be used to satisfy the Mathematical Reasoning and Analysis requirement.
- PHIL 101, with any one of the following courses, 204, 205, 302, 305, 334, 345, and 370, may be used to satisfy the sequence requirement in History, Philosophy and Religion.

PHIL 356, Comparative Philosophy may be used to satisfy the Global and Cultural Diversity requirement.

DEPARTMENTAL HONORS
The department offers an Honors Program for students enrolled in its major program which involves completing a substantial program which involves completing a substantial project, passing an oral examination on the thesis, and maintaining a B average in philosophy courses taken while in the program. To be eligible for admission, a student should have an overall grade point average of B or better, and a grade of B or better in each philosophy course already taken. A student normally should have taken at least four, and at most seven, philosophy courses at the time of application for admission. An honors student should register for PHIL 399, Directed Study (3), to do honors work. An interested student should apply for admission to the program during the first semester of junior year.

PHILOSOPHY (PHIL)

Undergraduate Courses
PHIL 101, Introduction to Philosophy (3)
Basic problems of philosophy and methods of philosophical thinking. Problems raised by science, morality, religion, politics, and art. Readings from classical and contemporary philosophers. Normally given in multiple sections with different instructors and possibly with different texts. All sections share core materials in theory of knowledge, metaphysics, and ethics despite differences that may exist in emphasis.

PHIL 102, Ethics, An Interdisciplinary Introduction (3)
This course will introduce methods and literature of several disciplines, including philosophy, that bear on contemporary ethical issues. The goal is to prepare students for a lifetime of ethical reflection, discussion, and problem-solving, as well as more advanced study in the disciplines introduced by enhancing their understanding of ethical concepts and moral reasoning. Topics include lying, moral responsibility, and power, specifically rights and responsibilities of citizens, students, teachers, engineers, health care providers, and accountants.

PHIL 201, Introduction to Logic (3)
Presentation, application, and evaluation of formal methods for determining the validity of arguments. Discussion of the relationship between logic and other disciplines.
PHIL 203. Natural Philosophy I (3)
Historical and philosophical interpretation of some epochal events in development of science. Copernican revolution, Newtonian mechanics, Einstein's relativity physics, quantum mechanics, and evolutionary theory; patterns of scientific growth; structure of scientific "revolutions;" science and "pseudo-science." First half of a year-long sequence. Cross-listed as HSTY 203.

PHIL 204. Natural Philosophy II (3)
Conceptual, methodological, and epistemological issues about science: concept formation, explanation, prediction, confirmation, theory construction and status of unobservables; metaphysical presuppositions and implications of science; semantics of scientific language; illustrations from special sciences. Second half of a year-long sequence. Cross-listed as HSTY 207.

PHIL 205. Contemporary Moral Problems (3)
Examination of selected contemporary moral problems and contemporary faces of perennial moral problems such as: when, if ever, lying is justified; the value of honesty and of confidence; under what circumstances, if any, various types of killing (suicide, execution, in war, euthanasia, killing of lower animals or ecosystems) are justified. Additional moral problems raised by new knowledge (such as genetic information) or new technology (such as rights to digital information, or the ability to), and responsible uses of these and other sources of power. Clarification of the concepts of value, ethical evaluation and justification, ethical argument, moral relevance, and the notion of a moral problem itself. Readings will draw on classical and contemporary sources in philosophy.

PHIL 225. Evolution (3)
Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macro-evolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophic issues in evolutionary theory. Cross-listed as ANTH 225, BIOL 225, GEOG 225, and HSTY 225.

PHIL 270. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women's studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, and art history. It is the required introductory course for students taking the women's studies major. Cross-listed as WMST 201.

PHIL 271. Bioethics: Dilemmas (3)
(See BETH 271.) Cross-listed as BETH 271.

PHIL 301. Ancient Philosophy (3)
Western philosophy from the early Greeks to the Skeptics. Emphasis on the pre-Socrates, Plato, and Aristotle. Prereq: PHIL 101. Cross-listed as CLSC 301.

PHIL 302. Modern Philosophy (3)

PHIL 303. Topics in Philosophy of Science (3)
In-depth study of selected topics in general philosophy of science or philosophy of physical, biological, or social science. Topics may include: theories of explanation, prediction, and confirmation; semantics of scientific language; reductionism; space, time and relativity; philosophical issues about quantum mechanics; philosophical issues about life sciences (e.g., evolution, technology, and functional explanation); explanation and understanding in social sciences; value in social science. Prereq: PHIL 101 or PHIL 201 or PHIL 203.

PHIL 304. Science and Engineering Ethics (3)
This course prepares students to recognize ethical problems that commonly arise in the scientific and engineering workplace, to understand ethical concepts, to evaluate ethical arguments, and to critically examine responses to problems and their ethical ramifications. It addresses questions such as: What are the criteria of fairness in crediting contributions to research? How safe is safe enough? What are professional responsibilities, and how do they change over time? What is research misconduct? When is ignorance culpable? What is intellectual property and what protections does it deserve? When is biological testing of workers justified? What are responsible ways of raising concerns, and what supports do good organizations give for raising them? What treatment counts as harassment or as an expression of prejudice? What are good means for controlling it? What are scientists' and engineers' responsibilities for environmental protection? What is a "conflict of interest" and how is it controlled? What protections for human research subjects are warranted? What, if any, use of animals in research is justified? Prereq: PHIL 101 or PHIL 102 or PHIL 205.

PHIL 305. Ethics (3)
Analysis of ethical theories and concepts of goodness, right, and obligation. Discussion of nature of justice, problem of justification of moral principles, and relation between facts and values. Prereq: PHIL 101, PHIL 102 or PHIL 205.

PHIL 306. Mathematical Logic and Model Theory (3)
Propositional calculus and quantification theory; consistency and completeness theorems; godel incompleteness results and their philosophical significance; introduction to basic concepts of model theory; problems of formulation of arguments in philosophy and the sciences.

PHIL 309. Philosophical Issues in Genetics (3)
A philosophical examination of the history and cultural connections of the science of genetics and its precursors. Genetics is a phenomenon of the twentieth century. Thus, it is new. Yet, its implications and dilemmas are enmeshed in old traditions and stereotypes, and the dynamics of cultural change. To explore the breadth of philosophical repercussions of genetics, this course will draw on science, technology, medicine, and their histories, but will also range wider to include aspects of the social history of racism and class relations, changing attitudes toward sexuality, the intricacies of big business and international cooperation, and other such diverse areas. Prereq: PHIL 101 or PHIL 203 or PHIL 204.

PHIL 313. Philosophy of Mathematics (3)
Logical paradoxes and their effects on foundations of mathematics. Status of mathematical entities and nature of mathematical truths. Formalist, logicist, and intuitionist positions. Prereq: PHIL 101 or PHIL 201.

PHIL 315. Selected Topics in Philosophy (3)
Examination of views of a major philosopher or philosophical school, a significant philosophical topic, or a topic that relates to philosophy and other discipline. Prereq: PHIL 101.

PHIL 320. The Phenomenological Tradition (3)
The background of phenomenology: Descartes, Kant, and Brentano. The epistemological rationale of Husserl's phenomenology and its ontological implications; the powers and limits of the phenomenological method. Heidegger's transformation of phenomenology to interpretive ontology of human existence. The development of interpretative theory as the foundation of all human existence. The development of interpretive theory as the foundation of all human sciences in Gadamer and Ricoeur. Prereq: PHIL 101 or consent.

PHIL 325. Philosophy of Feminism (3)
Dimensions of gender difference. Definition of feminism. Critical examination of feminist critiques of culture, including especially politics, ideology, epistemology, ethics, and psychology. Readings from traditional and contemporary sources. Prereq: PHIL 101.

PHIL 330. Topics in Ethics (3)
Examination of views in ethics of a major philosopher or philosophical school, a significant philosophical topic in ethics, or a topic that relates ethics to philosophy and another discipline. Prereq: PHIL 101, PHIL 102, or PHIL 205.

PHIL 333. Philosophy of Religion (3)
Topics include: classical and contemporary arguments for God's existence; divine foreknowledge and human freedom; the problem of evil and theodicy; nature and significance of religious experience; mysticism; varieties of religious experience; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Prereq: PHIL 101. Cross-listed as RLGN 333.

PHIL 334. Political and Social Philosophy (3)
Justification of social institutions, primarily political ones. Such distinctions as that between de facto and legitimate authority; analysis of criteria for evaluation, such as social justice and equality; inquiry into theories of justification of the state; theory of democratic government and its alternatives. Readings from classical and contemporary sources. Prereq: PHIL 101. Cross-listed as POSC 354.

PHIL 335. Philosophy of Law (3)
Nature of law and legal systems; bearing of moral justice on legal validity; nature and justification of criminal law and punishment; nature of legal rules and of obligations to law in legal systems; logic of legal reasoning; distinctions of concepts such as legal responsibility and causation. Reading from classical and contemporary sources. Prereq: PHIL 101. Cross-listed as LAWS 353.

PHIL 345. Epistemology and Metaphysics (3)
Traditional problems of epistemology, such as definition of knowledge, justification of belief, nature of evidence and foundationalism, skepticism, the a priori, and the role of sense perception in knowledge. Metaphysical presuppositions and implications of epistemological views. Forms of realism and anti-realism. Prereq: PHIL 101.

PHIL 355. 19th and Early 20th Century Philosophy (3)
History of philosophy after Kant up to and including logical empiricism. Interpretation and comparison of important philosophers and philosophical schools of the period in terms of common methods, problems, themes, doctrines, and ideologies. Emphasis on Schopenhauer, Hegel, Kierkegaard, Marx, and Nietzsche. Prereq: PHIL 101.
PHIL 356. Comparative Philosophy (3)  
Comparison of significant philosophers or philosophical schools of non-Western traditions with Western counterparts on metaphysical, epistemological, ethical, aesthetic, and sociopolitical theoretical issues. The non-Western traditions to be considered include the Indian and the Far Eastern, but not exclusively. Discussion, in context, of the problems of comparative hermeneutics. Readings will include original sources in English translation. Prereq: PHIL 101.

PHIL 365. Philosophy of Mind (3)  
Traditional problems such as the relation of mind and body, knowledge of other minds, free will and determination, and nature of psychological explanation. Analysis of chief theories of mind. Analysis of mental concepts such as intention, action, decision, emotion, and will. Prereq: PHIL 101.

PHIL 367. Topics in Evolutionary Biology (3)  
(See ANTH 367.) Cross-listed as ANTH 367.

PHIL 370. Philosophy and Literature (3)  
Affinities and tensions between philosophy and literature and issues that arise in their interface. Topics include: philosophical use of literary devices; literary use of philosophical ideas; literary philosophy and philosophical literature; and hermeneutics of literature and philosophy. Readings in philosophy and literature from both traditional and contemporary sources. Team-taught by faculty of the philosophy and literature departments. Prereq: PHIL 101.

PHIL 394. Seminar in Evolutionary Biology (3)  
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners' conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History. Cross-listed as ANTH 394, BIOL 394, GEOL 394, and HSTY 394.

PHIL 396. Undergraduate Research in Evolutionary Biology (3)  
(See ANTH 396.) Cross-listed as ANTH 396.

PHIL 399. Directed Study (3)  
Open to students in either of the major programs and to minors.

Graduate Courses

PHIL 403. Topics in Philosophy of Science (3)  
(See PHIL 303.)

PHIL 404. Science and Engineering Ethics (3)  
(See PHIL 304.)

PHIL 405. Ethics (3)  
(See PHIL 305.)

PHIL 406. Mathematical Logic and Model Theory (3)  

PHIL 409. Philosophical Issues in Genetics (3)  
(See PHIL 309.)

PHIL 413. Philosophy of Mathematics (3)  
(See PHIL 313.)

PHIL 415. Selected Topics In Philosophy (3)  
(See PHIL 315.)

PHIL 420. The Phenomenological Tradition (3)  
(See PHIL 320.) Prereq: Graduate standing or consent.

PHIL 425. Philosophy of Feminism (3)  
(See PHIL 325.) Prereq: PHIL 101.

PHIL 430. Topics in Ethics (3)  
(See PHIL 330.)

PHIL 433. Philosophy of Religion (3)  
(See PHIL 333.) Prereq: PHIL 101. Cross-listed as RLGN 433.

PHIL 434. Political and Social Philosophy (3)  
(See PHIL 334.) Cross-listed as POSC 454.

PHIL 435. Philosophy of Law (3)  
(See PHIL 335.) Prereq: PHIL 101.

PHIL 445. Epistemology and Metaphysics (3)  
(See PHIL 345.)

PHIL 455. 19th and Early 20th Century Philosophy (3)  
(See PHIL 355.)

PHIL 456. Comparative Philosophy (3)  
(See PHIL 356.) Prereq: PHIL 101.

PHIL 465. Philosophy of Mind (3)  
(See PHIL 365.)

PHIL 470. Philosophy and Literature (3)  
(See PHIL 370.)

PHIL 494. Seminar in Evolutionary Biology (3)  
(See PHIL 394.) Cross-listed as ANTH 394, BIOL 494, GEOL 494, and HSTY 494. PHIL 600. Tutorial (1-18)  
PHIL 651. Thesis M.A. (1-6)

PHIL 700. Advanced Tutorial and Dissertation (1-18)  
For Ph.D. candidates in fields related to philosophy.

Department of Physical Education and Athletics

Veale Center  
Phone 216-368-2867; Fax 216-368-5475

The Department of Physical Education offers the student a variety of opportunities from challenging academic classes to vigorous recreational activities.

FACULTY

Jennie Amodio, B.A. (Ohio University)  
Instructor  
Softball Coach

Chris Conlon, M.A. (Johns Hopkins University)  
Instructor  
Men and women's swim coach

Kamilah Cunningham, B.A. (Cleveland State University)  
Instructor  
Assistant Women's Basketball Coach

Greg Debeljak, M.A. (John Carroll University)  
Instructor  
Assistant Football Coach

Robert Del Rosa, M.A. (Western Reserve College)  
Associate Professor  
Wrestling coach; assistant director of athletics

Emily Donovan, B.A. (Kenyon College)  
Instructor  
Women's Soccer Coach

Dennis Harris, B.S. (The Ohio State University)  
Instructor  
Men's track and field coach

David M. Hutter, Ph.D. (The Ohio State University)  
Professor

Patrick Kennedy, M.S. (University of Maryland)  
Assistant Professor  
Associate Athletic Director  
Director of intramurals, coordinator of club sports and coordinator of facilities

Kathy Lanese, B.S. (Ohio University)  
Instructor  
Women's Track and Field Coach

Marcus Macalla, M.A. (John Carroll University)  
Instructor  
Assistant Football Coach

Sean McDonnell, M.A. (LeMoyne College)  
Instructor  
Head Men's Basketball Coach

Barb Moore, M.S. (West Virginia University)  
Instructor  
Head Athletic Trainer

Mina Moore, B.S. (Wayne State University)  
Instructor

Mike Pilger, M.A. (Boston University)  
Wrestling coach; assistant director of athletics

Joe Perella, B.S. (John Carroll University)  
Instructor  
Head Football Coach

Assistant Women's Basketball Coach

Men's & Women's Cross Country Coach

Women's Track and Field Coach

Women's Soccer Coach

Assistant Football Coach

Assistant Women's Basketball Coach

Men's track and field coach

Associate Professor  
Wrestling coach; assistant director of athletics

Emily Donovan, B.A. (Kenyon College)  
Instructor  
Women's Soccer Coach

Dennis Harris, B.S. (The Ohio State University)  
Instructor  
Men's track and field coach

David M. Hutter, Ph.D. (The Ohio State University)  
Professor

Patrick Kennedy, M.S. (University of Maryland)  
Assistant Professor  
Associate Athletic Director  
Director of intramurals, coordinator of club sports and coordinator of facilities

Kathy Lanese, B.S. (Ohio University)  
Instructor  
Women's Track and Field Coach

Marcus Macalla, M.A. (John Carroll University)  
Instructor  
Assistant Football Coach

Sean McDonnell, M.A. (LeMoyne College)  
Instructor  
Head Men's Basketball Coach

Barb Moore, M.S. (West Virginia University)  
Instructor  
Head Athletic Trainer

Mina Moore, B.S. (Wayne State University)  
Instructor

Mike Pilger, M.A. (Boston University)  
Wrestling coach; assistant director of athletics

Joe Perella, B.S. (John Carroll University)  
Instructor  
Head Football Coach
residence hall, fraternity, women, coed, graduate, and open. Intercollegiate varsity athletic competition is available in 10 sports for men and 9 sports for women.

PHYSICAL EDUCATION PHED)

Undergraduate Courses

PHED 100. Independent Activity (0)
This course is designed to allow the student to write individual fitness goals, compose an individual fitness program specific to the goals and execute the individual program. Students are required to participate in a pre and post-testing program and must achieve a minimum of 75% for each test component (national norms) in order to participate in Independent Activity. The course instructor must approve all programs. The student will be required to maintain a detailed activity log.

PHED 102. Archery (0)

PHED 105. CPR/First Aid (0)

PHED 108. Fencing - All Levels (0)

PHED 110. Hiking and Exploring (0)

PHED 114. Modern Dance (0)

PHED 119. Skin and Scuba Diving (0) Prereq: Advanced swimming skills.

PHED 120. Skin and Scuba Diving - Advanced (0) Prereq: Skin and Scuba Certification.

PHED 127. Water Safety Instructors (0) Prereq: Emergency Water Safety or Lifeguarding Certificate.

PHED 128. Advanced Weight Training (0) Prereq: PHED 034.

PHED 129. Life Guarding (0) Prereq: Advanced swimming skills.

PHED 130. Wellness (0)

PHED 131. Personal Fitness (0)

PHED 140. Modern Jazz Dance (0)

PHED 141. Folk Dance (0)

PHED 142. Social Dance (0)

PHED 170. Varsity Baseball (0)

PHED 171. Varsity Basketball - Men (0)

PHED 172. Varsity Basketball - Women (0)

PHED 174. Varsity Cross Country - Men (0)

PHED 175. Varsity Cross Country - Women (0)

PHED 176. Varsity Fencing - Men (0)

PHED 177. Varsity Fencing - Women (0)

PHED 178. Varsity Football (0)

PHED 179. Varsity Golf (0)

PHED 180. Varsity Soccer - Men (0)

PHED 181. Varsity Soccer - Women (0)

PHED 182. Varsity Swimming - Men (0)

PHED 183. Varsity Swimming - Women (0)

PHED 184. Varsity Tennis - Men (0)

PHED 185. Varsity Tennis - Women (0)

PHED 186. Varsity Track and Field - Men (0)

PHED 187. Varsity Track and Field - Women (0)

PHED 188. Varsity Volleyball (0)

PHED 189. Varsity Wrestling (0)

PHED 190. Varsity Softball - Women (0)

PHED 203. Body Conditioning - Advanced (1)

PHED 204. CPR/First Aid (1)

PHED 208. Racquetball - Advanced (1)

PHED 210. Skin and Scuba Diving (1) Prereq: Advanced swimming skills.

PHED 211. Skin and Scuba Diving - Advanced (1) Prereq: Skin and Scuba Certification.


PHED 216. Weight Training II (1) Prereq: PHED 128 or PHED 054.

PHED 217. Life Guarding (1) Advanced physical education activities. Advanced instruction in sports, limited to upperclassmen. This course may lead to certification in lifeguarding. Prereq: Advanced swimming skills.

PHED 218. Wellness (1)


PHED 320. Psychology of Sport (2) The major psychological dimension underlying an individual's participation in sport. Selected areas that influence the acquisition of physical skill and performance in sports.

PHED 325. Officiating Basketball (2) Administrative procedures, promotion, managerial relationships, scheduling, tournaments, budgeting, scoring systems, and officiating.

PHED 332. Care and Prevention of Athletic Injuries (3) Designed as introduction to field of athletic training. Students become acquainted with various responsibilities of athletic trainers. Helps students better understand injury prevention and basis foundations of sports trauma. Study includes injury evaluation and treatment of the foot, ankle, knee, and lower leg.

PHED 334. Advanced Athletic Training I (3) Introduces students to sports medicine management, including emergency procedures and general assessment skills. Principles underlying therapeutic modalities and exercise rehabilitation are discussed. Injury evaluation and treatment for the abdomen, shoulder, forearm, wrist, and hand are included. Prereq: PHED 332 and PHED 340.

PHED 337. Perspectives in Sex (3) The many facets of human sexuality; incorporating this information into an effective healthy program of living.

PHED 339. Advanced Athletic Training II (3) Concentrates on rehabilitation and modality application. Special topics such as drugs, nutrition, health conditions related to sports and gender issues are covered. Care and management of head, spinal, thoracic, and hip injuries included. Students participate in physical therapy clinic. Prereq: PHED 332 and PHED 340 and PHED 334.

PHED 340. Human Anatomy (3) The purpose of this course is to instruct the student in basic anatomy. Joint and muscle action as it relates to performance is covered.
PHED 341. Physiology of Exercise (3)
Exercise physiology is an aspect of sports medicine that involves the study of how the body, from a functional standpoint, responds and adjusts to exercise. The study of exercise physiology is based on factual information derived primarily from experimental research. Laboratory work is an integral part of this course. Prereq: PHED 340.

PHED 342. Biomechanics (3)
The purpose of this course is to give the students an understanding of biomechanics. This course will help students better understand why specific mechanisms result in specific injuries. Topics include strength vs. power, dynamics, closed kinetic chain, open kinetic chain, and biomechanical analysis of specific joints. Prereq: PHED 340.

PHED 357. Principles of Coaching (2)
Designed to provide methods and techniques for coaching sport. Topics include teaching skill, motivating participants, training, conditioning, practice organization, budget, equipment, and facility management, and psychological, sociological and philosophical implications.

The Department of Physics offers programs leading to the following undergraduate degrees: Bachelor of Arts, Bachelor of Science in Physics, Bachelor of Science in Mathematics and Physics, and Bachelor of Science in Engineering with an Engineering Physics major. Associated with the Bachelor of Science in Physics degree are optional concentrations in Mathematical Physics and in Biophysics. The department also offers the graduate degrees, Master of Science and Doctor of Philosophy as well as a unique Masters Degree in Entrepreneurship. All of these programs involve the study of the basic laws of nature and the properties of energy and matter in their various forms. The curriculum reflects the varied interests of the faculty and can thus prepare students for a wide range of future activities. At the undergraduate level, open electives and engineering physics concentration area courses tailor the programs to the individual student’s interests and career plans. Individualized programs are developed with the aid of an advisor. A similar flexibility exists in the first few years of graduate study. The research leading to the Ph.D. degree normally centers on a specific area of physics. However, even at this stage, the broad background and training characteristic of a physics degree are emphasized.

FACULTY
Lawrence M. Krauss, Ph.D. (Massachusetts Institute of Technology)
Ambrose Swasey Professor of Physics and Chair of the Department, Professor of Astronomy and Director Center for Education and Research in Cosmology and Astrophysics
Theoretical physics, particle physics, astrophysics, cosmology.

Daniel Akerib, Ph.D. (Princeton University)
Professor (daa5@case.edu)
Experimental astrophysics

Robert W. Brown, Ph.D. (Massachusetts Institute of Technology)
Institute Professor (rub@case.edu)
Particle physics theory, cosmology, medical imaging, industrial physics

Gary Chottiner, Ph.D. (University of Maryland)
Director of Undergraduate Studies, Professor (gc2@case.edu)
Experimental physics of surfaces and thin films

Corbin E. Covault, Ph.D. (Harvard University)
Associate Professor (ce8@case.edu)
Experimental high energy astrophysics

David E. Farrell, Ph.D. (University of London)
Professor (def@case.edu)
Experimental condensed matter physics, superconductors, medical physics

Kathleen Kash, Ph.D. (Massachusetts Institute of Technology)
Professor (kkk43@case.edu)
Experimental condensed matter physics and mesoscopic physics, quantum semiconducting structures

Kenneth L. Kowalski, Ph.D. (Brown University)
Professor (kklk3@case.edu)
Theoretical and experimental particle physics

Walter Lambrecht, Ph.D. (University of Ghent)
Professor (wol2@case.edu)
Theoretical condensed matter physics; electronic structure based physics of materials

Harsh Mathur, Ph.D. (Yale University)
Associate Professor, (hm7@case.edu)
Condensed matter theory

Rolfe G. Petschek, Ph.D. (Harvard University)
Professor (rgp@case.edu)
Theoretical condensed matter, optical materials

Charles Rosenblatt, Ph.D. (Harvard University)
Director of Graduate Studies, Professor (rosenblatt@case.edu)
Experimental condensed matter, liquid crystals and complex fluids

John Ruhl, Ph.D. (Princeton University)
Professor (ruhl@erebus.phys.cern.ch)
Experimental Astrophysics and Cosmology

Donald E. Schuele, Ph.D. (Case Institute of Technology)
Albert A. Michelson Professor of Physics (des3@case.edu)
Experimental condensed matter physics, properties of materials

Jie Shan, Ph.D. (Columbia University)
Warren E. Rupp Assistant Professor (jcs209@case.edu)
Experimental condensed matter physics, ultrafast optics, terahertz spectroscopy

Kenneth D. Singer, Ph.D. (University of Pennsylvania)
Associate Chair, Professor (kds4@case.edu)
Experimental condensed matter physics, nonlinear optics

Glenn D. Starkman, Ph.D. (Stanford University)
Armington Professor (gds6@case.edu)
Theoretical cosmology, particle physics, astrophysics

Cyrus Taylor, Ph.D. (Massachusetts Institute of Technology)
Professor (cct@case.edu)
Theoretical and experimental particle physics

Philip L. Taylor, Ph.D. (University of Cambridge)
Perkins Professor of Physics (plt@case.edu)
Theory of solids, polymers and other materials

Tanmay Vachaspati, Ph.D. (Tufts University)
Professor (tv7@case.edu)
Theoretical astrophysics, cosmology, particle physics
THE BACHELOR OF SCIENCE IN PHYSICS

The Bachelor of Science in Physics requires completion of the Arts and Sciences General Education Requirements (GER), the courses listed in the following table and 127 total credits. Courses required for the B.S. in Physics satisfy the 12 credit GER for Natural and Mathematical Sciences.

<table>
<thead>
<tr>
<th>Course</th>
<th>Year*</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 or 123. Physics I, Mechanics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122 or 124. Physics II, Electric. &amp; Magnetism</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221. Introduction to Modern Physics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 203. Analog and Digital Electronics</td>
<td>2F</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 204. Advanced Instrumentation Laboratory</td>
<td>2S</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 250. Mathematics, Physics, and Computing</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310. Classical Mechanics</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 301. Advanced Laboratory Physics I</td>
<td>3F</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 331. Introduction to Quantum Mechanics I</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 302. Advanced Laboratory Physics II</td>
<td>3S</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 324. Electricity and Magnetism I</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 332. Introduction to Quantum Mechanics II</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 325. Electricity and Magnetism II</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 351. Physics Senior Project</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>1 of the following</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 315. Introduction to Solid State Physics</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 326. Physical Optics</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 327. Quantum Electronics</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>1 of the following</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 316. Intro. to Nuclear and Particle Physics</td>
<td>4S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 328. Cosmology &amp; Sturcture of the Universe</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 336. Modern Cosmology</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 365. General Relativity</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td><strong>60</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Year*</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 105 or 111. Principles of Chemistry I</td>
<td>1</td>
<td>3 (4)</td>
</tr>
<tr>
<td>CHEM 106 or ENGR 145. Principles of Chem. II</td>
<td>1</td>
<td>3 (4)</td>
</tr>
<tr>
<td>CHEM 113. Principles of Chemistry Laboratory</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 131. Elementary Computer Programming**</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 121 or 123. Calculus 1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122 or 124. Calculus 2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 223 or 227. Calculus 3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224. Elementary Differential Equations</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHED two semesters</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td><strong>25 (27)</strong></td>
</tr>
</tbody>
</table>

Open electives** | | **15*** |
| A&S GER. | | **39** |
| Major/GER overlap | | —12 |
| **Total** | | **127** |

* course usually taken in this year, offered only in F = fall, S = spring
** or other approved computational course
*** The number of open electives may vary as determined by the degree requirement that the total number of credits add to 127 or more.
THE MATHEMATICAL PHYSICS CONCENTRATION IN THE BACHELOR OF SCIENCE IN PHYSICS DEGREE PROGRAM

Students who are interested in theoretical physics and who have a strong background in mathematics may consider applying for admission to this variation on the B.S. in Physics. This program is based on the B.S. in Physics, but with certain substitutions in the course requirements. Several of the laboratory courses are replaced by advanced mathematics courses and some of the undergraduate physics courses are replaced by graduate courses.

This program is not the same as the separate degree program, the B.S. in Mathematics and Physics, which is a coherent and parallel education in both mathematics and physics.

The following table shows the requirements for the Bachelor of Science in Physics with Mathematical Physics Concentration. Those courses in the standard B.S. program that are to be replaced are shown in brackets and are followed by their replacements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Year*</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 or 123. Physics I, Mechanics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122 or 124. Physics II, Electricity &amp; Magnetism</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221. Introduction to Modern Physics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>[PHYS 203. Analog and Digital Electronics] [2F]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-group 1** Adv. Math</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 204. Advanced Instrumentation Laboratory</td>
<td>2S</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 250. Mathematics, Physics, and Computing</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310. Classical Mechanics</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>[PHYS 301. Advanced Laboratory Physics I] [3F]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 349. Methods of Mathematical Physics I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 313. Thermodynamics &amp; Statistical Mechanics</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>[PHYS 331. Introduction to Quantum Mechanics I] [3F]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 481. Quantum Mechanics I (grad)</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 302. Advanced Laboratory Physics II</td>
<td>3S</td>
<td>4</td>
</tr>
<tr>
<td>[PHYS 324. Electricity and Magnetism I] [3F]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 423. Classical Electromagnetism (grad)</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>[PHYS 332. Introduction to Quantum Mechanics II] [3S]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 482. Quantum Mechanics II (grad)</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 325. Electricity and Magnetism II</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 350. Methods of Mathematical Physics II</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>M-group 3*** Adv. Math</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 351. Physics Senior Project</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>** of the following</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 315. Introduction to Solid State Physics</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 326. Physical Optics</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 327. Quantum Electronics</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 316. Intro. to Nuclear and Particle Physics</td>
<td>4S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 328. Cosmology &amp; Structure of the Universe</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 336. Modern Cosmology</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 365. General Relativity</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>**Subtotal</td>
<td>**</td>
<td><strong>64</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Year*</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 105 or 111. Principles of Chemistry I</td>
<td>1</td>
<td>3 (4)</td>
</tr>
<tr>
<td>CHEM 106 or ENGR 145. Principles of Chemistry II</td>
<td>1</td>
<td>3 (4)</td>
</tr>
<tr>
<td>CHEM 113. Principles of Chemistry Laboratory</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 131. Elementary Computer Programming***</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 121 or 123. Calculus 1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122 or 124. Calculus 2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 223 or 227. Calculus 3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224. Elementary Differential Equations</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHED two semesters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Subtotal | ** | **25(27)** |

| Open electives | | 15 |
| Open Electives | | |
| A&S GER | | 11 |
| Major/GER overlap | | -12 |
| **Total | ** | **127** |

* course usually taken in this year, offered only in F = fall, S = spring
** M-group 1, 2 and 3 are to be chosen from among approved advanced mathematics or statistics courses.
*** or other approved computational course
**** The number of open electives may vary as determined by the degree requirement that the total number of credits add to 127 or more.
in Engineering (B.S.E.) with a major in Engineering Physics. The B.A. and B.S. programs are traditional degrees offered by the College of Arts and Sciences. These liberal arts degrees carry the General Education Requirements of the College of Arts and Sciences. A variety of electives within and outside of the department are available in these programs to provide the breadth and flexibility that will considerably enhance the student’s opportunities at the best graduate schools and in industrial and government organizations.

The B.A. physics major includes a large number of elective courses, making it easy for the student to pursue other interests or complete a second major while earning a degree in physics. The B.S. degree has two alternatives to the standard program: a Mathematical Physics Concentration and a Biophysics Concentration. The B.S.E. degree in Engineering Physics supplies an excellent background for graduate studies in physics, but is also designed for students who value an engineering credential and who are considering a career in engineering either through employment following the B.S.E. or engineering graduate studies. This degree is awarded by the Case School of Engineering and includes the Engineering Core Curriculum. The technical electives in this program are concentrated in any of 15 specific engineering areas.

THE BIOPHYSICS CONCENTRATION IN THE BACHELOR OF SCIENCE IN PHYSICS DEGREE PROGRAM

This concentration is directed towards students interested in a combined study in biology and physics. The degree is a track within the standard B.S. in Physics. Four physics courses and certain open-elective credits are replaced by a “biogroup” of five courses, and a technical elective described below. All substitutions must be approved by a physics faculty committee.

The following table illustrates the requirements for the Bachelor of Science in Physics with Biophysics Concentration. Those courses in the standard B.S. program that are to be replaced are shown in brackets; their replacements are either found in the same entry or in the biogroup category.

<table>
<thead>
<tr>
<th>Course ................................................................ Year* Cr.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 or 123. Physics I, Mechanics ........................1 ....4</td>
<td></td>
</tr>
<tr>
<td>PHYS 122 or 124. Physics II, Electricity &amp; Magnetism 1 ....4</td>
<td></td>
</tr>
<tr>
<td>PHYS 221. Introduction to Modern Physics .....................2 ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 203. Analog and Digital Electronics ....................2F ....4</td>
<td></td>
</tr>
<tr>
<td>PHYS 204. Advanced Instrumentation Laboratory ............2S ....4</td>
<td></td>
</tr>
<tr>
<td>PHYS 250. Mathematics, Physics, and Computing .............2S ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 310. Classical Mechanics ....................................2S ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 301. Advanced Laboratory Physics I .....................3F ....4</td>
<td></td>
</tr>
<tr>
<td>PHYS 313. Thermodynamics &amp; Statistical Mechanics .........3F ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 331. Introduction to Quantum Mechanics I .............3F ....3</td>
<td></td>
</tr>
<tr>
<td>[PHYS 302] [Advanced Laboratory Physics II] ............3S ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 324. Electricity and Magnetism I .......................3S ....3</td>
<td></td>
</tr>
<tr>
<td>[PHYS 332] [Introduction to Quantum Mechanics II] .......3S ....3</td>
<td></td>
</tr>
<tr>
<td>[PHYS 315] [Introduction to Solid State Physics] ..........3F ....3</td>
<td></td>
</tr>
<tr>
<td>Tech elective** .................................................4F ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 325. Electricity and Magnetism II .......................4F ....3</td>
<td></td>
</tr>
<tr>
<td>PHYS 351. Physics Senior Project (biophysics topic) ......4 ....6</td>
<td></td>
</tr>
<tr>
<td>[PHYS 316] [Intro. to Nuclear and Particle Physics] ......4S ....4</td>
<td></td>
</tr>
<tr>
<td>**</td>
<td></td>
</tr>
<tr>
<td>Subtotal .................................................................. 42(44)</td>
<td></td>
</tr>
<tr>
<td>Course ................................................................ Year* Cr.</td>
<td></td>
</tr>
<tr>
<td>CHEM 105 or 111. Principles of Chemistry I ...........1 ....3(4)</td>
<td></td>
</tr>
<tr>
<td>CHEM 106 or ENGR 145. Principles of Chemistry II 1 ....3(4)</td>
<td></td>
</tr>
<tr>
<td>CHEM 113. Principles of Chemistry Laboratory ..........1 ....2</td>
<td></td>
</tr>
<tr>
<td>ENGR 131*** Elementary Computer Programming .........1 ....3</td>
<td></td>
</tr>
<tr>
<td>MATH 121 or 123. Calculus 1 .................................1 ....4</td>
<td></td>
</tr>
<tr>
<td>MATH 122 or 124. Calculus 2 .................................1 ....4</td>
<td></td>
</tr>
<tr>
<td>MATH 223 or 227. Calculus 3 .................................2 ....3</td>
<td></td>
</tr>
<tr>
<td>MATH 224. Elementary Differential Equations .............2 ....3</td>
<td></td>
</tr>
<tr>
<td>B-group 1**** “biogroup” .................................1 ....4</td>
<td></td>
</tr>
<tr>
<td>B-group 2**** “biogroup” .................................2 ....4(3)</td>
<td></td>
</tr>
<tr>
<td>B-group 3**** “biogroup” .................................3 ....3</td>
<td></td>
</tr>
<tr>
<td>B-group 4**** “biogroup” .................................3 ....3</td>
<td></td>
</tr>
<tr>
<td>B-group 5**** “biogroup” .................................4 ....3(4)</td>
<td></td>
</tr>
<tr>
<td>PHED 2 semesters ..............................................0</td>
<td></td>
</tr>
<tr>
<td>Subtotal .................................................................. 42(44)</td>
<td></td>
</tr>
<tr>
<td>Open electives] ..................................................(15)</td>
<td></td>
</tr>
<tr>
<td>Open electives***** ...........................................9(7)</td>
<td></td>
</tr>
<tr>
<td>A&amp;S GER .........................................................39</td>
<td></td>
</tr>
<tr>
<td>Major/GER overlap ............................................-12</td>
<td></td>
</tr>
<tr>
<td>Total .....................................................................128</td>
<td></td>
</tr>
</tbody>
</table>

* course usually taken in this year, offered only in F = fall, S = spring
** PHYS 315, PHYS 316, PHYS 326, and PHYS 327 are suggested technical electives
*** or other approved computational course
**** B-group 1-5 are to be chosen from among approved biology, biophysics, biochemistry, biomedical engineering courses, including certain prerequisites as needed (e.g., chemistry). BIOL 214 and BIOL 215 are suggested for B-group 1 and 2.
***** The number of open electives vary in order to arrive at the total number of 128 credits.
The B.S. in Mathematics and Physics degree is a single degree for students interested in both advanced mathematics and theoretical physics and their relationships. This degree is distinct from the Mathematical Physics Concentration in the B.S. in Physics degree. Students may be advised by either physics or mathematics faculty members. The student will complete a significant number of advanced mathematics courses and somewhat fewer laboratory courses than in the B.S. in Physics program.

All B.S., B.A. and B.S.E. candidates complete a year-long senior project in which the student works one-on-one with a faculty researcher, writes a senior thesis and presents the work in a public symposium.

Employment opportunities at the bachelor's level include research, development and technical assistance (engineering, computer programming and management) in industrial, government and university settings.

A program in teacher certification (grades 7 through 12), based on the BA degree, is available for students interested in a career in teaching physics at the secondary level.

Teacher Licensure

Two options are available within the B.A. physics major for students to become eligible for licensure as teachers in sec-

The Bachelor of Science Degree in Mathematics and Physics

In contrast to an applied mathematics degree or the B.S. in Physics with a Mathematical Physics Concentration, this is a synergistic, coherent, and parallel education in mathematics and physics. To a close approximation, the challenging course work corresponds to combining the mathematics and physics cores, with the physics laboratory cluster replaced by a single senior-year laboratory semester. A student in this new program may use either of two official advisors, one available from each department, who would also constitute a committee for the administration of the degree and the approval of curriculum petitions.

The total number of required credits is 126 (35 MATH, 38 PHYS, 6 senior project, 11-13 ENGR and CHEM, 27 A&S GER with 12 of the normal 39 GER credits satisfied by MATH and PHYS courses). There are 7-9 credits of open electives.

<table>
<thead>
<tr>
<th>Course</th>
<th>Year*</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 or 123 Physics I, Mechanics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122 or 124 Physics II, Electricity &amp; Magnetism</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221 Introduction to Modern Physics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310 Classical Mechanics</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 313 Thermodynamics &amp; Stat. Mech</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 331 or 481 Quantum I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 332 or 482 Quantum II</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 341**</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 423 Adv Elec &amp; Mag</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 472 Grad Lab</td>
<td>4S</td>
<td>3</td>
</tr>
<tr>
<td>MATH 121 or 123 Calculus I</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122 or 124 Calculus II</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 223 or 227 Calculus III</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224 Diff. Eq's</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 307 Algebra I</td>
<td>2F</td>
<td>3</td>
</tr>
<tr>
<td>MATH 308 Algebra II</td>
<td>2S</td>
<td>3</td>
</tr>
</tbody>
</table>

Course | Year* | Cr. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 321 Analysis I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>MATH 322 Analysis II</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>MATH 324 Complex Var</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>MP group I***</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MP group II***</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MP group III***</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MP group IV***</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 351 or MATH 351 Sr Proj</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>ENGR 131 CompProg</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 105 or 111 Intro Chem I</td>
<td>1</td>
<td>3 (4)</td>
</tr>
<tr>
<td>CHEM 106 or ENGR 145 Intro Chem II</td>
<td>1</td>
<td>3 (4)</td>
</tr>
<tr>
<td>CHEM 113 Chem Lab</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>PHED 2 semesters</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Open Electives</td>
<td>7-9</td>
<td></td>
</tr>
<tr>
<td>A&amp;S GER</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Major/GER overlap</td>
<td>-12</td>
<td></td>
</tr>
</tbody>
</table>

Total 127

* Course usually taken in this year, offered only in F = fall, S = spring

** An advanced physics course to be selected from the following list: PHYS 315, 316, 326, 328, 336, 365.

*** The ‘MP group’ of four courses corresponds to two physics courses and two mathematics courses. The physics courses would be chosen from PHYS 250, 349, and P350. The mathematics courses are subject to approval by the advisory committee and are thereby referred to as ‘approved electives.’ They may be chosen from the general list of mathematics courses at the 300 level or higher. Also subject to approval, it may be possible to choose a course from outside of the mathematics and physics departments as a substitute in the MP group.

**** If approved by the M&P committee, other science sequence courses may be substituted.

*****The number of open electives will vary depending on whether students choose 3 credit or 4 credit courses to fulfill the chemistry/science requirement.
ondary schools (Adolescents to Young Adults) qualified to teach physics or to teach physical sciences (both physics and chemistry). Students interested in either option should contact Professor Gary Chottiner. In addition to content (subject area) requirements, a 35 semester hour sequence in professional education is required comprising courses taken at Case Western Reserve University and at John Carroll University, culminating in student teaching. (See EDUCATION [EDUC & EDJC]).

Subject Area Requirements (Physics Licensure):

ASTR 201 or BIOL 114 or GEOL 110; 
PHYS 115 or 121; PHYS 116 or 122; 
PHYS 196, 221, 250, 309, 313, 331, 
351; CHEM 105, 106, 113; ENGR 131; 
MATH 121 or 125; MATH 122 or 126; 
MATH 223, 224; three of PHYS 310, 
315, 316, 324, 325, 326, 328, 332.

Subject Area Requirements (Dual Field Physical Science Licensure)*:

ASTR 201 or BIOL 110 or GEOL 110; 
PHYS 121, 122, 196, 221; CHEM 105, 
106, 113, 223, 224; or 323, 324, 233, 
234; PHY5 331; ENGR 131; MATH 121, 
122, 223; PHYS 250, 309; CHEM 301 
or 335; PHYS 313, 351; two of PHYS 
310, 315, 316, 324.

* Course requirements for students majoring in chemistry and seeking physical science teacher licensure are listed for the Department of Chemistry.

Subject Area Requirements (Physics Minor Program): 

PHYS 121 (or 115 or 123) and PHYS 
122 (or 116 or 124) and PHYS 221 
plus two or three* of the following 
courses;

PHYS 196, PHYS 204 or 208, PHYS 
309, PHYS 310, PHYS 313, PHYS 
315, PHYS 316, PHYS 326, PHYS 331, 
PHYS 332, PHYS 324, PHYS 328

*As stated in the Handbook for Undergraduate Students, the Case School of Engineering requires “no more than two courses taken for the minor may be used simultaneously to satisfy the requirements of the student’s major field, including departmental requirements, technical electives and the Engineering Core.” So CSE students may have to choose between using physics courses as technical electives or counting them as part of a minor in physics.

GRADUATE PROGRAMS AND RESEARCH

The physics department offers programs of study and research leading to both the Master of Science and Doctor of Philosophy degrees. Graduate assistantships are available for the full-time support of qualified students. All M.S. programs in physics with or without a thesis normally
can be completed in less than two years. The requirements for the Ph.D. degree in physics include a flexible program of courses that is typically completed within three years, and a concurrent program of directed research with less course work and more research in each succeeding year.

For the Ph.D. degree the student is required to pass a general qualifying examination in physics, which is normally taken after the first year of study, and a topical oral examination within one year of joining a research group. The student must then prepare a dissertation based on the results of independent research. There is no foreign language requirement.

Research pursuant to any of the graduate degree programs in physics may be carried out in five areas:

- Condensed-Matter Physics. An extensive experimental and theoretical program in the electronic properties of solids (including superconductivity); quantum liquids; mesoscopic physics; localization and quantum Hall effect; the physics of polymers, liquid crystals...
and complex fluids; the equations of state of solids; thin films; fluids in a microgravity environment; and the physics of surfaces and interfaces, semi-conducting and rare-earth based magnetic materials.

- **Particle/Astrophysics and Cosmology.** The experimental efforts in this area include the study of the nature of dark matter in the universe, observations of high energy gamma rays and cosmic rays, and measurements of the cosmic microwave background. Theoretical studies include neutrino astrophysics, stellar evolution, the cosmic microwave background, extra dimensions, gravitational lensing, dark matter, large scale structure, extra dimensions topological defects, phase transitions, and early-universe cosmology. Other related work includes activities in general relativity.

- **Elementary Particle Physics.** Theoretical studies in the strong, weak, and electromagnetic interactions of the elementary particles, and in all areas of particle theory, gravitation, and cosmology.

- **Optics and Optical Materials.** Both experimental and theoretical programs in nonlinear optics, integrated optics, ultrafast optics, and the optical properties of fluids, liquid crystals, polymers, and crystals, including semiconductors and semiconductor mesoscopic systems.

- **Imaging Physics, Biophysics, and Inverse Problems.** An experimental and theoretical program in aspects of non-invasive imaging, including magnetic resonance imaging, computed tomography, and ultrasound. Medical diagnostic techniques to measure iron in the liver. Industrial and medical applications in electromagnetic field modeling.

In addition to a traditional physics program, the Department has created a Physics Entrepreneurship Master's degree program. This unique two-year program is designed to empower physicists as entrepreneurs. It enables students and graduates to build on their physics skills to start new high-tech businesses or to launch new product lines in existing companies. The program provides top-level academic instruction and real-world entrepreneurial experience while connecting students with the business executives and leaders, experts, and venture capitalists who are crucial to success in start-up and growing ventures.

### FACILITIES

The Department of Physics maintains research laboratories in experimental and theoretical astrophysics and cosmology, elementary particle physics, low temperature physics, optics, condensed matter physics, surface physics, medical physics, and industrial physics.

In collaboration with the Center for Particle Astrophysics at Berkeley, the experimental particle-astrophysics group is leading a search to discover the identity of possible weakly interacting massive elementary particles that may make up the bulk of the matter in the universe. In collaboration with the NASA-Caltech Jet Propulsion Laboratory in Pasadena, the particle-astrophysics group is developing a satellite to do ultra-high resolution and high contrast astronomical observations. In collaboration with researchers at the University of Chicago and McGill University, the particle-astrophysics group is also operating a new experiment for gamma-ray astronomy in the energy range from 20 to 500 GeV, called STACEE (Solar Tower Solar Cherenkov Effect Experiment) located at the National Solar Thermal Test Facility (NSTTF) at Sandia National Laboratories in Albuquerque, New Mexico. STACEE has been in preparation since 1998, and makes use of a large field of heliostat mirrors to detect gamma-rays from energetic astrophysical sources including pulsars, supernova remnants, and active galactic nuclei. Detector design and data analysis software and computing facilities are located in the department.

The optics and optical materials group uses optical techniques to examine both the fundamental properties and potential technological applications of semiconductors, metals and insulators, polymers and liquid crystals, and fluids. Extensive facilities for linear, nonlinear, and light scattering studies are available, including gas ion, titanium sapphire, and ring dye lasers for continuous wave studies, a tunable picosecond and femtosecond pulsed laser system, and a tunable nanosecond laser system for nonlinear optical studies. Facilities also include video image acquisition and analysis, microscopy, holography, refractometry, ultrafast spectroscopy, absorption and reflection spectroscopy, and nearfield scanning optical microscopy. The optical materials center houses a full array of equipment, including photolithography for sample preparation.

The condensed matter experimentalists make use of a wide range of techniques and associated instrumentation to study properties of materials in bulk and in thin films and surfaces. Among these techniques are electron-positron annihilation, optical harmonic generation, terahertz spectroscopy, photoconductivity, magnetic susceptibility, precision dielectric constants, photoluminescence spectroscopy, and electron energy loss spectroscopy. Among the special facilities available within the department for condensed matter research are a 15-inch Varian electromagnet; helium 3He-4He dilution refrigerators (15 mK and 5 mK); several superconducting magnets, including 6T, 9T, and 14T magnets and an 8.2 T warm-bore superconducting magnet with optical access along all three Cartesian axes. Low-temperature facilities are available for research on two-dimensional arrays on liquid helium and superconductors. Other equipment includes dynamic light scattering and high resolution birefringence apparatus; high resolution differential scanning calorimeter; instrumentation for experiments up to pressures of 225,000 psi at room temperature and to pressures of 30,000 psi with the temperature variable from 4.2K to 400K; ultrahigh vacuum equipment; and a complete array of surface analysis equipment including low-energy and reflection high-energy electron diffraction, X-ray and ultraviolet photoemission spectrometers, Auger electron spectrometers, and
atomic force, scanning tunneling, and near field scanning optical microscopes usable in both "read" and "write" modes for nanolithography.

Theoretical physics research utilizes a wide variety of computers, both on and off campus. The particle-astrophysics theory group maintains a UNIX cluster of RISC machines as well as clustered PCs with which it performs extensive numerical calculations in such areas as Big Bang nucleosynthesis, neutrino astrophysics, dark matter studies, stellar evolution, physics of the very early universe, and large-scale structure in the Universe. Molecular modeling and other simulations are performed on ultrafast workstations. The electronic structure group uses a cluster of high-speed UNIX workstations and links to the Ohio Supercomputer Center to perform computational physics of materials.

Well-equipped undergraduate and graduate laboratory facilities are provided. Experiments in the junior year are selected from a large number of possibilities, with the general level of sophistication increasing as the student advances. All students participate in research as described above through the senior project. The new Physics Entrepreneurship Master's degree program will enable the students and graduates of the program to build on their physics skills to start new high-tech businesses or launch new product lines in existing companies, and then successfully grow these ventures. The purpose of this new degree track is to provide students having a background in physics and an interest in technological innovation with the training and experience needed to efficiently play leading roles in new high-tech ventures. While many physicists have traditionally pursued such career paths, this is the first physics program designed to prepare them for such a role.

PHYSICS (PHYS)

Undergraduate Courses

PHYS 100. Space, Time, and Motion (3)
An introductory course in physics for students of the liberal arts. Discussion of how physics is performed, what important discoveries about natural phenomena have been made by physicists, and what are the most exciting questions being tackled by physicists today. Connections to current work appearing in various popular media will be made. In particular, emphasis is made on the connections between the fundamental discoveries that led to our understanding of motion and the light, and much of the ongoing research at the forefront of modern physics.

PHYS 101. Distinguishing Science from Pseudoscience (3)
There are many current issues arising in popular discourse, ranging from the believability of ESP to reincarnation, to "free energy" machines, which can benefit from simple physical analyses. This course will provide an introduction to the use of basic principles of physics to explore the viability of these ideas. A seminar format will be utilized with specific topics presented by students and by the instructor. Prereq: PHYS 100, PHYS 115, PHYS 121, or PHYS 123.

PHYS 113. Principles of Physics Laboratory (2)
The laboratory portion of the first two semesters of introductory physics. (A two-semester course.) Prereq: Departmental permission.

PHYS 113A. Principles of Physics Laboratory - Mechanics (1)
The laboratory portion of first semester introductory physics. Prereq: Departmental permission.

PHYS 113B. Principles of Physics Laboratory - Electricity and Magnetism (1)
The laboratory portion of the second semester of physics. Prereq: Departmental permission.

PHYS 115. Introductory Physics I (4)
First part of a two-semester sequence directed primarily towards students working towards a B.A. in science, with an emphasis on the life sciences. Kinematics; Newton's laws; gravitation; simple harmonic motion; mechanical waves; fluids; ideal gas law; heat and the first and second laws of thermodynamics. This course has a laboratory component.

PHYS 116. Introductory Physics II (4)
Electrostatics, Coulomb's law, Gauss's law; capacitance and resistance; DC circuits; magnetic fields; electromagnetic induction; RC and RL circuits; light; geometrical optics; interference and diffraction; special relativity; introduction to quantum mechanics; elements of atomic, nuclear and particle physics. This course has a laboratory component. Prereq: PHYS 115.

PHYS 121. General Physics I. Mechanics (4)
Particle dynamics, Newton's laws of motion, energy and momentum conservation, rotational motion, and angular momentum conservation. This course has a laboratory component. Prereq: MATH 121 or MATH 123 or MATH 125 or one year of high school calculus.

PHYS 122. General Physics II. Electricity and Magnetism (4)
Electricity and magnetism, emphasizing the basic electromagnetic laws of Gauss, Ampere, and Faraday. Maxwell's equations and electromagnetic waves, interference, and diffraction. This course has a laboratory component. Prereq: PHYS 121 or PHYS 123, Coreq: MATH 122, MATH 124, or MATH 126.

PHYS 123. Physics and Frontiers I - Mechanics (4)
The Newtonian dynamics of a particle and of rigid bodies. Energy, momentum, and angular momentum conservation with applications. A selection of special frontier topics as time permits, including fractals and chaos, special relativity, fluid mechanics, cosmology, quantum mechanics. This course has a laboratory component. Admission to this course is by invitation only.

PHYS 124. Physics and Frontiers II - Electricity and Magnetism (4)
Time-independent and time-dependent electric and magnetic fields. The laws of Coulomb, Gauss, Ampere, and Faraday. Microscopic approach to dielectric and magnetic materials. Introduction to the usage of vector calculus; Maxwell's equations in integral and differential form. The role of special relativity in electromagnetism. Electromagnetic radiation. This course has a laboratory component. Prereq: PHYS 123 or consent of department. Coreq: MATH 122 or MATH 124.

PHYS 166. Physics Today and Tomorrow (1)
This course will provide students with an opportunity to learn about the most exciting and timely research areas in physics, as well as other topics germane to being a professional physicist. These discussions will cover fields such as nanoscience, ultrafast optics, exotic materials, biophysics, cosmology, string theory and the role of physicists in developing new technologies. Each week a member of the faculty will meet with students to discuss a topic of current interest, how a physicist approaches the problem, and how physicists interact with others to find a solution. Other topics germane to being a professional physicist also will be discussed, including the relationship among academic, industrial, and governmental laboratories; ethics; and non-traditional careers for students trained in physics.

PHYS 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

PHYS 196. Energy and Society (3)
Global and national perspectives on the problems of energy supply and demand, global warming, oil cartels, solar, nuclear and wind energy, energy history, politics and economics of fossil fuels, and alternative energy sources. Cross-listed as GEOL 196, HSTY 196, and POSC 196.

PHYS 203. Analog and Digital Electronics (4)
Elements of both analog and digital electronics from the practical viewpoint of the experimental scientist; AC circuits, linear and non-linear operation of op-amps, logic gates, flip-flops, counters, display, memory, transistors, and D/A and A/D conversion. Laboratory work involves quantitative investigation of the operation of all these elements, together with projects that explore their combination. Prereq: PHYS 122 or PHYS 124.

PHYS 204. Advanced Instrumentation Laboratory (4)
Principles of experimental design; limits of resolution via band-width, thermal noise, background signals; data acquisition and control by computer; computer simulation; signal processing techniques in frequency and time domains, FFT, correlations, and other transform methods; counting techniques. Applications include lock-in amplifiers, digitizing oscilloscopes and data acquisition systems. Prereq: PHYS 203 and PHYS 221.

PHYS 208. Instrumentation and Signal Analysis Laboratory (4)
AC circuit theory, Fourier series, discrete Fourier series. Fourier integral, discrete Fourier integral; analysis in time and frequency domains, correlation, cross-correlation and other transform techniques; computer control of experiments via IEEE-488 interface; advanced instrumentation; DMM, arbitrary waveform generator, multiplexing and digitizing oscilloscopes; experimental design, noise; design, construction, and testing of a lock-in amplifier. Prereq: PHYS 221 and ENGR 210.
PHYS 300. Advanced Laboratory Physics I (4)
Problem solving approach with a range of available experiments in classical and modern physics. Emphasis on experimental techniques, data and error analysis, and the formal presentation of the work performed. Prereq: PHYS 204.

PHYS 302. Advanced Laboratory Physics II (4)
Several projects using research-quality equipment in contemporary fields of experimental physics. Each requires reading appropriate literature, choosing appropriate instrumentation, performing data acquisition and analysis, and writing a technical paper. Topics include particle counting techniques, neutron activation, gamma-ray spectroscopy, a range of condensed matter experiments including temperature dependent properties between 10 and 350 K, modern optics, ultrahigh vacuum surface science. Prereq: PHYS 301.

PHYS 309. Selected Physics Experiments (4)
An introduction to analog electronics and experimental physics. The first few weeks focus on DC and AC circuits, including circuit elements and measurements including nonlinear elements and operational amplifiers. The remainder of the semester includes selected experiments from classical and modern physics with an emphasis on experimental techniques, data and error analysis and the formal presentation of work. Prereq: PHYS 116 or PHYS 122 or PHYS 124.

PHYS 310. Classical Mechanics (3)
Lagrangian formulation of mechanics and its application to central force motion, scattering theory, rigid body motion, and systems of many degrees of freedom. Prereq: PHYS 221 and either MATH 223 or MATH 227.

PHYS 313. Thermodynamics and Statistical Mechanics (3)

PHYS 315. Introduction to Solid State Physics (3)
Characterization and properties of solids; crystal structure, thermal properties of lattices, quantum statistics, electronic structure of metals and semiconductors. Prereq: PHYS 331.

PHYS 316. Introduction to Nuclear and Particle Physics (3)
The physics of nuclei and elementary particles: experimental methods used to determine their properties; models and theories developed to describe their structure. Prereq: PHYS 331.

PHYS 317. Engineering Physics Laboratory I (4)
Laboratory course for engineering physics majors. Emphasis is on experimental techniques, data and error analysis, and written and oral presentation of work. Four experiments drawn from classical and modern physics are carried out. These emphasize condensed matter, material and optical physics. Experiments include electric fields, resistivity of materials, optical interference, chaotic systems, and spectroscopy. Design of data analysis systems and software is required. Prereq: PHYS 208.

PHYS 318. Engineering Physics Laboratory II (4)
Laboratory course for engineering physics majors. Several projects using research-quality equipment in contemporary fields of experimental physics. Open-ended experiments each require reading appropriate literature, designing the experiment, performing data analysis, and writing a technical paper. Topics are drawn from areas of modern physics, and concentrate on condensed matter, material, and optical physics. Prereq: PHYS 317.

PHYS 324. Electricity and Magnetism I (3)
First half of a sequence that constitutes a detailed study of the basics of electromagnetic theory and many of its applications. Electrostatics and magnetostatics of free space, conductors, dielectric and magnetic materials; basic theory illustrated with applications drawn from condensed matter physics, optics, plasma physics, and physical electronics. Prereq: PHYS 116 or PHYS 122 or PHYS 124.

PHYS 325. Electricity and Magnetism II (3)
(Continuation of PHYS 324.) Electrodynamics, Maxwell's equations, electromagnetic waves, electromagnetic radiation and its interaction with matter, potential formulation of electromagneticst, and relativ- ity. Prereq: PHYS 324.

PHYS 326. Physical Optics (3)
Geometrical optics and ray tracing, wave propagation, interaction of electromagnetic radiation with matter, interference, diffraction, and coherence. Supplemen- tary current topics from modern optics such as non- linear optics, holography, optical trapping and optical computing. Prerequisite(s) may be waived with consent of department. Prereq: PHYS 116 or PHYS 122 or PHYS 124.

PHYS 327. Quantum Electronics (3)
An introduction to theoretical and practical quantum electronics covering topics in quantum optics, laser physics, and nonlinear optics. Topics to be addressed include the physics of two-level quantum systems including the density matrix formalism, rate equations, and semiclassical radiation theory; laser operation including oscillation, gain, resonator optics, transverse and longitudinal modes, Q-switching, mode-locking, and coherence; and nonlinear optics including the nonlinear susceptibility, parametric interactions, stimulated processes, and self-action. Prereq: PHYS 331 or PHYS 481.

PHYS 328. Cosmology and the Structure of the Universe (3)
(See ASTR 328.) Cross-listed as ASTR 328.

PHYS 329. Independent Study (1-4)
An individual reading course in any topic of mutual interest to the student and the faculty supervisor.

PHYS 331. Introduction to Quantum Mechanics I (3)
Quantum nature of energy and angular momentum, wave nature of matter, Schroedinger equation in one and three dimensions; matrix methods; Dirac notation; quantum mechanical scattering. Two particle wave functions. Prereq: PHYS 221.

PHYS 332. Introduction to Quantum Mechanics II (3)
Continuation of PHYS 331. Spin and fine structure; Dirac equation; symmetries; approximation methods; atomic and molecular spectra; time dependent pertur- bations; quantum statistics; applications to electrons in metals and liquid helium. Prereq: PHYS 331.

PHYS 336. Modern Cosmology (3)
An introduction to modern cosmology and an explora- tion of current topics in the field. The first half of the course will cover the mathematical and physical basis of cosmology, while the second will delve into current questions and the observations that constrain them. Prereq: PHYS 221.

PHYS 339. Seminar (1-3)
Conducted in small sections with presentation of pa- pers by students and informal discussion. Special prob- lem seminars and research seminars offered according to interest and need, often in conjunction with one or more research groups. Prereq: Consent of department.

PHYS 340. Teaching Electricity (2)
This lab-based course is directed at in-service and prospective teachers of science in the middle and high schools. The course content will cover the basics of electricity (current, voltage, power, energy, Kirchhoff's laws and their relation to the laws of conservation of charge and energy, Ohm's law). Some elements of electromagnetism will also be introduced, time-permitting. The sessions will be hands-on and activity-based. The sessions will also model and discuss teaching pedagogy such as cooperative learning, interactive lectures, learning styles, constructivism and inquiry-learning. The technology used will involve simple and cheap equipment that can be easily replicated in classrooms. Evaluation will be based on attendance, participation, pre- and post-tests, and journals.

PHYS 349. Methods of Mathematical Physics I (3)
Analysis of complex functions: singularities, residues, contour integration; evaluation and approximation of sums and integrals; exact and approximate solution of ordinary differential equations; transform calculus; Sturm-Liouville theory; calculus of variations. Prereq: MATH 224.

PHYS 350. Methods of Mathematical Physics II (3)
(Continuation of PHYS 349.) Special functions, orthogonal polynomials, partial differential equations, linear operators, group theory, tensors, selected special topics. Prereq: PHYS 349.

PHYS 351. Physics Senior Project (3)
A two-semester course required for senior physics majors. Project based on experimental, theoretical, or teaching research under the supervision of a physics faculty member, possibly jointly with a faculty member from another department. Study of the techniques currently utilized in a specific research area and of the recent literature associated with the project. Ex- perimental or theoretical work leading to meaningful results which are to be presented as a term paper and an oral report at the end of the second semester. Sup- ervising faculty will review progress with the student on a regular basis and progress reports made twice each semester to the Physics Senior Committee to ensure successful completion of the work. Prereq: PHYS 302 or PHYS 309.

PHYS 353. Senior Engineering Physics Project (3)
A two-semester course required for senior engineering physics majors (3 credits each semester). The project will be in the student’s engineering physics concentra- tion area and will be supervised by a faculty advisor who will review progress with the student on a regular
basis. The project may be calculational, experimental or theoretical, and will address both the underlying physics and appropriate engineering design principles. The project requirements include short oral presentations twice each semester before the senior project committee and a term-paper and an oral presentation at the end of the second semester. Prereq: PHYS 318.

PHYS 365. General Relativity (3)
This is an introductory course in general relativity. The techniques of tensor analysis will be developed and used to describe the effects of gravity and Einstein's theory. Consequences of the theory as well as its experimental tests will be discussed. An introduction to cosmology will be given. Prereq: Consent of department.

Graduate Courses

PHYS 413. Classical and Statistical Mechanics I (3)
An integrated approach to classical and statistical mechanics. Lagrangian and Hamiltonian formulations, conservation laws, kinematics and dynamics, Poisson brackets, continuous media, derivation of laws of thermodynamics, the development of the partition function. To be followed by PHYS 414.

PHYS 414. Classical and Statistical Mechanics II (3)
A continuation of PHYS 413. Noninteracting systems, statistical mechanics of solids, liquids, gases, fluctuations, irreversible processes, phase transformations. Prereq: PHYS 413 and consent of department.

PHYS 415. Introduction to Solid State Physics (3)
(See PHYS 315.) For graduate students in engineering and science. (May not be taken for credit by graduate students in the Department of Physics.) Prerequisite may be waived with consent of department. Prereq: PHYS 331.

PHYS 423. Classical Electromagnetism (3)

PHYS 426. Physical Optics (3)
(See PHYS 326.)

PHYS 427. Quantum Electronics (3)
(See PHYS 327.) Prereq: PHYS 331 or PHYS 481.

PHYS 428. Cosmology and the Structure of the Universe (3)
(See ASTR 428.) Cross-listed as ASTR 428.

PHYS 431. Physics of Imaging (3)
Description of physical principles underlying the spin behavior in MR and Fourier imaging in multi-dimensional systems. Introduction of conventional, fast, and chemical-shift imaging techniques. Spin echo, gradient echo, and variable flip-angle methods. Projection reconstruction and sampling theorems. Bloch equations, T1 and T2 relaxation times, rf penetration, diffusion and perfusion. Flow imaging, MR angiography, and functional brain imaging. Sequence and coil design. Prerequisite may be waived with consent of instructor. Prereq: PHYS 122 or PHYS 124 or EBME 410. Cross-listed as EBME 431.

PHYS 436. Modern Cosmology (3)
(See PHYS 336.)

PHYS 439. Special Topics Seminar (1-3)
Intermediate level seminar for advanced undergraduate and beginning graduate students.

PHYS 441. Physics of Condensed Matter I (3)

PHYS 442. Physics of Condensed Matter II (3)
Continuation of PHYS 441. Lattice vibrations, thermal properties of solids, semiconductors, magnetic properties of solids, and superconductivity. Prerequisite may be waived with consent of department. Prereq: PHYS 441.

PHYS 449. Methods of Mathematical Physics I (3)
(See PHYS 349.) Additional work required.

PHYS 450. Methods of Mathematical Physics II (3)
(See PHYS 350.) Additional work required.

The experimental basis for modeling the electroweak and strong interactions in terms of fundamental fermions, quarks and leptons, and gauge bosons, photons, the weak bosons, and gluons; particle accelerators and detection techniques; phenomenology of particle reactions, decays and hadronic structure; space, time and internal symmetries; symmetries; symmetry breaking. Prereq: Consent of department.

PHYS 452. Empirical Foundations of the Standard Model II (3)
Continuation of PHYS 451. Tests of the predictions of the broken SU(2) x U(1) gauge-symmetric model of the electroweak interactions and the color-SU(3) model of the strong interactions. Structure of the weak currents, the quark mixing matrix, and the gauge-boson couplings. Exploration of the Higgs sector and the coupling of the Higgs to quarks and leptons. Heavy quark physics. Calculation of hadronic processes using partonic distribution functions. CP violation, neutrino masses, fermion nonconservation, and possible extensions of the Standard Model. Prerequisite may be waived with consent of department. Prereq: PHYS 451.

PHYS 460. Advanced Topics in NMR Imaging (3)
(See EBME 460.) Cross-listed as EBME 460.

PHYS 465. General Relativity (3)
(See PHYS 365.) Additional work required.

PHYS 472. Graduate Physics Laboratory (3)
A series of projects designed to introduce the student to modern research techniques such as automated data acquisition. Students will be assessed as to their individual needs and a sequence of projects will be established for each individual. Topics may include low temperature phenomena, nuclear gamma ray detection and measurement and optics.

PHYS 481. Quantum Mechanics I (3)
Quantum mechanics with examples of applications. Schroedinger method; matrix and operator methods. Approximation methods including WKB, variational and various perturbation methods. Applications to atomic, molecular and nuclear physics including both bound states and scattering problems. Applications of group theory to quantum mechanics. Prereq: Consent of department.

PHYS 482. Quantum Mechanics II (3)
Continuation of PHYS 481. Prerequisite may be waived with consent of department. Prereq: PHYS 481.

PHYS 491. Modern Physics for Innovation I (3)
The first half of a two-semester sequence providing an understanding of physics as a basis for successfully launching new high-tech ventures. The course will examine physical limitations to present technologies, and the use of physics to identify potential opportunities for new venture creation. The course will provide experience in using physics for both identification of incremental improvements, and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) physics-based venture creation, and will illustrate characteristics for success. Prereq: Permission of department.

PHYS 492. Modern Physics for Innovation II (3)
Continuation of PHYS 491, with an emphasis on current and prospective opportunities for Physics Entrepreneurship. Longer term opportunities for Physics Entrepreneurship in emerging areas including, but not limited to, nanoscale physics and nanotechnology; biophysics and applications to biotechnology; physics-based opportunities in the context of information technology. Prereq: PHYS 491.

PHYS 522. Nonlinear Optics (3)

PHYS 539. Special Topics Seminar (1-3)
Individual or small group instruction on topics of interest to the department. Topics include, but are not limited to, particle physics, astrophysics, optics, condensed matter physics, biophysics, imaging. Several such courses may run concurrently. Prereq: Permission of department.

PHYS 541. Quantum Theory of Solids I (3)

PHYS 544. Advanced Theory of Materials (3)

PHYS 566. Cosmology (3)
This course will provide an up-to-date introduction to our current understanding of the origin and evolution of the Universe and will make connections between our understanding of elementary particle physics and cosmology. Specific topics will include: General Parameters of Cosmology: Expansion, Lifetime, and Density of the Universe; The Early Universe, Constraints on Elementary Particles, Dark Matter and Dark Energy.
PHYS 579. Special Topics: Frontiers in Research (3)
In-depth examination of a cutting-edge topic of current research. New topic is selected each semester.

PHYS 581. Quantum Mechanics III (3)
Continuation of PHYS 482. The methods of quantum field theory applied to the nonrelativistic many-body problem, radiation theory, and relativistic particle physics. Second quantization using canonical and path integration techniques, constrained systems, and gauge theories. Graphical perturbative methods and graphs; summation approximations. Topological aspects of field theories. Prereq: PHYS 482 and consent of department.

PHYS 591. Gauge Field Theory I (3)
Noether's theorem, symmetries and conserved currents, functional integral techniques, quantization, Feynman rules, anomalies, QED, electroweak interactions, QCD, renormalization, renormalization group, asymptotic freedom and assorted other topics. Prereq: PHYS 581 and consent of department.

PHYS 592. Gauge Field Theory II (3)
(See PHYS 591.) Prereq: PHYS 591.
PHYS 601. Research in Physics (1-9)
PHYS 651. Thesis M.S. (1-9)

PHYS 666. Frontiers in Physics (0)
Weekly colloquia given by eminent physicists from around the world on topics of current interest in physics.

PHYS 701. Dissertation Ph.D. (1-9)
PHYS 703. Dissertation Fellowship (1-8)

PHYS 820. Teaching Physics: Hands-On and Inquiry-Based (2)
This lab-based course is directed at in-service teachers of science in the middle and high schools. The course content will cover the basics of mechanics, oscillations and waves, sound, and light. The sessions will be hands-on and activity-based. The sessions will also model and discuss teaching pedagogy such as cooperative learning, interactive lectures, learning styles, constructivism and inquiry-learning. The technology used will vary from sophisticated computer-based labs to cheap, home-made experiments. The participants will also be trained in the machine shop on how to use tools to construct items for their own classrooms. Evaluation will be based on attendance, participation, pre- and post-tests, and journals. Prereq: Consent of department.

PHYS 822. Physics Teacher Retraining (1)
For pre-college teachers who have taken PHYS 820 and who wish to develop similar courses for other teachers. Will involve working with students in PHYS 820 to help them improve their understanding of concepts, and working with the instructors on ways to make courses such as this more effective. Enrollment limited to five. Prereq: PHYS 820 and consent of department.

PHYS 840. Teaching Electricity (2)
This lab-based course is directed at in-service and prospective teachers of science in the middle and high schools. The course content will cover the basics of electricity (current, voltage, power, energy, Kirchhoff's laws and their relation to the laws of conservation of charge and energy, Ohm's law). Some elements of magnetism will also be introduced, time-permitting.

The study of political science is primarily concerned with governmental structures and processes in world societies, including who governs, why, and how. Faculty specialties in the department include American politics and governmental institutions; violence and civil disorder; public policy analysis; international relations; political economy; and comparative politics with various regional concentrations. In its programs leading to the B.A., M.A., and Ph.D., the department makes a strong effort to relate the study of politics to students' needs and concerns and tries to reflect in its courses both the excitement and seriousness of real-world politics. The study of political science can build a foundation for many types of future employment. Many political science majors are preparing for graduate study or law school. Others intend to pursue careers in journalism or teaching, in public administration, or jobs in private industry and business. Both the public and private sectors hold career possibilities for the political science major.

FACULTY
Joseph White, Ph.D. (University of California, Berkeley)
Luxenberg Family Professor of Public Policy and Chair
American government; Congress; public policy; health and budget policy
Kenneth W. Grundy, Ph.D. (Pennsylvania State University)
Marcus A. Hanna Professor of Political Science
International relations; African politics

Alexander P. Lamis, Ph.D. (Vanderbilt University), J.D. (University of Maryland)
Associate Professor
American government; electoral politics; constitutional law

Kathryn C. Lavelle, Ph.D. (Northwestern University)
Assistant Professor
International relations; Africa; political economy; U.S. foreign policy; international organizations

Emery G. Lee III, Ph.D. (Vanderbilt University), J.D. (Case Western Reserve University)
Assistant Professor
American government; political theory; public law; ethics

Frances E. Lee, Ph.D. (Vanderbilt University)
Associate Professor
American government, Congress, legislative policy-making

Vincent E. McHale, Ph.D. (Pennsylvania State University)
Professor and Chair; Director, International Studies Program
Comparative politics; Europe; political sociology; methodology

Kelly M. McMann, Ph.D. (University of Michigan)
Assistant Professor
Comparative politics; Central Asia; Russia and former East Bloc; democratization

Associate Faculty
Robert H. Binstock, Ph.D. (Harvard University)
Henry R. Luce Professor of Aging, Health and Society, Department of Epidemiology and Biostatistics, School of Medicine; and Professor of Political Science
American government; public policy; health care and aging

Jonathan L. Entin, J.D. (Northwestern University)
Professor of Law, School of Law; and Professor of Political Science
American constitutional law; social science and the law

Laura Y. Tartakoff, J.D. (Case Western Reserve University); M.A. (Fletcher School, Tufts University)
Adjunct Associate Professor of Political Science
Constitutional law; civil liberties; comparative constitutionalism
UNDERGRADUATE PROGRAMS

Major

The major in political science leads to the Bachelor of Arts degree. While the specific courses to be taken are determined by the student’s interest, with approval of a faculty advisor, those majoring in political science must complete 30 hours of coursework in the department, distributed as follows:

- Three hours of POSC 109
- Six hours of POSC courses at the 200 level
- Eighteen hours of POSC courses at the 300 level
- Three hours of a senior project, POSC 396

No more than six hours of independent study (i.e., POSC 395 and/or POSC 396 or POSC 397/398, Honors Program) may count toward the major. Independent study completed through the Washington Semester program or the Washington Center program is excluded from this limitation.

Minor

A minor in political science consists of 15 hours (5 courses) in the department, of which 9 hours must be at the 300 level. An elected minor sequence must be approved by a political science faculty advisor.

A minor in public policy is available to undergraduates in the College of Arts and Sciences and to undergraduates in the economics and management programs in the Weatherhead School of Management. The public policy minor consists of 15 credit hours, ordinarily including:

- ECON 205 and POSC 386
- One course from the following list of approved courses: HSTY 256, HSTY 358, POSC 308, POSC 310, POSC 385
- Two courses in a specific policy field (e.g., health care, the environment, business and the economy, science and technology policy, nonprofit and charitable organizations, social policy, etc.), as approved by the public policy minor advisor.

Sequences (Engineering Core Curriculum)

All sequences must include POSC 109 (3 hours), POSC 272 (3 hours), and one additional course (3 hours) selected in consultation with the department’s sequence advisor. Contact the department chair, for advice about all Case sequences.

Departmental Honors

A junior or senior political science major who has a minimum grade point average of 3.7 in political science courses and a 3.3 average overall and who has completed all course work in the department except for six hours at the 300 level, may request permission to enroll in the Political Science Honors Program by contacting a Political Science faculty project advisor before registration for POSC 397. Completion of both courses in the two-semester sequence (POSC 397 and POSC 398) is mandatory for honors consideration. During the two semesters, the student carries out research and writes a substantial paper. (No other form of project is acceptable for Honors.) It is expected that the student will meet frequently with his or her project advisor throughout both semesters to discuss and evaluate the work in progress. The student’s work in POSC 397 will receive a grade of A, B, C, D, or F based on work completed to date; a letter grade of A, B, C, D, or F also will be assigned to POSC 398 upon completion of the project. Completion of the two-course sequence requires that the final paper be submitted to the project advisor at a specified time during the second semester, usually by the twelfth week of the semester. The student also is required to present his/her honors project at a special departmental colloquium to be held toward the end of each Spring semester. If the department judges the paper to be of high quality and if a political science GPA of 3.7 is maintained, the student will receive honors in political science upon graduation.

Integrated Graduate Studies

Application to the Integrated Graduate Studies program in political science must occur no later than the beginning of the second semester of the junior year, but preferably earlier. Upon completion of 90 undergraduate hours, the student must have satisfied all general requirements for the B.A., including at least 23 hours in the political science major, the General Education Requirements, and one minor program; and must have a 3.5 grade point average in political science courses and 3.3 overall. If admitted to the IGS program, the student will take 30 hours of graduate-level political science courses during the senior year, adhering to the departmental regulations governing the master’s degree program. If completed successfully, these hours will count simultaneously toward both degrees in political science. The B.A. will be awarded upon completion of all requirements for that degree, including total hours; the M.A. will be awarded upon successful completion of the 30 hours of graduate-level courses and the M.A. examination.

GRADUATE PROGRAMS

Master of Arts

Requirements for admission to the Master of Arts program in political science are three letters of recommendation from former instructors; a minimum score of 500 on each required segment of the Graduate Record Examination (GRE) (verbal, quantitative, analytical); for students from other countries, also a minimum score of 550 on the paper or 215 on the computer version of the Test of English as a Foreign Language (TOEFL); and transcripts of all undergraduate study, indicating completion of a Bachelor of Arts or Bachelor of Science degree program, preferably with grade point average of 3.2 overall and 3.4 in political science courses. The Master of Arts in political science is a broadly based program in which the student is expected to acquire and exhibit general knowledge and skills. Therefore, within the 30 hours of graduate-level course work (400 level and above) required for the political sci-
ence Master of Arts, 12 hours must be distributed as follows:
- three hours in American government and politics;
- three hours in comparative politics; and
- three hours in international affairs.
- three hours of research methods

Among the remaining 18 hours of “electives,” the student may take courses oriented toward a general Master of Arts (i.e., covering the four broad areas listed above) or may elect to specialize in one of these or some other proposed and approved area. Excluding those hours taken to fulfill degree requirements in quantitative methods, a maximum of six hours may be taken outside the Department of Political Science, with prior approval, for specialized work related to the Master of Arts degree for which no political science course is appropriate. A maximum of nine hours of independent study (POSC 601) may count toward the degree. A minimum grade point average of 3.0 must be maintained throughout the Master of Arts program. Upon completion of no less than 30 hours and no more than 42 hours of Master of Arts course work, the student must request scheduling of the political science Master of Arts examination. The examination will cover the four broad areas listed above, the political science Master of Arts reading list, and any elected area of concentration. Complete information on the Master of Arts program in political science is available from the department office.

Doctor of Philosophy

Requirements for admission to the Doctor of Philosophy program in political science for individuals without an M.A. degree in Political Science include all requirements for admission to the M.A. program. In addition, applicants to the Ph.D. program should determine whether their interests match those of individual faculty members who would need to supervise the intense research involved in a dissertation. Applicants with an M.A. in Political science should also have a minimum GPA of 3.4 in the M.A. program, and all applicants should include trans-

scripts of all prior undergraduate and/or graduate study.

All Ph.D. students must complete 45 hours of graduate-level courses, plus at least 18 hours of POSC 701, “Dissertation,” credit. The required 45 hours of doctoral courses taken before dissertation credits must be distributed as follows:
- 12 hours in primary subfield (American, comparative, or international relations)
- 9 hours in secondary subfield (one of the remaining two fields)
- 6 hours in the remaining subfield
- 6 hours in research methods
- 12 hours of electives

A maximum of 9 hours of independent study (POSC 601) may be undertaken. Electives and research methods courses may be taken outside of the department, but only with prior approval from his or her political science advisor.

Complete information for all aspects of the Doctor of Philosophy program in political science (e.g., comprehensive examination; dissertation requirements; etc.) is available in a special announcement from the department office.

POLITICAL SCIENCE (POSC)

Undergraduate Courses

POSC 109. The American Political System (3)
Introduction to the study of American politics, addressing the questions “Who rules?” and “Who benefits?” in the American political system. Explores the nature of constitutional limits, the role of public participation, the impact of pressure groups, and the influence of various governmental institutions on American political life.

POSC 196. Energy and Society (3)
Global and national perspectives on the problems of energy supply and demand, global warming, oil cartels, solar, nuclear, and wind energy, energy history, politics and economics of fossil fuels, and alternative energy sources. Cross-listed as PHYS 196.

POSC 260. Introduction to Comparative Politics (3)
Comparative politics is the study of processes and institutions within countries. Prompted by real-world puzzles, comparatists investigate broad, theoretical questions: What constitutes a revolution, and why do revolutions occur? How does one country become more democratic than another? Why do relations between some ethnic groups turn violent? This course introduces students to some of the central puzzles and theories of comparative politics in order to help them better understand world events.

POSC 272. Introduction to International Relations (3)
Survey of the principles of international relations, politics, law and organization; the rise, development and change of the nation-state system; development of international cooperation; methods of studying international relations.

POSC 301. Decision-Making in American Cities (3)
Localities are the primary interface with government and provide the basic psychological place identification for most Americans. The course will explore this assertion in the context of urban America today. How are decisions made in cities? Who shapes these decisions and why? What role is played by shifting demographics, race, and poverty? What can the individual do to influence local decision-making?

POSC 306. Interest Groups in the Policy Process (3)
Introduction to the institutions and processes that make up the political environment of nonprofit and other organizations in the United States, beginning with an examination of the role of civil society in a democracy and continuing with the framing of issues, role of political entrepreneurs and organized interests, elections, the legislative process and strategies for influencing it, and the roles of executive institutions and the courts.

POSC 308. The American Presidency (3)
The sources of, strategies of, and restraints on presidential leadership in the United States. Emphasis on problems of policy formation, presidential relations with Congress and executive agencies, and the electoral process.

POSC 310. The Legislative Process (3)
Legislative, representative, and other functions of Congress and state legislatures; legislative relations with the executive and with private interests; powers and limitations of the legislature as a policy-making institution.

POSC 320A. The Midterm Elections (3)
Analysis of the midterm elections in the United States. Covers congressional and state elections in all regions, focusing on the issues, personalities, campaign strategies, and voter trends in this key electoral battle held between presidential elections. Offered every four years in conjunction with the election cycle.

POSC 320B. The U.S. Midterm Elections (3)
Analysis of the midterm elections in the United States. Covers congressional and state elections in all regions, focusing on the issues, personalities, campaign strategies, and voter trends in this key electoral battle held between presidential elections. Offered every four years in conjunction with the election cycle.

POSC 320C. The Presidential Election (3)
Analysis of the upcoming presidential election in the United States. Focuses on the issues and personalities, polls and public opinion, campaign strategies, and electoral behavior. Offered every four years in conjunction with the United States presidential election cycle.

POSC 320D. Politics of the American South (3)
Analysis of forces that have transformed the political landscape of the American south since World War II, changing the region from an economically backward bastion of white supremacy to a prospering, biracial society fast on the way to rejoining the national mainstream.

POSC 323. Judicial Politics (3)
Rejecting the view that judges mechanically apply the law, the study of judicial politics seeks to understand the behavior of judges as political actors with policy goals. Topics include judicial selection and socialization, judicial policy change, judicial strategy (especially the strategic interaction of judges on multi-judge panels), the interaction of courts in hierarchical judicial systems, the policy impact of judicial decisions, and the courts’ interactions with coordinate branches of government (the executive, Congress, state governments,
state courts). Primary focus will be on the federal judiciary, with some discussion of state judicial systems.

POSC 325. American Constitutional Law (3)
An introductory survey of U.S. constitutional law. Special attention given to the historical, philosophical, and political dimensions of landmark Supreme Court cases. Judicial review, federalism, separation of powers, due process, and equal protection. Supreme Court’s involvement in major political controversies: the New Deal, abortion, physician-assisted suicide, school desegregation, and affirmative action.

POSC 326. Comparative Constitutions (3)
Overview of ancient Greek and Roman constitution-making, medieval principles, emergence of modern constitutionalism, and the constitutionalist vision of the American and French Revolutions. Examination of contemporary constitutional issues and developments in countries such as Canada, France, Germany, Great Britain, Ethiopia, India, and the United States.

POSC 327. Civil Liberties in America (3)
Supreme Court’s interpretation of the First Amendment: liberty of religion through the establishment and free exercise clauses, freedoms of speech and the press, of assembly and association. The “pure tolerance” view examined against subversive speech, “fighting words,” libel and obscenity. Survey of content-neutral regulation, symbolic expression, and current efforts to limit expression (by Supreme Court speech codes and the feminist anti-pornography movement).

POSC 328. Topics in Civil Liberties (3)
Rights of the accused as outlined in the Fourth, Fifth, Sixth, and Eighth Amendments. Topics covered are (1) arrests, searches, and seizures, (2) the privilege against compelled self-incrimination, (3) the rights to counsel, confrontation, and jury trial, and (4) the prohibition against cruel and unusual punishments. Case-specific approach but presents interplay of history, philosophy, and politics as background of each topic.

POSC 334. Violence and the Political System (3)
Empirical analysis of various theories advanced in the cross-cultural explanation of factors which cause and mediate the occurrence of violence—revolutions, terrorism, and civil disorder—within the political system.

POSC 341. Elections, Voters, and Political Parties (3)
Examination of American political parties, their activities, organization, characteristics, and functions. Candidate strategy (campaign history viewed within the context of voter orientations and predispositions, stressing linkages between citizen and party and between party and government.

POSC 343. Public Opinion and American Democracy (3)
Examination of theories, concepts and empirical research related to attitudes and the political behavior of mass publics.

POSC 346. Women and Politics (3)
Examination of the role of women in politics. Topics include: political socialization; sources and implications of gender difference in political participation (voting, candidacy, leadership); and the politics of “women’s issues.”

POSC 348. Political and Social Thought in the Machine Age (3)
Explores the responses of economist writers, philosophers, cultural critics, and public policy makers to changes in Western society wrought by industrialization, by focusing on their concerns with technological change. Cross-listed as HSTY 348.

POSC 349. Political Science Research Methods (3)
Research methods in political science and other social sciences. Research design, including development of hypotheses and operational measures, and evaluation of quantitative and qualitative methodologies. Useful for students going into graduate school, policy analysis, or consulting.

POSC 351. Modern Political Thought (3)
Examination of a limited topic in the study of modern political thought. Topics vary.

POSC 352. American Political Thought (3)
Examination of the unique contribution to the science of government made by American political thinkers.

POSC 354. Political and Social Philosophy (3)
Justification of social institutions, primarily political ones. Such distinctions as that between de facto and legitimate authority; analysis of criteria for evaluation, such as social justice and equality; inquiry into theories of justification of the state; theory of democratic government and its alternatives. Readings from classical and contemporary sources. Prereq: PHIL 101. Cross-listed as PHIL 334.

POSC 355. Modern Political Ideologies (3)
Substance and nature of ideological thinking in the contemporary world via a survey of political “isms”—for example, liberalism, libertarianism, conservatism, fascism, socialism, and even more recent trends such as feminism, environmentalism, etc.

POSC 357. Democratic Politics: Theory and Practice (3)
Study of the theory and application of democracy. The concept of democracy will be examined from the Athenian model to contemporary debates over participatory and deliberative models. Then the concept will be applied to understanding issues of democratic practice and the study of politics in American, comparative, and international arenas. Finally, the course will address the potential effects, both good and ill, of technological innovation on democratic practices, such as “distance” participation, the Internet, and other communication technology.

POSC 361. State-Building and State Collapse (3)
Are nation-states the most effective means of organizing society? This course explores this question by examining the historical rationales behind the development of the nation-state, contemporary challenges to the nation-state, and potential alternatives to the nation-state. Possible challenges to the nation-state include multinational corporations, international humanitar- ian intervention, and regional integration. Alternative providers of state services include charities, companies, and mercenaries.

POSC 362. Politics of Central Asia (3)
Once an unfamiliar region to many people of the world, Central Asia took center stage in the fall of 2001 as a result of the U.S. campaign against terrorism. This course will introduce students to the politics of Central Asia, focusing on the region today composed of Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, and Kazakhstan. We will review the nationalism, foreign relations, religion, ethnicity, and economics of the region.

POSC 363. Comparative Elections and Electoral Systems (3)
Elections involve more than the simple act of voting to express individual preferences. The rules under which elections are held worldwide determine who controls the executive and how votes are converted into legisla- tive seats. The mechanics of various electoral arrange-
POS 370. International Law and Organizations (3)
Study of international organizations and international law as two means for regulating and coordinating nation-state behavior. History of the two techniques will be traced, covering 19th century efforts at cooperation, the League of Nations and the United Nations, regional and specialized global organization. The functions of international law in global politics will be stressed, with primary focus on the evolving role of law in dealing with global problems, e.g., war, the environment, economic cooperation, and human rights.

POS 370K. Nationalism, Ethnicity, and Religion in World Politics (3)
Examination of the post-Cold War surge in conflicts among nationalism, ethnic groups, and religions, with particular attention to the former Yugoslavia, Ireland, India, Africa, and the Middle East.

POS 371. Natural Resources and World Politics (3)
Examination of the political causes and ramifications of the uneven distribution of the valuable natural resources for modern industrial societies. Strategic and military issues and the exploitation of the sea bed. Examination in some detail of selected commodity issues, including petroleum, copper and uranium.

POS 372. The United Nations in the Post-Cold War World (3)
The United Nations has become the focus of a debate over its effectiveness as a global organization dedicated to promoting world peace. Some critics believe it is time for the U.N. to move forward in this regard, while others see the U.N. as an anarchistic, bloated bureaucracy sorely in need of reform. This course will consider the United Nations from the perspective of powerful states such as the United States, as well as from the perspective of weaker ones, and also will consider areas such as peacekeeping, human rights, economic development, political reform, and the U.N.'s involvement with non-state actors such as terrorists.

POS 374. Politics of Development in the Global South (3)
Exploration of the post-World War II emergence of the Global South nations of Africa, Asia, the Middle East, Latin America, and Eastern Europe, and the process and meaning of their entry into the world political arena.

POS 375. Nuclear Weapons and Arms Control (3)
National and international problems concerning nuclear weapons, and the past and present attempts both to control their spread and to prevent their use. Topics covered include the science and technology of fusion and fusion warheads and delivery vehicles; history, domestic policies, and international relations concerning nuclear weapons; and arms control treaties and their verification. Cross-listed as HSTY 377.

POS 376. United States Foreign Policy (3)
Focus on U.S. foreign policy making with a dynamic network of executive and congressional actors and organizations; analysis of traditional and contemporary U.S. foreign policies from nuclear defense to current economic resource issues; future role of the United States in world affairs.

POS 377. Politics of Russia (3)
Russia faces three problems: the creation of a sovereign state, the development of a new political system, and the restructuring of its economy. In this course we will challenge the assumption that the outcome of these three transitions will be a strong, democratic, capital-
POSC 449. Political Science Research Methods (3)
(See POSC 349.)

POSC 451. Modern Political Thought (3)
(See POSC 351.)

POSC 452. American Political Thought (3)
(See POSC 352.)

POSC 454. Political and Social Philosophy (3)
(See POSC 354.) Cross-listed as PHIL 434.

POSC 455. Modern Political Ideologies (3)
(See POSC 355.)

POSC 457. Democratic Politics: Theory and Practice (3)
(See POSC 357.)

POSC 461. State-Building and State Collapse (3)
(See POSC 361.)

POSC 462. Politics of Central Asia (3)
(See POSC 362.)

POSC 463. Comparative Elections and Electoral Systems (3)
(See POSC 363.)

POSC 464. Dictatorship and Democracy in 20th-Century Latin America (3)
(See POSC 364.)

POSC 466. Government and Politics of Africa (3)
(See POSC 366.)

POSC 467. Western European Political Systems (3)
(See POSC 367.)

POSC 470A. Political Economy (3)
(See POSC 370A.)

POSC 470C. The United States and Asia (3)
(See POSC 370C.)

POSC 470G. U.S. Intelligence and National Security (3)
(See POSC 370G.)

POSC 470J. International Law and Organizations (3)
(See POSC 370J.)

POSC 470K. Nationalism, Ethnicity, and Religion in World Politics (3)
(See POSC 370K.)

POSC 471. Natural Resources and World Politics (3)
(See POSC 371.)

POSC 472. The United Nations in the Post-Cold War World (3)
(See POSC 372.)

POSC 474. Politics of Development in the Global South (3)
(See POSC 374.)

POSC 475. Nuclear Weapons and Arms Control (3)
(See POSC 375.) Cross-listed as HSTY 475.

POSC 476. United States Foreign Policy (3)
(See POSC 376.)

POSC 477. Politics of Russia (3)
(See POSC 377.)

POSC 479. Middle East: Politics, Economics, and American Policy (3)
(See POSC 379.)

POSC 480. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

POSC 481. City as Classroom (3)
(See HSTY 481.) Cross-listed as HSTY 481.

POSC 484. Ethics and Public Policy (3)
(See POSC 384.)

POSC 485. U.S. Bureaucratic Politics (3)
(See POSC 385.)

POSC 486. American Public Policy Process (3)
(See POSC 386.)

POSC 487. Comparative Public Policy in Advanced Industrial Societies (3)
(See POSC 387.)

POSC 489. Special Topics in American Politics and Policy (3)
(See POSC 389.)

POSC 601. Individual Investigation (1-6)
The student must submit to the departmental office a project prospectus form, approved and signed by the faculty project supervisor, no later than the end of the second week of classes. The prospectus must outline the goals of the project and the research methodology to be used and is part of the basis for grading. The prospectus form is available from the departmental office. Prereq: Departmental prospectus form.

POSC 701. Dissertation Ph.D. (1-9)
Prereq: Consent of department.

POSC 703. Dissertation Fellowship (1-8)

Practicum Program

The Practicum Program provides undergraduates in the College of Arts and Sciences the opportunity to engage in a learning experience in a workplace environment. Students develop new skills and gain insights into the connections between their academic studies and possible career choices. The practicum is a planned, structured, supervised, full-time, semester-long experience during the academic year. Successful completion of a practicum is noted on the student’s transcript.

Program Requirements

The Practicum Program is managed by the Career Center in collaboration with the College of Arts and Sciences. To be eligible, a student must have completed 60 credit-hours prior to the start of the work assignment, must be enrolled as a full-time student, and must be in good academic standing. To participate in the program, students apply to the Career Center in the semester preceding the work assignment. A student may participate in up to two practica, but must spend at least one intervening semester on campus.

PRAC 001. Practicum I (0)
A practicum is a workplace experience, the primary goal of which is the intellectual, personal and professional growth of the student. It occurs under the supervision of a mentor in the workplace who is committed to seeing that it is an educational experience as well as a work venture. It requires skills appropriate to the student’s year in college and provides the student with new skill, insights and experiences that are transferable back to the academic setting and/or a future position in the workplace. May include requirements preparatory to undertaking the workplace assignment as well as a final project to be completed by the end of the semester in which the workplace experience occurs. Prereq: Junior Standing (completion of 60 hours).

PRAC 002. Practicum II (0)
A practicum is a workplace experience, the primary goal of which is the intellectual, personal and professional growth of the student. It occurs under the supervision of a mentor in the workplace who is committed to seeing that it is an educational experience as well as a work venture. It requires skills appropriate to the student’s year in college and provides the student with new skill, insights and experiences that are transferable back to the academic setting and/or a future position in the workplace. May include requirements preparatory to undertaking the workplace assignment as well as a final project to be completed by the end of the semester in which the workplace experience occurs. Prereq: Junior standing - must have at least one intervening semester in residence after PRAC 001.
Programs in psychology can be selected in preparation for graduate work in the field, or as background for a variety of human service-oriented professions, or to obtain general knowledge and understanding of behavior that is applicable in many different careers.

**FACULTY**

**Douglas K. Detterman, Ph.D.** (University of Alabama, Tuscaloosa)  
*Louis D. Beaumont University Professor and Chair*  
*Human intelligence and mental retardation*

**Heath A. Demaree, Ph.D.** (Virginia Tech)  
*Assistant Professor*  
*Cerebral and psychophysiological bases of emotion*

**Julie J. Exline, Ph.D.** (State University of New York, Stony Brook)  
*Assistant Professor*  
*Social relationships; transgression; moral and religious issues*

**Joseph F. Fagan III, Ph.D.** (University of Connecticut)  
*Assistant Professor*  
*Development of and individual differences in cognition, perception, and intelligence*

**Grover C. Gilmore, Ph.D.** (Johns Hopkins University)  
*Professor*  
*Perceptual development and aging; visual information processing; memory; psychophysics*

**Robert L. Greene, Ph.D.** (Yale University)  
*Professor*  
*Human memory and cognition*

**T. J. McCallum, Ph.D.** (University of Southern California)  
*Assistant Professor*  
*Older adults; caregiving; ethnicity; stress and coping*

**James C. Overholser, Ph.D.** (Ohio State University)  
*Professor*  
*Adult psychopathology; depression; suicide; personality disorders*

**Sandra W. Russ, Ph.D.** (University of Pittsburgh)  
*Professor*  
*Creativity; affective development in children; personality assessment; coping mechanisms in children*

**Elizabeth J. Short, Ph.D.** (University of Notre Dame)  
*Associate Professor*  
*Cognitive psychology; applied developmental; learning disabilities*

**Milton E. Strauss, Ph.D.** (Harvard University)  
*Professor*  
*Adult psychopathology; schizophrenia; mental disorders of aging*

**Lee A. Thompson, Ph.D.** (University of Colorado, Boulder)  
*Associate Professor*  
*Human behavior genetics; child development; Social psychology; personality theory; health psychology*

**Eric Youngstrom, Ph.D.** (University of Delaware)  
*Associate Professor*  
*Clinical child psychology*

**ASSOCIATE FACULTY**

**Stanley Althof, Ph.D.**  
*Associate Professor*  
*School of Medicine/University Hospitals*

**Dennis Drotar, Ph.D.**  
*Professor*  
*School of Medicine/Department of Psychiatry*

**Norah Feeny**  
*Assistant Professor*  
*School of Medicine/Department of Psychiatry*

**Howard Hall, Psy.D., Ph.D.**  
*Assistant Professor*  
*School of Medicine/Rainbow Babies and Children's Hospital*

**William C. House, Ph.D.**  
*Associate Professor*  
*School of Medicine/MetroHealth Medical Center*

**Barry Layton, Ph.D.**  
*Assistant Professor*  
*School of Medicine/MetroHealth Medical Center*

**Marian Patterson, Ph.D.**  
*Associate Professor*  
*School of Medicine/Alzheimer Center/University Hospitals*

**Lynn Singer, Ph.D.**  
*Professor*  
*School of Medicine/University Hospitals*

**Terry Stancin, Ph.D.**  
*Associate Professor*  
*School of Medicine/MetroHealth Medical Center Hudson*

**Thomas P. Swales, Ph.D.**  
*Assistant Professor*  
*School of Medicine/MetroHealth Medical Center*

**Gerry Taylor, Ph.D.**  
*Professor*  
*School of Medicine/Department of Pediatrics*

**Jane Timmons-Mitchell, Ph.D.**  
*Assistant Professor*  
*School of Medicine/Department of Psychiatry*

**Kathleen Wells, Ph.D.**  
*Associate Professor*  
*Mandel School of Applied Social Sciences*

**Carol Sue White, Ph.D.**  
*Associate Professor*  
*School of Medicine/MetroHealth Medical Center*

**Peter J. Whitehouse, M.D., Ph.D.**  
*Professor*  
*School of Medicine/Department of Neurology*

**Abraham Wolf, Ph.D.**  
*Assistant Professor*  
*School of Medicine/Department of Psychiatry*

**James M. Yokely, Ph.D.**  
*Assistant Professor*  
*School of Medicine/Department of Psychiatry*

**Cameron Camp, Ph.D.**  
*Adjunct Professor*  
*Myers Research Institute*

**Phyllis Dukes, Ph.D.**  
*Adjunct Assistant Professor*  
*Mental Development Center*

**Robert Goldberg, Ph.D.**  
*Adjunct Assistant Professor*  
*Cleveland Veterans Administration Medical Center*

**Carolyn Landis, Ph.D.**  
*Adjunct Instructor*  
*Rainbow Babies and Children's Hospital*

**Jeffrey Rosenbaum, Ph.D.**  
*Adjunct Assistant Professor*  
*Children's Aid Society/Beech Brook*

**Philip Safford, Ph.D.**  
*Adjunct Professor*  
*Professor Emeritus, Kent State University*

**Jes-James Sellers, Ph.D.**  
*Adjunct Assistant Professor*  
*University Counseling Center*

**Jeremy Shapiro, Ph.D.**  
*Adjunct Assistant Professor*  
*The Guidance Centers*
UNDERGRADUATE PROGRAMS

The undergraduate programs in psychology are designed to provide broad education in the science of behavior. The curriculum consists of three levels: an introductory level that is a prerequisite for most other courses in the department; an intermediate level, covering the various substantive areas of psychology; and an advanced level that offers numerous unique opportunities for undergraduates to engage in specialized and individualized work. In order to be assigned an undergraduate major/minor advisor, please obtain a declaration form from the Office of Undergraduate Studies, and see the staff in Mather Memorial 103 in order to complete the form.

Major

Students completing the B.A. may major in psychology. Psychology majors must complete 30 hours of course work in the department.

Required courses

- PSCL 101, General Psychology I (3)
- PSCL 282, Quantitative Methods in Psychology (3).

Three additional courses chosen from

- PSCL 315, Social Psychology (3)
- PSCL 352, Physiological Psychology (3)
- PSCL 353, Psychology of Learning (3)
- PSCL 355, Sensation and Perception (3)
- PSCL 357, Cognitive Psychology (3)
- PSCL 382, Psychological Measurement (3)
- PSCL 393, Experimental Child Psychology (3)

The remaining hours can be fulfilled by taking psychology electives chosen by the major and his or her advisor.

Minor (15 hours)

Required Course

- PSCL 101 (3 hours)

Electives

A minimum of four courses (12 hours) chosen by the student in consultation with his/her advisor. Practica and independent study are available to minors but cannot be used to satisfy the minor requirement.

Sequence for Engineering Core (9 hours)

The sequence reflects an emphasis on either the cognitive/biological or social/personal aspects of the field. All sequences must include PSCL 101 and two courses from one of the following groups:

Personal and Social Behavior: PSCL 102, 230, 300, 313, 315, 317, 321, 325
Cognitive/Biological Behavior: PSCL 352, 353, 355, 357, 360

Departmental Honors

Junior majors with a 3.0 overall grade point average and a 3.25 average in
psychology are encouraged to apply to the department's Honors Program. This program consists of one three-credit course PSCL 395, during which students carry out under faculty supervision an independent project in their area of interest. Satisfactory completion of a paper based on this research qualifies students to receive their degree with Honors in Psychology noted on their academic transcript. PSCL 375, Research Design and Analysis, is a prerequisite to PSCL 395.

Integrated Graduate Programs

The Department of Psychology participates in the Integrated Graduate Studies Program. Interested students should note the general requirements and the admission procedures in this bulletin and may consult the department for further information.

GRADUATE PROGRAMS

Graduate programs leading to the Doctor of Philosophy degree are offered in the fields of adult clinical, child clinical, experimental psychology, social psychology, and mental retardation research. The Master of Arts degree can be earned in the department as part of work toward a doctorate. Additional information about graduate work in psychology is available at the departmental web site www.cwru.edu/artsci/pscl.

PSYCHOLOGY (PSCL)

Undergraduate Courses

PSCL 101. General Psychology I (3)
Methods, research, and theories of psychology. Basic research from such areas as psychophysiology, sensation, perception, development, memory, learning, psychopathology, and social psychology.

PSCL 102. General Psychology II (3)
The applications of psychological research in normal problems of adjustment. Topics include: coping with anxiety, romance and marriage, and interpersonal behavior.

PSCL 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

PSCL 230. Child Psychology (3)
Basic facts and principles of psychological development from the prenatal period through adolescence. Prereq: PSCL 101.

PSCL 231. Child Psychology Practicum (1)
The course will involve three hours per week of practicum experience at either the Church of the Covenant day care center or the Mental Development Center School. Student will be given an orientation to child development in the context of a preschool program. Prereq: PSCL 101. Coreq: PSCL 230.

PSCL 282. Quantitative Methods in Psychology (3)
The theory and application of basic methods used in the analysis of psychological data. Not available for credit to students who have completed STAT 201 or ANTH 319.

PSCL 313. Psychology of Personality (3)
The development and organization of personality; theories of personality and methods for assessing the person; problems of personal adjustment.

PSCL 315. Social Psychology (3)

PSCL 317. Health Psychology (3)
Examines psychological processes that affect physical health. Covers the physiological factors affecting the immune system, chronic physical disorders, pain, compliance with prescribed medical treatments, the effects of stress and coping, the effects of the patient-physician interaction, and the psychological aspects of the hospital and the health care systems. Prereq: PSCL 101.

PSCL 321. Abnormal Psychology (3)

PSCL 325. Psychotherapy and Personality Change (3)
Three methods of psychotherapy (behavioral, psychoanalytic, and client-centered) are discussed. The therapy techniques and the manner by which personality change is effected are examined. Prereq: PSCL 101.

PSCL 329. Adolescence (3)
Psychological perspectives on physical, cognitive, and social development. Prereq: PSCL 101.

PSCL 334A. Seminar and Practicum: Preschool and Daycare (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230.

PSCL 334C. Seminar and Practicum: Hospitalized Children (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230.

PSCL 335A. Seminar and Practicum: Preschool and Daycare (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230.

PSCL 335C. Seminar and Practicum: Hospitalized Child (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230 and Junior or Senior standing.

PSCL 338. Seminar and Practicum in Adolescence (3)
(See EDUC 338.) Cross-listed as EDUC 338 and SOCI 338.

PSCL 339. Seminar and Practicum in Adolescents (3)
(See SOCI 339.) Prereq: PSCL 230. Cross-listed as SOCI 339.

PSCL 340. Seminar and Practicum with Aging Populations (3)
Supervised field placement with aging populations. Regular seminar meetings. Goal is to integrate readings, lectures, and practicum experiences with aging populations. Prereq: PSCL 101.

PSCL 344. Developmental Psychopathology (3)
This course will focus on the interplay of biological, psychological, familial, and social determinants of disorders ranging from autism to delinquency and bulimia. Prereq: PSCL 230 or PSCL 321.

PSCL 345, Mind, Culture and Religious Experience (3)
(See RLGN 344.) Cross-listed as RLGN 344.

PSCL 350. Behavior Genetics (3)
Examines the impact of both nature and nurture on human behavior. Basic quantitative genetic methodology will be covered. Current family, twin and adoption studies in the areas of personality, intelligence, alcoholism, criminality, and psychopathology will be reviewed. Prereq: PSCL 101.

PSCL 352. Physiological Psychology (3)
The nervous system as it relates to behavior. Prereq: PSCL 101.

PSCL 353. Psychology of Learning (3)
The basic methods in the study of learning. The major theories proposed to account for the learning process. Development of the fundamental concepts and principles governing the learning process in both humans and lower animals. Prereq: PSCL 101.

PSCL 355. Sensation and Perception (3)

PSCL 357. Cognitive Psychology (3)

PSCL 360. Laboratory and Seminar in Human Experimental Psychology (3)
Methods of research in human learning, cognition, and perception will be examined through seminar discussions and laboratory experiments.

PSCL 369. Adult Development and Aging (3)
An overview of concepts and research relating to adult development and aging. The lifespan perspective will be used in examining major developmental paradigms. Personality and cognitive lines of development will be traced across the lifespan. Data from both longitudinal and cross-sectional studies will be analyzed. Both normal and pathological aging will be discussed. Special emphasis will be given to areas of cognitive deterioration in aging. Implications for optimal adult development and aging will also be discussed.

PSCL 370. Human Intelligence (3)
Survey of individual differences in human intellect including construction and administration of intelligence tests, theories and models of intelligence, and the role of heredity and environment in intelligence and the development of intelligence. This course will also examine the relationships of cognitive abilities to
intelligence and human to artificial intelligence. Prereq: PSCL 101.

PSCL 371. Religion of the Life Cycle in Cultural Context (3)
(See RLGN 370.) Cross-listed as RLGN 370.

PSCL 375. Research Design and Analysis (3)
Conceptual and methodological issues confronted by the behavioral scientist conducting research. Major experimental designs and statistical procedures. Intuitive understanding of the mathematical operations. Prereq: PSCL 282.

PSCL 382. Psychological Measurement (3)

PSCL 388. Human Sexual Behavior (3)
Sex is approached as a form of personal and interpersonal behavior. A broad range of theories from social psychology will be used to explain human sexual behavior, and these will be evaluated by using facts and findings from recent research studies. Topics include sexual relationships, gender differences, promiscuity, rape and coercion, finding and choosing sex partners, sexual risk-taking, harassment, sexual identity and orientation, cultural influences and differences, evolution of sexual motivations, prostitution, pornography, and love. Prereq: PSCL 101 and PSCL 315.

PSCL 390. Seminars in Psychology (1-3)
Surveys of special subject areas. Topics vary in response to faculty and student interests. Small group discussion. Prerequisite depends on content.

PSCL 393. Experimental Child Psychology (3)
The development of behavior from birth to adolescence. Growth of basic processes such as perception, learning, memory, intelligence, and language in the light of current theoretical models. Prereq: PSCL 101.

PSCL 395. Honors Program (3)
Supervision in carrying out an independent research study in the student's area of interest. Prereq: PSCL 375.

PSCL 397. Independent Study (1-3)
Individual study involving specific programs of reading, research, and special projects. Prereq: PSCL 101.

Graduate Courses

PSCL 400. Ethics for Professional Researchers (3)
Ethical principles applied to topics including authorship, plagiarism, grants, ownership of intellectual property, conflict of interest, harassment, and treatment of animal or human subjects.

PSCL 401. Sensation and Perception (3)
Role of sensory and perceptual processes in adjustment. Theories and experimental work dealing with such topics as nativism vs. empiricism, perception without awareness, perception and personality, effects of drugs on personality, effects of drugs on perception, pathology of perception. Limited to graduate students.

PSCL 402. Cognition and Information Processing (3)
Aspects of cognition beyond the area of sensation and perception, involving symbolic processes, especially problems of meaning, conceiving, reasoning, judging, and thinking.

PSCL 403. Physiological Foundations of Behavior (3)
Fundamental neurological processes controlling behavior.

PSCL 404. Learning Theory (3)
The research literature in learning; theoretical formulations of contemporary learning theorists. Limited to graduate students.

PSCL 405. Personality Theory (3)
General problems and systematic points of view in the analysis of personality. Limited to graduate students.

PSCL 407. Research Design and Quantitative Analysis I (3)
Intermediate research design and statistical analysis used in psychological research. Statistical inference from single variables, elementary principles of probability, correlation and regression. Prereq: PSCL 282.

PSCL 408. Research Design and Quantitative Analysis II (3)

PSCL 409. Advanced Social Psychology (3)
Major theories, methods, and problem areas of social psychology. Psychological development of the individual group structures and dynamics.

PSCL 410. Developmental Psychology (3)
The research literature and theoretical formulation in the area of developmental psychology. Limited to graduate students.

PSCL 412. Measurement of Behavior (3)

PSCL 417. Multivariate Data Analysis (3)
Major statistical techniques used in experimental and survey research containing more than one dependent variable. Techniques discussed include multiple regression, canonical correlation, multivariate analysis of variance, discrimination analysis, cluster analysis and factor analysis. Prereq: PSCL 408.

PSCL 418. History and Systems (3)
Historical antecedents of modern psychology.

PSCL 424. Clinical Interviewing (3)
Introduction to diagnostic and therapeutic interviewing.

PSCL 425. Methods of Assessment I (3)
Limited to graduate students in clinical psychology. Prereq: Graduate standing in psychology with department permission.

PSCL 426. Methods of Assessment II (3)
Methods of psychological assessment, emphasizing personality and family function in childhood and adulthood. Prereq: Limited to Grad students in Clinical Psychology. Requires approval of the Director of Clinical Training.

PSCL 427. Special Assessment Methods with Children with Multiple Problems (3)

PSCL 429. Practicum in Assessment I (1)

PSCL 430. Practicum in Assessment II (1)
Prereq: Approval of the Director of Clinical Training. Coreq: PSCL 426.

PSCL 435. Vision: Molecules to Perception (3)
The organization, physiology, and function of the vertebrate visual system are considered in detail. The visual pathway from retina to LGN and visual cortex is described with an emphasis on circuits that produce successively more complex receptive field properties. Classic papers and current literature form the basic course material. Assessment is based on student presentations, class participation, and a term paper. Prereq: NEUR 402 or consent of department.

PSCL 444. Developmental Psychopathology (3)
This course will focus on the interplay of biological, psychological, familial, and social determinants of disorders ranging from autism to delinquency and bulimia.

PSCL 453. Seminars in Psychology (1-3)
A special problem or topic. Content varies with student and faculty interest. Recent offerings: creative thinking in research, community psychological evaluation of community processes, experimental and computer methods, consultation, and psychoanalytic ego psychology.

PSCL 469. Psychology of Aging (3)
Normal psychological development in later life; psychological development in the oldest old; definitions and assessment of successful aging.

PSCL 497. Graduate Independent Study (1-3)
Independent research and reading programs with individual members of the faculty.

PSCL 501. Pediatric Psychology I (1-3)
Seminar on current research topics, research design and methodological issues related to pediatric psychology. Introductory lectures provide an overview of research populations, methods, and practical issues appropriate to research with pediatric populations.

PSCL 502. Seminar: Pediatric Psychology (1-3)
Seminar examining specific topics in pediatric psychology. Topics will deal with issues of infant development. Infants at risk for disability, neuropsychology and learning disabilities, and childhood psychopathology. Prereq: Limited to Graduate students in Psychology department.

PSCL 524. Advanced Psychopathology (3)
Theoretical issues and current research data bearing on major patterns of psychological disturbance.

PSCL 525. Professional Issues in Clinical Psychology (3)
Consideration of legal and ethical principles in research and practice in clinical psychology and contemporary controversies in professional psychology. Prereq: Graduate standing in Psychology.

PSCL 527. Principles of Intervention (3)
Review of principles of psychological change, models of intervention, and process/outcome research related to intervention.

PSCL 529A. Practicum in Intervention I: Behavior Therapy (1)
Prereq: Graduate standing in clinical psychology.

PSCL 529C. Practicum in Intervention I: Psychotherapy (1)
Prereq: Graduate standing in clinical psychology.

PSCL 530A. Practicum in Intervention II: Behavior Therapy (1)
Prereq: Graduate standing in clinical psychology.

PSCL 530C. Practicum in Intervention II: Psychotherapy (1)
Prereq: Graduate standing in clinical psychology.
PSCL 531A. Seminar in Intervention I: Behavior Therapy (2)  
Theoretical issues and research on psychological interventions. Prereq: Graduate standing in clinical psychology.

PSCL 531C. Seminar in Intervention I: Psychodynamic (2)  
Theoretical issues and research on psychological interventions. Prereq: Graduate standing in clinical psychology.

PSCL 532A. Seminar in Intervention II: Behavior Therapy (2)  
Theoretical issues and research on psychological interventions. Prereq: Graduate standing in clinical psychology.

PSCL 532C. Seminar in Intervention II: Psychodynamic (2)  
Theoretical issues and research on psychodynamic intervention. Prereq: PSCL 531C and graduate standing in clinical psychology.

PSCL 535. Child and Family Intervention (2)  
A course for advanced clinical graduate students that covers psychodynamic and cognitive behavioral approaches for working with children and adolescents and systems approaches for working with families.

PSCL 536. Intervention with Parents and Couples (2)  
A course for advanced clinical graduate students that covers various approaches to working with parents and couples and special topics in family therapy such as ethnicity and nontraditional families.

PSCL 537. Child and Family Case Seminar I (1)  
Clinical graduate students in child and family field placements present and receive group supervision on ongoing cases.

PSCL 538. Child and Family Case Seminar II (1)  
Clinical graduate students in child and family field placements present and receive group supervision on ongoing cases.

PSCL 601. Special Problems (1-18)  
(Credit as arranged.)

PSCL 651. Thesis M.A. (1-18)  
(Credit as arranged.)

PSCL 700. Internship (0)  
Full-time predoctoral internship in clinical psychology. Required of all students in clinical psychology program. Registration requires written consent of director of clinical psychology training and must be for one calendar year.

PSCL 701. Dissertation Ph.D. (1-18)  
(Credit as arranged.)

PSCL 703. Dissertation Fellowship (1-8)

Public Policy Program

222 Mather House  
Phone 216-368-2426  
Emery Lee, Academic Representative and Minor Advisor (egl4@po.cwru.edu)

PROGRAM FACULTY

Joseph White, Ph.D. (University of California at Berkeley)  
Director, Center for Policy Studies, and Luxenberg Family Professor of Public Policy

Robert H. Binstock Ph.D. (Harvard University)  
Professor of Epidemiology and Biostatistics, School of Medicine

David C. Hammack, Ph.D. (Columbia University)  
Hiram C. Haydn Professor of History

Alexander P. Lamis, Ph.D. (Vanderbilt University)  
Associate Professor of Political Science

Rhonda Y Williams, Ph.D. (University of Pennsylvania)  
Assistant Professor of History

UNDERGRADUATE PROGRAM

Undergraduate or graduate courses with public policy content are offered through the departments of anthropology, geological sciences, history, political science, and sociology in the College of Arts and Sciences; through the Department of Economics and other departments of the Weatherhead School of Management; through the Schools of Law, Medicine, and Nursing; and through the Mandel School of Applied Social Sciences and the Mandel Center for Nonprofit Organizations. Students can engage with policy issues through both courses and the extracurricular programming of the Center for Policy Studies and other university bodies.

An undergraduate minor is available to undergraduates in the College of Arts and Sciences and in the economics and management programs housed within the Weatherhead School of Management. The requirements are in four categories, listed below. Substitutions can be made under exceptional circumstances, at the discretion of the Minor Advisor.

MINOR - HOURS: 15

A. The policy process: POSC 386

B. Economic analysis: ECON 205

D. Two courses on a particular field of public policy selected with the approval of the advisor.

Department of Religion

111 Mather House  
Phone 216-368-2210; Fax 216-368-4681  
Peter J. Haas, Chair (pjh7@case.edu)

The academic study of religion at Case Western Reserve University is multicultural, non-sectarian, and both disciplinary and interdisciplinary. Students examine a range of past and present cultures and societies using methods and approaches drawn from the humanities, arts, social sciences, and sciences, all of which sharpen critical and evaluative skills. Religious beliefs, institutions, and practices are studied with emphasis placed on the critical problems and possibilities inherent in current theories, methods, and technologies. The academic study of religion, combined with appropriate courses in other fields, provides an excellent background for any professional career that involves interaction with diverse populations -- including law, engineering, medicine and health care professions, journalism, and social work -- and for graduate studies in a number of fields. A major in religion provides a well-rounded liberal arts education or can be combined conveniently with a second major. Minors or sequences in Religion complement and broaden any field chosen as a major.

FACULTY

Peter J. Haas, Ph.D. (Brown University)  
Abba Hillel Silver Professor of Jewish Studies and Chair

jewish literature and thought; Western religions; science and religion; religion and culture
and other technological resources, cultural courses are designed to utilize Internet are encouraged to participate in study social aspects of these religions. Majors religious traditions, as well as cultural and minor programs acquaint the student in Engineering. Both the major and minor programs acquaint the student with the texts and traditions of major religious traditions, as well as cultural and social aspects of these religions. Majors are encouraged to participate in study abroad programs. Where appropriate, courses are designed to utilize Internet and other technological resources, cultural institutions in University Circle, and the cultural diversity of greater Cleveland. Several 300-level courses may be taken for graduate credit by fulfilling additional course requirements, and qualified students may pursue the M.A. degree under the Integrated Graduate Studies Program (IGS). The Department of Religion also contributes courses to and supports a number of the college’s interdisciplinary programs and centers such as Asian Studies, Women’s Studies, Environmental Studies, International Studies, the Program in Judaic Studies, and the College Scholars Program.

Major

Students majoring in Religion must complete a minimum of 30 semester hours of work in the Department. Courses required of all majors are RLGN 102: Introduction to the Study of Religion and at least three hours of RLGN 399/499: Major/Minor Seminar (repeatable up to six hours). In addition, majors must complete three courses in one of the three areas described below, one course in each of the other two areas outside of the area of concentration, and three elective courses. A list of courses assigned to each area of concentration is available from the Department. Additionally, majors are encouraged to develop interdisciplinary competency by taking courses in other departments relevant to their area of concentration. Majors are urged to take a second language related to their interests and concentration.

Area 1: Religious Texts and Traditions

Courses in Area 1 focus on the critical study of religious texts and traditions and their historical development. These courses encourage critical reflection on the methods and theories employed to study them. Interpretive perspectives include those drawn from the academic study of religion and other disciplines in the arts and humanities, social sciences, and natural sciences.

Area 2: Religion and Culture

Courses in Area 2 examine ways that religious discourses and practices are woven into larger webs of culture and are related to other elements within those webs. Through analysis of a wide range of cultural productions, both ancient and contemporary, from visual culture to popular media, these courses focus on the complex ways that religion takes form within particular cultural contexts, and conversely, helps to form cultural artifacts.

Area 3: Religion in Society

Courses in Area 3 investigate the various ways that people practice their religious beliefs within their own social groups and sustain their traditions within the larger society. Within this area are courses on the tensions between religion and science, ethics across religious boundaries and within religious traditions, and how religious groups affect political, economic, and social issues within local and world communities. Some courses in this area offer opportunities for working with social service and advocacy agencies in the community.

Minor

Students minoring in Religion must complete 15 semester hours of work in the Department. Courses required of all minors are RLGN 102: Introduction to the Study of Religion and three hours of RLGN 399/499: Major/Minor Seminar. Nine hours of course work must be chosen in consultation with a departmental advisor. These courses must demonstrate diversity in the study of religion.

Sequences (Engineering Core)

Sequences normally include three courses that demonstrate diversity in the study of religion. Approval for sequences must be obtained from the departmental advisor. In selecting courses, attention will be given to religious pluralism and diversity of approaches to the academic study of religion.

Departmental Honors

Students who are majoring in Religion and have an overall grade point average of 3.5 and also a grade point average of 3.5 in Religion courses may apply for
the honors program. Honors candidates enroll in RLGN 395: Honors Research each semester during their senior year. A year-long honors project must be accepted by a member of the Department faculty who normally would be the major advisor for the project, and must be formally approved by a majority of the full-time faculty members of the Department. The approval must be granted not later than the end of the first semester. A faculty committee awards departmental honors upon satisfactory completion, defense, and acceptance of the senior project, provided that the required grade point averages are maintained.

RESEARCH

Faculty members in the Department are engaged in scholarly research, writing, editorial projects, and leadership roles in professional societies.

RELIGION (RLGN)

Undergraduate Courses

RLGN 102. Introduction to the Study of Religion (3)
Introduction to the academic study of religion and of the religious dimensions of life. Open to all students but prerequisite for majors and minors in Religion.

RLGN 105. Aspects of Jewish and Middle Eastern Religions and Cultures (1)
This mini-course explores a variety of topics in Jewish and Middle Eastern religions and cultures. A one-credit course, repeatable up to three times, taught by distinguished Rosenthal Fellows visiting from Hebrew University in Jerusalem. Intended for students and others interested in an introduction to religion and culture. Participation in lectures and discussions and a final exam are required.

RLGN 115. Ethical Problems in Local Perspective (3)
This course examines contemporary ethical problems—including abortion, racism, suicide, capital punishment, bioethics, and just war theory—in light of their impact on the local Cleveland community. Most of us are aware of the national conversation around these issues; this course explores how local communities and institutions address and deal with these ethical problems. Prereq: Priority given to first and second year students; permit required.

RLGN 201. Literature and History of Ancient Israel (3)
The purpose of the course is to introduce students to the literature and thought of the Hebrew Bible. The approach will be historical-critical while examining traditional Jewish and Christian interpretations. The goal is to enrich and deepen the student's knowledge of the Bible and its context and open new horizons to the Biblical works and world.

The literature of the New Testament in its historical, ideological, and religious setting.

RLGN 204. Introduction to Asian Religions (3)
Principal Asian religious traditions based on a study of classical sources. Classical Chinese thought, Hinduism, and Buddhism. Readings include selections from the works of Confucius, Mencius, Mo Tzu, Lao Tzu, Chuang Tzu, the Mahabharata, the Bhagavad Gita, and the early Buddhist canon.

RLGN 205. Religions and Cultures of India (3)
An historical and thematic introduction to Indian civilization in its major religious forms. Includes study of Hinduism, Jainism, Sikhism, and Islam, as these have given shape to distinctive ways of life in India. We will read historical studies, religious and philosophic texts, examine forms of devotion and ritual, recount the stories of major religious figures (human and divine), and encounter distinctive forms of religious expression through the arts. Finally, we will consider contemporary interrelations among these traditions. The course entails three excursions to religious sites off campus.

RLGN 206. Religion and Ecology (3)
Historical and cross-cultural introduction to religious perspectives on nature and ecology, including Jewish, Christian, Hindu, Buddhist, and Native American texts and ritual practices. Themes include: ecology of chaos and complexity, urban ecology, wilderness, and ecological crises.

RLGN 207. Religion and Feminism (3)
Examination of feminist perspectives on religion, such as the status of women in Western and non-Western religions, the nature and purpose of religious beliefs and practices from the standpoint of religious and non-religious feminists, the current status of feminist philosophies of religion, and the efforts of feminists to transform traditional religions and to create new religions.

RLGN 208. Introduction to Western Religions (3)
Basic introduction to the three great monotheistic religions of the Western World: Christianity, Judaism, and Islam. All three of these religious traditions trace their roots to the faith of Biblical Israel as revealed by a series of prophets including Noah, Abraham, and Moses. Each absorbed the philosophy and science of the Greco-Roman world and went on both to influence and struggle with each other. Many of the religious problems of the contemporary world, from Afghanistan to the Middle East to Yugoslavia, can be traced to tension within and between these religious groups.

RLGN 215. Religion In America (3)
Survey of religious histories in North America, from the trans-Bering migrations to the present. Drawing from a variety of approaches such as social history, ritual studies, and institutional and doctrinal histories, this course charts the religious development of various groups including Native Americans, African Americans, Euro-Americans, and others.

RLGN 216. Hinduism (3)
The dominant religious tradition of India. The evolution of Hinduism from Vedic religion; classical Hindu mythology, philosophy, and theology as well as the modern transformation of Hinduism; orthodox Hindu practices as well as beliefs and practices found in regional and village settings; visions of the universe, humanity, and existence that differ radically from monothestic and secular traditions of the West.

RLGN 217. Buddhism (3)
The development of Buddhism. The life and teaching of the Buddha, the formation of the early Buddhist church, the schools of Hinayana Buddhism and Abhidharma philosophy. Nagarguna and the emergence of Mahayana Buddhism, the spread of Buddhism to China, the transformation of Buddhist thought in China, Zen Buddhism, the spread of Buddhism to the West.

RLGN 223. Religious Roots of Conflict in the Middle East (3)
The course is about the rhetoric and symbols used by various voices in the Middle East in the ongoing debate about the future shape of the region. For historical and cultural reasons, much of the discourse draws on religious symbolism, especially (although not exclusively) Islamic, Jewish, and Christian. Because of the long and complex history of the region and the religious communities in it, virtually every act and every place is fraught with meaning. The course examines the diverse symbols and rhetorical strategies used by the various sides in the conflict and how they are understood both by various audiences within each community and among the different communities.

RLGN 231. Jews in the Modern World (3)
Investigation of the impact of modernity on the Jewish community. In particular the course will examine the influence of the Emancipation and Enlightenment on the social situation of the Jews in Europe and America and the corresponding changes in Judaic religion, philosophy, social structure, and culture. Attention will be paid to the creation of a modern Jewish identity in the secular culture of the post-Modern world.

RLGN 235. Religion and Visual Culture (3)
Cross-cultural introduction to complex relations between religion and seeing. Study of visual culture, sacred iconography, calligraphy, film, mass media, and avant-garde fashion. Extensive use of cultural resources in University Circle.

RLGN 240. The Heavens in Religion and Science (3)
Review of the relationships between scientific descriptions of the natural world and the religious and ethical implications drawn from those in Western civilizations. Introduction to the close cooperation between religion and science in the West until the modern period and review of the breakdown of that relationship in the past 200 years.

RLGN 241. Religious Experience and the Life Sciences (3)
Examination of religious experience and beliefs in face of advances in the life sciences, especially neuroscience and evolutionary biology. Relation of religion and science, contemporary issues, history of discussions and debates.

RLGN 254. The Holocaust (3)
History of racism in European society from 18th to 20th century; investigation, from perspectives of history, psychology, literature, philosophy, and religion, of how bureaucracy could exterminate six million Jews; responses of individuals, groups, institutions, and nations to deliberate extermination of nearly a whole people. Cross-listed as HSTY 254.

RLGN 266. Bible in Fiction - Fiction in the Bible (3)
Examination of use of biblical themes, tropes, and characters in modern fiction and popular culture, e.g., films, librettos, songs. Readings include Genesis, Exodus, Numbers, Judges, 1-2 Samuel, Haggadic Midrashim, Jewish fables, and modern fiction.
RLGN 270. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women's studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, religion, anthropology, psychology, film studies, cultural studies, and art history. It is the required introductory course for students taking the women's studies major.
Course listed as WMST 201.

RLGN 271. Bioethics: Dilemmas (3)
(See BETH 271.) Cross-listed as BETH 271.

RLGN 275. Jerusalem Perspectives (3)
Topics in the religious, cultural, and historical legacy of past and present Middle Eastern societies. The course is taught by Fellows of the Samuel Rosenthal Center who are faculty members of the Hebrew University in Jerusalem. Course repeatable for credit up to four times.

RLGN 280. Religion and Politics in the Middle East (3)
An in-depth look at the relationship between politics and religion in the Middle East. Students will spend the first week on the Case campus and the last three weeks in Israel, where time will be divided between classroom teaching, guest lectures, and "field trips" to important sites. Students will have the opportunity to interact directly with members of the region's diverse religious groups within the political, social, and cultural contexts in which they live. A final research paper will be required. Knowledge of Hebrew is not necessary.

RLGN 300. Archaeology of Biblical Israel (3)
Religious and social world of biblical Israel as recovered by archaeology and interpreted with aid of comparative history and anthropology.

RLGN 301. Ritual in Religion (3)
Drawing from a broad range of approaches and academic fields, this seminar offers an introduction to the study of ritual. The course has three main goals: (1) to help students become familiar with important theories of and approaches to ritual studies; (2) to explore a number of ritual practices from different cultures, from ancient priestly rites in the Bible to contemporary cockfights in Bali; and (3) to study and discuss several representations of ritual in contemporary literature and film.

RLGN 303. Japanese Religions (3)
Thematic and historical survey of major Japanese religious ideas and institutions. Emphasis on translated readings in primary texts. Issues covered include Shinto and Buddhist traditions, religion and state, and role of religion in modern Japan.

RLGN 306. Interpreting Buddhist Texts (3)
Readings in translation of major texts from the Buddhist tradition. Special emphasis on problems of textual interpretation, historical context, Buddhist conceptions of the sacred, and Buddhist ethics. Prereq: RLGN 102 or RLGN 204 or RLGN 217 or RLGN 303 or RLGN 341.

RLGN 315. Heresy and Dissidence in the Middle Ages (3)
Survey of heretical individuals and groups in Western Europe from 500 to 1500 A.D., focusing on popular rather than academic heresies. The development of intolerance in medieval society and the problems of doing history from hostile sources will also be explored. Cross-listed as HSTY 315.

RLGN 316. Modern Religious Thought: 1800 to the Present (3)
A survey of some major religious thinkers of Europe and North America from roughly 1800 to the present. A chronological examination of classical texts of theology and philosophy of religion of this period, with consideration of significant themes: Given the advance in modern rational thought, how can we understand traditional religion? What is the relationship between religion and reason? Religion and history? Religion and culture? Religion and experience? Is the attempt to modernize faith misguided or necessary to prevent faith from being captive to outmoded cultural assumptions?

RLGN 319. The Crusades (3)
(See HSTY 319.) Cross-listed as HSTY 319.

RLGN 325. Justice, Religion, and Society (3)
The ways in which several 20th-century American religious figures, both North and South American, have interpreted their religion as requiring them to struggle for a better society by using direct action to deal with issues of poverty, peace, and social justice. Introduction to writings of prominent social justice activists such as Dorothy Day; Daniel Berrigan, Thomas Merton, and others. Course learning within the Cleveland area via association with structured institutions and programs engaged in social justice and urban poverty issues in order to investigate these from the inside.

RLGN 330. Classical Jewish Religious Thought (3)
The thought of some major biblical and Rabbinic writings and of the classic age of medieval Jewish philosophy.

RLGN 332. Jewish Experience in America (3)
Religious, political, and social history of Jews in America from 17th century to the present. Special attention to the question, “How have Jews responded to the openness of American society?” including the definition of Jewish theology in contrast to Christiani- ty, the special culture of Eastern European immigrants, and the struggle of Jewish women to assert Jewish committments against the tide of assimilation in the late 20th century.

RLGN 333. Philosophy of Religion (3)
Topics include: classical and contemporary arguments for God’s existence; divine foreknowledge and human freedom; the problem of evil and theodicy; nature and significance of religious experience; mysticism; varieties of religious metaphysics; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Prereq: PHIL 101 or RLGN 102. Cross-listed as PHIL 333.

RLGN 341. Religion and Postmodernism (3)
Consideration of the impact of postmodern thought on the study of religion. Examination of how recent critical theory informs our understanding of religious texts and religious themes in contemporary literature, arts and film. Utilizing the theories of Foucault, Derrida, Kristeva, and others, the class will explore such postmodern concerns as narrative, textuality, the author, ideology, gender, and rhetoric.

RLGN 343. Mysticism (3)
A mystical experience can be broadly defined as a direct experience of the sacred. The course will begin with an exploration of the language of mystical experience and assess how mystical experiences can studied “objectively.” Then we will examine mysticism in major religious traditions through primary texts with some commentary for guidance. In the final classes we will compare the significance of mystical phenomena, as well as common themes and divergent views, across the traditions.

RLGN 344. Mind, Culture, and Religious Experience (3)
Critical examination of several major approaches to the psychological foundations of religious experience. Topics will include such phenomena as conversion, spirit possession, mystical and ecstatic states, religious leadership, perception of the divine, and personaliza- tion of religious symbolism. Phenomenological and anthropological studies of religion will be used. Cross-listed as PSCL 345.

RLGN 345. Religion and Horror (3)
This seminar explores relations among religion, horror, and the monstrous in ancient scripture and contemporary horror. Course readings, discussions, and research projects approach the subject from two distinct but re- lated directions: first, a focus on elements of horror and the monstrous in biblical and related ancient mythic and ritual texts; second, an examination of religious dimensions in the modern horror, especially as found in representations of monstrosity in literature and film. Prereq: RLGN 102 or permission of department.

RLGN 350. Jewish Ethics (3)
An exploration of Jewish moral and ethical discourse. The first half of the course will be devoted to studying the structure and content of classical Jewish ethics on issues including marriage, abortion, euthanasia and social justice. Students will read and react to primary Jewish religious texts. The second half of the course will focus on various modern forms of Judaism and the diversity of moral rhetoric in the Jewish community today. Readings will include such modern thinkers as Martin Buber and Abraham Joshua Heschel.

RLGN 366. Religion and Film (3)
Study of the cultural use of biblical figures, especially in film: movies as myth; place of myths in American culture; how cinematic images continue the polarization of biblical images and intertwine them with the American myth.

RLGN 370. Religion and the Life Cycle in Cultural Context (3)
A comparative exploration of how religious thought and practice relate to psychological development and the human life cycle in two cultural settings—the United States and India. The course is interdisciplinary. Students will read foundational psychological studies of the life cycle, religious development, and the role of religion in facilitating or impeding personality development. They will also consider anthropological accounts of indigenous notions of personality, human development, and the life course in India. Consideration of these studies will lead students to a constructive critique of Western psychological theories and their applicability to Indian, particularly Hindu, lives. Cross-listed as PSCL 371.

RLGN 372. Anthropological Approaches to Religion (3)
The development of, and current approaches to, comparative religion from an anthropological perspective. Topics include witchcraft, ritual, myth, healing, religious language and symbolism, religion and gender, religious experience, the nature of the sacred, religion and social change, altered states of consciousness, and evil. Using material from a wide range of world cultures, critical assessment is made of conventional distinctions such as those between rational/irrational, natural/supernatural, magic/religion, and primitive/
Department of Sociology
226 Mather Memorial Building
Phone 216-368-2700; Fax 216-368-2676
Richard A. Stettersten, Chair

Sociology is a unique perspective for understanding the social structure and social forces which affect individuals and their relationships with one another and their community. Sociologists explore the roles of age, gender, race, religion, culture, ethnicity, and income in shaping human experience in our changing society. Sociology courses also provide a better understanding of the determinants of social conflict, crime, and deviant behavior, along with humankind's continuing positive efforts to cope with social problems and social change. Sociologists think creatively and critically about individual values, lifestyles, and options in a rapidly changing world. They also have skills to conduct surveys and other quantitative and qualitative studies for understanding public opinion, social needs, trends, and institutions. The department places special emphasis on issues of health and social influences on health policies and health behaviors throughout the life course. The Department of Sociology offers programs leading to the Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees. Additional options include participation in the Integrated Graduate Studies Bachelor of Arts/Master of Arts sequence and a joint degree program in law and sociology.

The creative and rigorous thinking inherent in sociological analysis is excellent preparation for advanced work in almost any field. The major in sociology provides students with a broad preparation for understanding the social context in which we live, for obtaining positions in diverse work settings and/or for pursuing graduate or professional degrees. The sociology major provides a solid grounding for understanding and researching social processes and institutions ranging from the family, work settings, health care institutions, and to other complex organizations. A sociology major will be useful to students considering careers in the health and social service professions, social research, public administration and program development, market research, communications, and business careers. Students may design course work to facilitate entry into the job market, graduate study, or professional study. A sociology major provides excellent preparation for admittance to law school or medical school. Surveys show sociology majors to be among those with the highest rates of acceptance to professional schools. Sociology course work, a minor, or second major in sociology, also provides excellent preparation to students majoring in other social sciences, natural sciences, or humanities.

FACULTY

Richard A. Stettersten, Ph.D. (Northwestern University)
Professor and Chair
Aging and the lifecourse, children and youth, social policy, lifecourse methods.

Dale Dannefer, Ph.D. (Rutgers University)
Professor
Aging and the lifecourse, theory, work and family, research methods.

Gary Deimling, Ph.D. (Bowling Green State University)
Professor
Family sociology; sociology of aging; medical sociology; research methods.

Brian Gran, Ph.D. (Northwestern University)
Assistant Professor
Sociology of law; political sociology; comparative sociology; health care policy

Susan W. Hinze, Ph.D. (Vanderbilt University)
Associate Professor
Medical sociology; social inequality, sex and gender; work and family.

Eva Kahana, Ph.D. (University of Chicago)
Pierce T. and Elizabeth D. Robson Professor of Humanities
Sociology of aging; medical sociology; social factors in stress and coping.

Kyle Kercher, Ph.D. (University of Washington)
Associate Professor
Quantitative methodology; aging/social gerontology.
UNDERGRADUATE PROGRAMS

Major
The major in sociology has been designed to serve the different educational goals of undergraduates: general education, pre-professional training, postgraduate employment, and preparation for graduate school. The major requires a minimum of 30 hours of work. All majors complete the common core requirements: (12 hours):

- SOCI 112 Introductory Sociology
- SOCI 303 Research methods
- SOCI 300 Sociological Theory
- STAT 201 or PSCL 282 Statistics

plus 18 hours of electives, consisting of any six courses in sociology SOCI 375, Independent Study, is available to selected majors in their junior or senior year.

Minor
The minor consists of 15 credit hours in sociology, including:

- SOCI 112 Introductory Sociology
- SOCI 300 Sociological Theory

plus three additional electives, of which at least two must be 300 level courses.

Sequences for Engineering Core
Sociology provides the computer science or engineering student a perspective for understanding society. All sociology sequences leading to a sociology degree must include SOCI 112, Introduction to Sociology (3 credits) and students choose two courses from one of the following three sequences: 1) Modern Society: SOCI 208, Dating, Marriage and Family, SOCI 222, Gender in U.S. Society, SOCI 302, Race and Ethnic Minorities, SOCI 310, The Individual in Society; 2) Social Problems: SOCI 204, Criminology, SOCI 320, Juvenile Delinquency, SOCI 333, Sociology of Deviant Behavior and SOCI 349, Social Inequality; 3) Health and Aging: SOCI 311, Health, Illness and Social Behavior, SOCI 313, Sociology of Stress and Coping, SOCI 319, Sociology of Institutional Care, SOCI 369, Aging in American Society

Departmental Honors
Juniors majoring in sociology with a 3.0 overall GPA and a 3.4 GPA in sociology are invited to apply for the department’s Honors Program, which consists of an intensive, year-long investigation of a research problem under the guidance of a faculty member. Students will earn credit through registration in SOCI 397 and SOCI 398. Admission to honors work is by faculty approval.

Honor Society
The opportunity to join Alpha Kappa Delta (AKD), the sociology honors fraternity, is available to selected juniors and seniors (Membership requires a 3.4 GPA in sociology and a 3.2 GPA overall.)

Integrated Graduate Studies
The Department of Sociology participates in the Integrated Graduate Studies Program. Students in the program are able to obtain B.A. and M.A. degrees simultaneously. Interested students should note the general requirements and the admission procedures in the appropriate section of this bulletin and may consult the department for further information.

GRADUATE PROGRAM
The Department of Sociology offers graduate training leading to the Doctor of Philosophy degree. Students may petition for a Master of Arts degree once they fulfill the requirements outlined below. Sociology of aging and medical sociology are the major areas of emphasis in the department. A formal concentration in research methods is also offered as a complement to these areas.

Master of Arts
To receive the Masters of Arts degree a student must successfully complete 27 credit hours of course work. Required courses for the degree are SOCI 400 and 406 and either 401 or 407 plus 469 and 443 and four general electives in sociology. In addition, the student must pass one written comprehensive examination.
in Sociology of Aging, Medical Sociology or Research Methods.

Doctor of Philosophy

The Doctor of Philosophy degree is awarded upon the completion of all requirements of the School of Graduate Studies and the following departmental requirements: Completion of 63 credit hours past the Bachelor of Arts degree, including 18 credits of 701 (dissertation hours). Required courses are SOCI 400, 401, 406, 407, 443, 469, two additional electives in research methods, two additional electives in medical sociology, two additional electives in aging, and three general electives in sociology. In addition, students must pass two comprehensive examinations. In two of three areas (Research Methods; Aging; Medical) and successfully defend the dissertation. To obtain the concentration in Research Methods, students must take SOCI 406; 407; two courses from among 414, 473, and 509; and two additional electives.

A predoctoral training program in Health Research and Aging sponsored by the National Institute of Aging has been offered in conjunction with the Elderly Care Research Center of the Department of Sociology.

RESEARCH PROGRAMS

The Elderly Care Research Center

Funded research projects of the center focus on theory-based and public policy relevant issues in aging and medical sociology. Current projects relate to physical and mental health outcomes of stress, coping, cancer survivorship and adaptation to frailty and life-threatening illness in late life. The center is recipient of an NIA Merit Award for a long-term study of very old residents of a retirement community. This research seeks to understand health promotion, proactive adaptation, and maintenance of wellness in late life. Major research projects focusing on medical sociology deal with life-threatening illness, caregiver burden, and physician-patient interactions. The center serves as a laboratory for student research. Col-laborative and cross-national research involves colleges from other disciplines and universities in Israel, Hungary, Britain, and Germany.

SOCIOLOGY (SOCI)

Undergraduate Courses

SOCI 112B. Introduction to Sociology: Human Interaction (3)
How can so many different people who have competing ideals and lifestyles live together in harmony? What makes one organization successful and another one fail? This course examines such questions from the social scientist's viewpoint. Topics include: how people learn to be human, families, markets and economic institutions, class structures, crime and deviant behavior, aging, self-identity, and social change.

SOCI 113. Critical Problems in Modern Society (3)
Focus is on major social problems present in large, complex, industrial societies. Topics include environmental problems, poverty, drug addiction, social deviance, and alienation.

SOCI 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

SOCI 203. Human Development: Medical and Social (3)
Social influences on health and illness across the lifespan. Social determinants of health and health behavior, and delivery of health care. Guest lectures from the medical school and other health care providers address professional practice issues across the lifespan. Issues include: new approaches to birthing; adolescent substance abuse; myths and realities of AIDS; risk factors of diseases in middle age; menopause, cognition and aging-Alzheimer's disease; problems in care of elderly; medical ethic of death and dying.

SOCI 204. Criminology (3)
What is crime and to what extent does crime affect you? This course will investigate the nature and extent of crime, theories on the causes of crime, types of crime and criminals, and the efforts society makes to cope with and prevent criminal behavior.

SOCI 208. Dating, Marriage, and Family (3)
What is the family today? How has it changed over the last century? How will it change in the future? This course aims to answer these questions as it explores the influences of work, education, government, health and religion on today's changing families. The course considers the factors that affect mate selection. It also examines parenting, roles of husbands and wives, and family dysfunction, and divorce.

SOCI 222. Gender in U.S. Society (3)
The focus of this course is on unique and convergent experiences of men and women in U.S. society. Different social expectations and opportunities encountered by men and women in the context of marriage and the family, work settings, and in informal organizations will be addressed. Legislation and social policy dealing with gender issues will be considered. Cross-listed as WMST 222.

SOCI 255. Special Topics (1-3)
Courses taught as special topics seminars focus on selected areas of study in sociology. They tend to be more specialized and emphasis is placed upon a sociological examination of one social institution (such as the media) or on one historical period (such as the '60s).

SOCI 269. Young and Old Face the 21st Century (3)
Examines prospects and problems of the young and old as a window into the 21st century. An intergenerational perspective is used to highlight opportunities for cooperation and conflict between young and old who face the future together. This approach represents a shift in thinking about aging as relevant only to the old, to a view that aging is relevant to the future of all individuals, families, and societies.

SOCI 300. Modern Sociological Thought (3)
The most profound commentary of industrial society began in the middle of the nineteenth century with thinkers such as Durkheim, Marx, and Max Weber. Students will read the work of these scholars as it appeared in the original sources. They thoughtfully address concepts such as social integration and alienation, crime and punishment, and the social impact of modernization. The course is of special relevance to students in the social sciences, but is also recommended for students in other fields who wish to understand the social context in which professional lives will be conducted. Prereq: SOCI 112B.

SOCI 302. Race and Ethnic Minorities in American Society (3)
Has the United States become a melting pot of ethnic groups or does it remain a salad bowl? American society is uniquely diverse in its ethnic and racial composition. This diversity has influenced much of American history and had substantial impact on the structure of social organization of present day society. This course familiarizes students with basic concepts of race and ethnicity, relevant theories and their applications to critical issues. Prereq: SOCI 112B.

SOCI 303. Social Research Methods (3)
Principles of making causal inferences about human behavior; problem formulation and research design; measurement of sociological concepts; data collection and analysis methods; evaluation of research findings. Prereq: SOCI 112B.

SOCI 310. The Individual in Society (3)
This course focuses on the relationship between individuals and the societies in which they live. Influences of values and culture on individuals' selves and identities are discussed as well as how individuals attach meaning to personal life experiences and histories in the context of society at large. Prereq: SOCI 112B.

SOCI 311. Health, Illness, and Social Behavior (3)
This course considers the role of social factors (e.g., poverty, occupational and family structure) on health and illness. Discussion will concentrate on the role of health promotion (e.g., anti-smoking campaigns), social behavior and lifestyle in health and health care use. Considerable attention is given to understanding health care careers and professions and their role in the health of societies and individuals. Prereq: SOCI 112B.

SOCI 313. Sociology of Stress and Coping (3)
This course will focus attention on human stress throughout the lifespan and its role in personal health and well-being. There have been exciting advances in recent years in understanding the nature of stress in everyday life as well as elements of extreme stress. Trauma is experienced by many people due to normative events such as illness and bereavement or natural and man-made disasters such as crime or war. Coping strategies and social supports which ameliorate negative impact of stress will be considered. Prereq: SOCI 112B.

SOCI 314. Qualitative Methods/Field Research (3)
Students explore the theoretical foundations of qualitative social research. The course is designed to introduce...
and provide experience with a range of data generation strategies and analytic skills. The ethnographic techniques of semi-structured interviewing and participant-observation receive particular attention. Prereq: SOCI 112B.

SOCI 319. Sociology of Institutional Care (3)
This course focuses on converging issues of theory, research, and practice in general hospitals, mental hospitals, nursing homes, hospices, and correctional institutions. The ecology of institutions and the adaptation of individuals within institutions will also be considered. There will be field trips to institutional facilities. Prereq: SOCI 112B.

SOCI 320. Delinquency and Juvenile Justice (3)
The primary focus of this course is on acquainting the student with the nature and the extent of juvenile delinquency. Accordingly, theoretical approaches to delinquency causation and the prevention, control, and treatment of delinquent behavior in society are addressed. Important aspects of juvenile justice procedures, policy, and practice are examined, and the early history of the juvenile justice system and the many changes occurring over the years are discussed. Prereq: SOCI 112B.

SOCI 326. Women in Societies in the Modern World (3)
Participation of women in both family and economic institutions in developed and developing societies around the world. Prereq: SOCI 112B or permission of program director. Cross-listed as WMST 326.

SOCI 333. Sociology of Deviant Behavior (3)
Sociological approaches to causes of deviant behavior, and social psychology of deviance are studied. Illustrations range from juvenile delinquency to scientific misconduct and cover both criminal and noncriminal forms of deviance. Prereq: SOCI 112B.

SOCI 338. Seminar and Practicum in Adolescence (3)
(See EDUC 338.) Cross-listed as EDUC 338 and PSCL 338.

SOCI 339. Seminar and Practicum in Adolescents (3)
(See SOCI 338.) Cross-listed as PSCL 339.

SOCI 349. Social Inequality (3)
Theory and research on contemporary inequality is considered in terms of income, wealth, education, occupational standing, occupational prestige, status categories, racial, ethnic, religious, age, and gender groupings. Prereq: SOCI 112B.

SOCI 355. Special Topics (3)
One or more sections each semester focusing on selected areas of study in sociology.

SOCI 360. Criminal Justice and Law (3)
Overview of criminal justice system and procedures and problems concerning police, prosecutors, courts, and corrections. Covers society's ways of protecting dependent groups and ensuring justice, evolution of the current legal system, and relationships between the law and moral behavior. Prereq: SOCI 112B or consent of department.

SOCI 361. The Life Course (3)
Individual experiences and transitions over the life course are considered as the result of societal, cultural, psychological, biological, and historical influences. Developmental issues of childhood, adolescence, young adulthood, middle years and late life are discussed in the context of social expectations, challenges, and opportunities. Emphasis is placed on theoretical readings. Prereq: SOCI 112B.

SOCI 365. Health Care Delivery (3)
Health care in the U.S. may be approaching a critical cross-road. Limiting care to older persons and the chronically ill has been proposed as a means to combat rising costs and limited access to health care. What are the alternatives to health care rationing? Socialized medicine? National health insurance? This course deals with issues of cost, quality, and access to health care in the United States and other societies. It considers how solutions by other societies can provide directions for the organization of health care in the U.S. Prereq: SOCI 112B.

SOCI 369. Aging in American Society (3)
Considers the position and participation of aged adults in American society. Sociological perspectives through which to interpret the aging process and old age; social policies; intergenerational relations; lifestyles and how they affect participation of the aged in American society; dying and death serve as major themes. Prereq: SOCI 112B.

SOCI 370. Family Structure and Process (3)
This course focuses on the conduct, conflicts and triumphs encountered in everyday living by families. Examines how families from different historical periods, classes and races experience life. Attention will be given to the sense of variety inherent in family forms and intrafamilial experiences. Using sociological, theoretical and historical perspectives, learn why the family is often blamed for major societal problems. Prereq: SOCI 112B.

SOCI 372. Work and Family: U.S. and Abroad (3)
Covers the impact on human lives of the interface between work and family; the different ways gender structures the experience of work and family depending upon racial and ethnic background, social class, age, and partner preference; the impact of historical context on work-family experiences; work-family policies in the United States and other countries. Prereq: SOCI 112B and junior/senior standing. Cross-listed as WMST 372.

SOCI 375. Independent Study (1-3)
Prereq: SOCI 112B and SOCI 300.

SOCI 381. City as Classroom (3)
(See HSTY 381.) Cross-listed as HSTY 381.

SOCI 397. Honors Studies (3)
Intensive investigation of research or conceptual problem; original work under supervision of faculty member. Limited to senior majors. Prereq: Senior status.

SOCI 398. Honors Studies (3)
Intensive investigation of research on conceptual problem; original work under supervision of faculty member. Limited to senior majors.

Graduate Courses

SOCI 400. Development of Sociological Theory (3)
This course examines in detail the works of the major social theorists of the 19th and 20th centuries. It is intended to integrate their ideas with the social and historical milieu from which they were born. Questions of intergroup conflict vs. cooperation, interactions between economic, familial, religious, and political institutions, and the development of the self as a function of larger social processes are addressed. Much celebrated figures as Marx, Weber, and Durkheim, as well as modern thinkers will be presented and discussed. Prereq: Graduate standing.

SOCI 401. Contemporary Sociological Theory (3)
Current viewpoints in sociological theory are explored using contrasting theoretical perspectives.

SOCI 406. Sociological Research Methods I (3)
The first of a two-semester sequence in research methodology. Students will learn how to interpret and conduct social science research. The two-semester course covers problem formulation, the logic of causal inference, measurement models, research designs, sampling, data collection, and data analysis.

SOCI 407. Sociological Research Methods II (3)
The second of a two-semester series in social research methodology. (See SOCI 406.) Prereq: SOCI 406.

SOCI 410. The Individual in Society (3)
This course focuses on the relationship between individuals and the societies in which they live. Influences of values and culture on individuals' selves and identities are discussed as well as how individuals attach meaning to personal life experiences and histories in the context of society at large.

SOCI 411. Health, Illness, and Social Behavior (3)
(See SOCI 311.)

SOCI 413. Sociology of Stress and Coping (3)
(See SOCI 313.)

SOCI 414. Qualitative Methods/Field Research (3)
(See SOCI 314.)

SOCI 419. Sociology of Institutional Care (3)
(See SOCI 319.)

SOCI 443. Medical Sociology (3)
Course covers theories, research methods, and problems in sociology of medicine. Topics include social epidemiology, health and illness behavior, and sick role. Structures and functions of delivery systems and their interrelationships with other social institutions are discussed.

SOCI 445. Sociology of Mental Illness (3)
Focus is on social construction of mental health and illness and sociology of emotions. Social determinants of psychological distress will be discussed along with social stigma associated with mental illness. Institutional and community options for care of the mentally ill will be considered along with the impact of recent social movements of deinstitutionalization and independent living.

SOCI 449. Social Inequality (3)
(See SOCI 349.)

SOCI 455. Special Topics (3)
One or more sections each semester focusing on selected areas of study in sociology.

SOCI 460. Criminal Justice and Law (3)
(See SOCI 360.)

SOCI 461. The Life Course (3)
(See SOCI 361.)

SOCI 465. Health Care Delivery (3)
(See SOCI 365.)

SOCI 469. Aging in American Society (3)
(See SOCI 369.)

SOCI 470. Family Structure and Process (3)
(See SOCI 370.)

SOCI 472. Work and Family: U.S. and Abroad (3)
(See SOCI 372.)
developmental questions; disentangling age, period, and cohort effects; conducting longitudinal research; handling social contexts; conducting multi-level research; analyzing secondary and archival data; and making comparisons in human development. Prereq: SOCI 406 or equivalent.

SOCI 481. City as Classroom (3)  
(See HSTY 481.) Cross-listed as HSTY 481.

SOCI 496. Public Policy and Aging (3)  
(See EPBI 408.) Cross-listed as EPBI 408.

SOCI 500. Advanced Social Theory (3)  
This course focuses on problems and issues relevant to contemporary social theorizing. As such, it deals with the rational roots of mainstream sociological thought and its relation to practice. Attention will also be paid to critical theory, hermeneutics, and current feminist thinking. Prereq: SOCI 400 and SOCI 401.

SOCI 509. Problems of Data Analysis (3)  
Research in social epidemiology, health service research and other applied fields increasingly demands an understanding of social research methodology. This seminar exposes students to the range of the art analyses of social science data including: data preparation, factor analysis, regression and structural equation modeling. Students are provided the opportunity to interpret and critically evaluate the methodology used in journal articles, with an emphasis on data analytical techniques. Students will analyze data sets using SPSS and EIQS. Prereq: STAT 401, SOCI 406, and SOCI 407 or permission of department.

SOCI 601. Reading and Research (1-9)  
Individual study and/or project work.

SOCI 701. Dissertation Ph.D. (1-18)  
Project option also allows students either to work in a research setting or to pursue double majors combine statistics with computer science, biology (molecular, organismal or ecology), psychology.

FACULTY

Wojbor Woyczynski, Ph.D. (Wroclaw University, Poland)  
Professor  
Stochastic models, probability, random fields, time series, dynamics of chaotic processes, nonlinear diffusion, turbulence

Nidhan Choudhuri; Ph.D. (Michigan State University)  
Assistant Professor
Bayesian nonparametric, empirical likelihood, bootstrap, multivariate splines

Paula FitzGibbon, M.S. (Miami University)  
Lecturer

Catherine Loader, Ph.D. (Stanford University)  
Associate Professor
Local regression and likelihood; mixture models; functional data analysis and application to biological data; numerical algorithms in statistics and applied probability; boundary crossing problems and statistical applications.

Ramani Pilla, Ph.D. (Penn State)  
Bioinformatics/genetics, correlated data (clustered and longitudinal); estimating equations; mixture models (nonparametric and semiparametric); random effects models; random fields; statistical computation; spatial scan analysis

Joseph Sedransk, Ph.D. (Harvard University)  
Professor
Bayesian inference, sample survey theory, methodology and applications

Jiayang Sun, Ph.D. (Stanford University)  
Professor
General statistics and applications; methodologies in statistical computing and data mining; semi- and nonparametrics, biased sampling, bump hunting and mixtures; statistics in astronomy, neuroscience, imaging and information technology research

Lajos Takacs, Ph.D. (Budapest University)  
Professor Emeritus
Stochastic processes, probability, queuing systems

Adjunct Faculty

Mary H. Regier, Ph.D. (University of California at Berkeley)  
Adjunct Professor

UNDERGRADUATE PROGRAMS

Students in statistics begin with a foundation in mathematics, then add statistical theory plus intensive modern data analysis and a concentration in a field of each student’s choice where statistics is used. The goal is to develop an appreciation of each facet of the discipline and a mastery of technical skills. This prepares students to enter a growing profession with opportunities in the academic, governmental, actuarial, and industrial spheres. For the undergraduate student looking toward graduate school, the course of study within these guidelines easily incorporates additional mathematics in preparation for the more abstract mathematical level of graduate courses. The more specialized option in actuarial science expands the basic program in statistics to incorporate topics from operations research and numerical analysis which are fundamental to actuarial theory and computation. This actuarial option includes the course work necessary to prepare for Courses 1-3 of the Society of Actuaries Exams.

All undergraduate majors begin with a foundation in mathematics and a core of courses in mathematical statistics, courses in statistical methodology and courses in modern data analysis. Each student’s program is individualized by the choice of an applied field of concentration according to the student’s own talents and interests and by the choice of appropriate STAT electives which may be drawn from offerings by the Statistics Department and from suitable offerings by other departments at the University. The Senior Project option also allows students either to work in a research setting or to participate in interdisciplinary collaboration or in industrial consulting along with a statistics faculty member. The B.A. degree offers flexibility and the chance to pursue a wider range of interests. It also offers the possibility of expanding the interdisciplinary aspect of the program to complete the requirements for majors in two fields. Some examples of particularly attractive double majors combine statistics with computer science, biology (molecular, organismal or ecology), psychology.
The B.S. degree adds a laboratory science requirement. For students seriously interested in basic science, a natural science is the logical choice as a focus for the application, and the B.S. degree is the logical choice of program.

Bachelor of Science in Statistics

The B.S. degree in statistics requires a minimum of 124 hours, including at least 68 hours of approved course work, including 27 hours in statistics, the remainder in related disciplines and a substantive field of application, to satisfy the following requirements:

1. MATH 121, 122, 223, 224, and 201 or equivalent;
2. ENGR 131 or ECMP 251 or approved alternate; plus an additional higher numbered course in computation from ENGR or ECMP offerings or EPBI 414 or EPBI 420;
3. STAT 325 and 326, STAT 345 and 346;
4. At least 15 hours of courses in statistical methodology to be chosen from statistics courses numbered 300 and higher offered by the Statistics Department, or approved courses in statistical methodology or probability taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, etc. At least 6 hours must be in STAT courses; STAT 243 and 244 may be counted;

---

PROTOTYPE PROGRAMS - STATISTICS COURSE WORK

STATISTICS B.A. PROGRAM

Year 1

Fall
MATH 121
CMPS 131
ENGL 150
GER: Science
GER: Social Science
Physical Education Requirement
Total: 16 hours

Spring
MATH 122
GER: Arts and Humanities
GER: Science
GER: Social Sciences
Free Elective
Physical Education Requirement
Total: 16 hours

Year 2

Fall
MATH 223
STAT 243
GER: Arts and Humanities
GER: Social Sciences
Free Elective
Total: 15 hours

Spring
MATH 224
MATH 201
STAT 244
GER: Arts and Humanities
GER: Global and Cultural Diversity
Total: 15 hours

Year 3

Fall
STAT 345
EPBI 420
Substantive Field Requirement
GER: Arts and Humanities
Free Elective
Total: 15 hours

Spring
STAT 346
STAT Elective
Substantive Field Requirement
Free Elective
Free Elective
Total: 15 hours

Year 4

Fall
STAT 325
STAT Elective
Free Elective
Free Elective
Total: 15 hours

Spring
STAT 326
STAT 395
STAT 391
Free Elective
Free Elective
Total: 13 hours
### Bachelor of Arts

The B.A. degree in statistics requires a minimum of 120 hours, including at least 56 hours of approved course work, including 27 hours in statistics, the remainder in related disciplines and a substantive field of application, to satisfy the following requirements:

1. MATH 121, 122, 223, 224, and 201 or equivalent;
2. ENGR 131 or ECMP 251 or approved alternate; plus an additional higher numbered course in computation from ENGR or ECMP offerings or EPBI 414 or EPBI 420;
3. STAT 325 and 326, STAT 345 and 346;
4. At least 15 hours of courses in statistical methodology to be chosen from statistics courses numbered 300 and higher offered by the Statistics Department, or approved courses in statistical methodology or probability taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, etc. At least 6 hours must be in STAT

---

### STATISTICS

#### B.S. PROGRAM

#### Year 1

**Fall**
- MATH 121
- MATH 122
- ENGR 131
- ENGL 150
- GER: Science
- GER: Social Sciences
- Physical Education Requirement
  - Total: 16 hours

**Spring**
- GER: Arts and Humanities
- GER: Science
- GER: Social Sciences
- Free Elective
- Physical Education Requirement
  - Total: 16 hours

#### Year 2

**Fall**
- MATH 223
- STAT 243
- GER: Arts and Humanities
- GER: Social Sciences
- Free Elective
  - Total: 15 hours

**Spring**
- MATH 224
- MATH 201
- STAT 244
- GER: Arts and Humanities
- GER: Global and Cultural Diversity
  - Total: 15 hours

#### Year 3

**Fall**
- STAT 345
- EPBI 420
- Substantive Field Requirement
- GER: Arts and Humanities
- Science Requirement
  - Total: 15 hours

**Spring**
- STAT 346
- STAT Elective
- Substantive Field Requirement
- Free Elective
- Science Requirement
  - Total: 15 hours

#### Year 4

**Fall**
- STAT 325
- STAT Elective
- STAT 391
- Free Elective
- Free Elective
  - Total: 16 hours

**Spring**
- STAT 326
- STAT 395
- STAT 391
- Free Elective
- Free Elective
  - Total: 16 hours

---

(5) Two approved courses (or more) numbered 300 or above in an approved discipline outside statistics;

(6) A combined total of 12 hours (or more) in ASTR, BIOL, CHEM, GEOL, PHYS which may be counted toward a major in that field including at least one of PHYS 121 and 122, CHEM 105 and 106 plus 113, CHEM 107 and 108 plus 113, BIOL 110 and 210 plus 211, BIOL 110 and 220 plus 221. Students are strongly encouraged to include advanced expository or technical writing courses in their programs.

---

(5) Two approved courses (or more) numbered 300 or above in an approved discipline outside statistics;

(6) A combined total of 12 hours (or more) in ASTR, BIOL, CHEM, GEOL, PHYS which may be counted toward a major in that field including at least one of PHYS 121 and 122, CHEM 105 and 106 plus 113, CHEM 107 and 108 plus 113, BIOL 110 and 210 plus 211, BIOL 110 and 220 plus 221. Students are strongly encouraged to include advanced expository or technical writing courses in their programs.

---

(5) Two approved courses (or more) numbered 300 or above in an approved discipline outside statistics;

(6) A combined total of 12 hours (or more) in ASTR, BIOL, CHEM, GEOL, PHYS which may be counted toward a major in that field including at least one of PHYS 121 and 122, CHEM 105 and 106 plus 113, CHEM 107 and 108 plus 113, BIOL 110 and 210 plus 211, BIOL 110 and 220 plus 221. Students are strongly encouraged to include advanced expository or technical writing courses in their programs.
STATISTICS

COMBINED B.S.—M.S. PROGRAM

Year 1
Fall
MATH 121  
ECMP 251  
ENGL 150  
GER: Science  
GER: Social Sciences  
Physical Education Requirement  
Total: 16 hours

Spring
MATH 122  
GER: Arts and Humanities  
GER: Science  
GER: Social Sciences  
Free Elective  
Physical Education Requirement  
Total: 16 hours

Year 2
Fall
MATH 223  
STAT 243  
STAT GER: Arts and Humanities  
GER: Social Science  
Science Requirement  
Total: 15 hours

Spring
MATH 224  
MATH 201  
STAT 244  
GER: Arts and Humanities  
Science Requirement  
Total: 15 hours

Year 3
Fall
STAT 345/445  
EPBI 420  
Substantive Field Requirement  
GER: Arts and Humanities  
Free Elective  
Total: 15 hours

Spring
STAT 346  
STAT Elective  
Substantive Field Requirement  
GER: Global and Cultural Diversity  
Free Elective  
Total: 15 hours

Year 4
Fall
STAT 425  
STAT Elective  
STAT 491 (1)  
Free Elective  
Free Elective  
Free Elective  
Total: 16 hours

Spring
STAT 426  
STAT Elective  
STAT 491 (1)  
Free Elective  
Free Elective  
Free Elective  
Total: 16 hours

Year 5
Fall
STAT 455  
STAT Elective  
STAT 491 (1)  
Free Elective  
Total: 10 hours

Spring
STAT Elective  
STAT Elective  
STAT 651  
STAT 491 (1)  
STAT 495 (3)  
Total: 13 hours

Statistics
courses; STAT 243 and 244 may be counted;
(5) Two approved courses (or more) numbered 300 or above in an approved discipline outside statistics.

Students are strongly encouraged to include advanced expository or technical writing courses in their programs. Students may pursue a B.A. with a double major in statistics and a related field from within the College of Arts and Sciences. In this case, the substantive field requirement (No. 5 above) is waived.

Bachelor Degrees - Option in Actuarial Science

The actuarial program leading to a either a B.A. or a B.S. in statistics requires 30 hours in statistics and actuarial studies and must satisfy the requirements for the appropriate degree program with the following modifications of requirements (4) and (5) of the B.A. or B.S. program:
(4) At least 12 hours of courses in statistical methodology to be chosen from statistics courses numbered 300 and higher offered by the Statistics Department, or approved courses taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, etc. At least 6 hours must be in STAT courses; STAT 243 and 244 may be counted;
(5) STAT 317 and STAT 318. Students ordinarily can expect to be prepared to take Courses 1-3 of the Society of Actuaries Exams upon graduation

Minor in Statistics

A minor in statistics requires a minimum of 15 hours of approved course work in statistics. The minor must satisfy the requirements below and must include a minimum of 9 credits in courses from the Statistics Department offerings.
(1) STAT 243 and 244 or STAT 345 and 346 or other approved sequence
(2) STAT 208 or STAT 312 or STAT 313 or STAT 332 or STAT 333 or STAT 325
(3) Two approved elective courses in statistics numbered 300 or above.

Combined Bachelor-Master Degrees

The combined bachelor-master degrees in statistics require a minimum of 21 hours beyond the bachelor's degree requirements. In total, 42 hours must be in statistics, including an M.S. thesis or M.S. research project, with the remainder (either 41 or 26 hours for B.S. or B.A., respectively) in approved course work in related disciplines and a field of application. In addition to the B.S. or B.A. requirements, a combined degree program must include:
(1) STAT 455 and three semesters of STAT 491;
(2) One semester of STAT 495
(3) M.S. research project (STAT 621) or M.S. Thesis (STAT 651);
(4) At least 6 additional hours of courses in statistical theory and methodology (making a total of 21 hours including at least 4 STAT courses numbered 400 or higher) to be chosen from Statistics Department offerings numbered 300 and higher, or approved courses in statistical methodology or probability taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, etc. Students are strongly encouraged to include advanced expository or technical writing courses in their programs.

GRADUATE PROGRAMS

The department offers programs leading to the Master of Science and to the Doctor of Philosophy degrees. Graduate assistantships both with teaching responsibilities and with research duties are available to qualified applicants.

The dual core of the M.S. program is mathematical statistics and modern data analysis with the option of a special Entrepreneurial Track. Expanding from this core, students develop technical facility in a variety of statistical methodologies. This breadth of competence is designed to equip graduates to go beyond the appropriate choice of method for implementation and to be able to adapt these techniques and to construct new methods to meet the specific objectives and constraints of new situations.

Master of Science in Statistics

The M.S. degree in statistics requires a minimum of 27 hours of approved course work in statistics and related disciplines and an M.S. research project or a thesis. Each student’s program is developed in consultation with the Director of Graduate Studies or a senior faculty mentor and must satisfy the following requirements:
(1) STAT 425 and 426;
(2) STAT 445 and 446;
(3) STAT 455
(4) STAT 495 (3 credits);
(5) M. S. research project (STAT 621) or M.S. Thesis (STAT 651);
(6) A minimum of 6 hours of approved graduate level statistics electives.
(7) STAT 491 (0 credits)

The goals of this program are to give each student a balanced view of statistical theory and the application of statistics in practice or in substantive research and at the same time to have the student develop a broad competence in statistical methodology. The required core course work reflects this balance. The first two requirements are for full-year sequences in data analysis and theory; and the third develops the theory underlying linear modeling. The requirement for applications of statistics will be satisfied through intensive participation in the Consulting Forum; selecting an M.S. research project provides additional exposure. Graduate students are also required to participate in a forum or seminar to gain experience in written and oral presentation. The remainder of each student’s program is individualized to address the more specialized statistical demands of the selected field of concentration or the focus of multi disciplinary work. Each student may choose either the applied research project or the thesis option depending on individual interests. In either case the student can expect to work with a faculty.
mentor in undertaking a significant task which will culminate in polished written and oral presentations; in many cases the work will be suitable for presentation at professional society meetings or publishable in a substantive literature. A student coming to school from a position as professional statistician might choose a statistical problem arising in the workplace as the basis for an M.S. research project. A student intending to continue graduate work toward a Ph.D. might choose an M.S. research project to explore the intimate relationship of statistics to substantive fields. Alternatively, either student might choose the thesis option to tailor methodology to a new setting or to make a first essay at mathematical statistical research.

Master of Science in Statistics Projected Track
The Master of Science in Statistics-Entrepreneurial Track (MSS-ET) is a professional degree designed to provide training in statistics focused on developing data analysis and decision-making skills in industrial/government/consulting environments where uncertainties and related risks are present. It expands our basic Master of Statistics program by creating a professional-type track which provides some business training. The Entrepreneurial Track provides instruction and real business-world experience to students who have a background in statistics and a vision for new and growing ventures.

The minimum number of hours required for the MSS-ET program is 27. A typical curriculum to be followed is listed below but variance could be granted at departmental discretion.

**Year 1**

**Fall**
Data Analysis I
Theoretical Statistics I
New Venture Creation

**Spring**
Data Analysis II
Theoretical Statistics II
Technology Entrepreneurship

**Year 2**

**Fall**
Statistical Computing
Linear Models
Consulting Forum/Internship

**Spring**
Elective or Actuarial Science I or Actuarial Science II
MS Project or Experimental Design
Consulting Forum w/Practicum/Internship

The required New Venture Creation and Technology Entrepreneurship courses will be offered by the Weatherhead School of Management. Students on internships will sign up for the Consulting Forum sequence. In addition, students are required to participate in an intensive one-week annual workshop on the industrial use of statistics from the management perspective. The up to 30 hour (no credit) workshop will take place during the Fall or Spring undergraduate breaks.

**Doctor of Philosophy in Statistics**
The focus of the doctoral program is on research and the plan of study emphasizes the theory of statistics so that graduates from this program will be able both to extend the theoretical basis for statistics and to bring statistical thought to scientific research in other fields. The objective of preparing students to collaborate in interdisciplinary work demands breadth as well, so advanced knowledge of a substantive field and participation in the collaborative experience are also integral to the program.

Students planning to enter the doctoral program in statistics should obtain information from the departmental office. Plans of study are prepared individually by the graduate student and a faculty advisor to develop the talents and interests of each student.

**STATISTICS (STAT)**

**Undergraduate Courses**

**STAT 201. Basic Statistics for Social and Life Sciences (3)**
Designed for undergraduates in the social sciences and life sciences who need to use statistical techniques in their fields. Descriptive statistics, probability models, sampling distributions. Point and confidence interval estimation, hypothesis testing. Elementary regression and analysis of variance. Not for credit toward major or minor in Statistics.

**STAT 207. Statistics for Business and Management Science I (3)**
Organizing and summarizing data. Mean, variance, moments. Elementary probability, conditional probability. Commonly encountered distributions including binomial, Poisson, uniform, exponential, normal distributions. Central limit theorem. Sample quantities, empirical distributions. Reference distributions (chi-square, z-, t-, F-distributions). Point and interval estimation; hypothesis tests. Prereq: MATH 122 or MATH 126 or equivalent.

**STAT 208. Statistics for Business and Management Science II (3)**

**STAT 243. Statistical Theory with Application I (3)**

**STAT 244. Statistical Theory with Application II (3)**

**STAT 312. Basic Statistics for Engineering and Science (3)**
For advanced undergraduates in engineering, physical sciences, life sciences. Comprehensive introduction to probability models and statistical methods of analyzing data with the object of formulating statistical models and choosing appropriate methods for inference from experimental and observational data and for testing the model’s validity. Balanced approach with equal emphasis on probability, fundamental concepts of statistics, point and interval estimation, hypothesis testing, analysis of variance, design of experiments, and regression modeling. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Prereq: MATH 122 or equivalent.

**STAT 313. Statistics for Experimenters (3)**
For advanced undergraduates in engineering, physical sciences, life sciences. Comprehensive introduction to modeling data and statistical methods of analyzing data. General objective is to train students in formulating statistical models, in choosing appropriate methods for inference from experimental and observational data, and to test the validity of these models. Focus on practicalities of inference from experimental data. Inference for curve and surface fitting to real data sets. Designs for experiments and simulations. Student
generation of experimental data and application of statistical methods for analysis. Critique of model; use of regression diagnostics to analyze errors. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Prereq: MATH 122 or equivalent.

STAT 317. Actuarial Science I (3)
Practical knowledge of the theory of interest in both finite and continuous time. That knowledge should include how these concepts are used in the various annuity functions, and apply the concepts of present and accumulated value for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, duration, asset/liability management, investment income, capital budgeting, and contingencies. Valuation of discrete and continuous streams of payments, including the case in which the interest conversion period differs from the payment period will be considered. Application of interest theory to amortization of lump sums, fixed income securities, depreciation, mortgages, etc., as well as annuity functions in a broad finance context will be covered. Topics covered include areas examined in the American Society of Actuaries Exam 2. Prereq: MATH 122 or MATH 126 or equivalent.

STAT 318. Actuarial Science II (3)
Theory of life contingencies. Life table analysis for simple and multiple decrement functions. Life and special annuities. Life insurance and reserves for life insurance. Statistical issues for prediction from actuarial models. Topics covered include areas examined in the American Society of Actuaries Exam 3. Prereq: STAT 317 and one of the following: STAT 207, 312, 345, or equivalent.

STAT 325. Data Analysis and Linear Models (3)
Basic exploratory data analysis for univariate response with single or multiple covariates. Graphical methods and data summarization, model-fitting using S-plus computing language. Linear and multiple regression. Emphasis on model selection criteria, on diagnostics to assess goodness of fit and interpretation. Techniques include transformation, smoothing, median polish, robust/resistant methods. Case studies and analysis of individual data sets. Notes of caution and some methods for handling bad data. Knowledge of regression is helpful. Prereq: Permission of department.

STAT 326. Multivariate Analysis and Data Mining (3)
Extensions of exploratory data analysis and modeling to multivariate response observations and to non-Gaussian data. Singular value decomposition and projection, principal components, factor analysis and latent structure analysis, discriminant analysis and clustering techniques, cross-validation, E-M algorithm, CART. Introduction to generalized linear modeling. Case studies of complex data sets with multiple objectives for analysis. Prereq: STAT 325.

STAT 332. Statistics for Signal Processing (3)

STAT 333. Uncertainty in Engineering and Science (3)
Phenomena of uncertainty appear in engineering and science for various reasons and can be modeled in different ways. The course integrates the mainstream ideas in statistical data analysis with models of uncertain phenomena stemming from three distinct viewpoints: algorithm/computational complexity; classical probability theory; and chaotic behavior of nonlinear systems. Descriptive statistics, estimation procedures and hypothesis testing (including design of experiments). Random number generators and their testing. Monte Carlo Methods. Mathematica notebooks and simulations will be used. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Prereq: MATH 122.

STAT 345. Theoretical Statistics I (3)
Topics provide the background for statistical inference. Random variables; distribution and density functions; transformations, expectation. Common univariate distributions. Multiple random variables; joint, marginal and conditional distributions; hierarchical models, covariance. Distributions of sample quantities, distributions of sums of random variables, distributions of order statistics. Methods of statistical inference. Prereq: MATH 122 or MATH 223.

STAT 346. Theoretical Statistics II (3)

STAT 391. Statistics Student Seminar (1-3)
Seminar run collaboratively by students to investigate a topic or research problem, the topic chosen each semester. All students participate in presentation of material each semester. Recommended for all students majoring in statistics in their senior year. Emphasis on written and oral presentation of statistical summaries, reports and projects. Prereq: Statistics major or minor and nine credits of approved Statistics courses numbered 240 or above.

STAT 395. Senior Project in Statistics (3)
An individual project done under faculty supervision involving the investigation and statistical analysis of a real problem encountered in university research or an industrial setting. Written report. Prereq: Permission of department.

Graduate Courses

STAT 401. Statistics for Social and Life Sciences (3)
Principles and practice of data presentation and basic models including analysis of variance and multiple linear regression. Content includes analysis of discrete data in contingency tables, sensitivity and specificity, odds ratios, tests of goodness of fit, display and summarization of data, hypothesis testing, and interval estimation. Taught in case-based format with individual and/or collaborative student projects. Primarily for graduate students in nursing and health sciences. For not for credit toward undergraduate major or minor in Statistics or for credit toward any graduate degree in Statistics. Prereq: STAT 201.

STAT 412. Statistics for Design and Analysis in Engineering and Science (3)
For graduate students (primarily) and advanced undergraduate students in engineering, physical sciences, and life sciences. After basic statistical concepts are reviewed, the remainder of the course consists of a comprehensive introduction to statistical methods of designing experiments and analyzing data. The general objective is to train students in statistical modeling and in the choice of experimental designs to use in scientific investigations. A variety of experimental designs are considered, and regression analysis is presented as the primary technique for analyzing data from designed experiments, and in determining relationships between various possible statistical models. The course is oriented toward graduate students engaged in or embarking on research. Prereq: MATH 122 (an introductory statistics course is recommended).

STAT 413. Reliability and Calibration (3)

STAT 414. Industrial Statistics (3)
Introduction to statistical methods and techniques that are being used in industry, and especially in various company-wide quality improvement programs such as Six Sigma. The course covers control charts and process capability with considerable breadth and depth. The classical and alternative approaches that have been used in designing industrial experiments are also covered extensively. Linear regression, analysis of means (ANOM), and evolutionary operation (EVO) are other techniques that are covered. Prereq: STAT 312 or equivalent.

STAT 417. Actuarial Science I (3)
(See STAT 317.)

STAT 418. Actuarial Science II (3)
(See STAT 318.)

STAT 425. Data Analysis and Linear Models (3)
Basic exploratory data analysis for univariate response with single or multiple covariates. Graphical methods and data summarization, model-fitting using S-plus computing language. Linear and multiple regression. Emphasis on model selection criteria, on diagnostics to assess goodness of fit and interpretation. Techniques include transformation, smoothing, median polish, robust/resistant methods. Case studies and analysis of individual data sets. Notes of caution and some methods for handling bad data. Knowledge of regression is helpful. Prereq: Permission of department.

STAT 426. Multivariate Analysis and Data Mining (3)
Basic exploratory data analysis for univariate response with single or multiple covariates. Graphical methods and data summarization model-fitting using S-plus computing language. Linear and multiple regression. Emphasis on model selection criteria, on diagnostics to assess goodness of fit and interpretation. Techniques include transformation, smoothing, median polish, robust/resistant methods. Case studies and analysis of individual data sets. Notes of caution and some methods for handling bad/biased data. Knowledge of regression is helpful. Prereq: Permission of department.

STAT 427. Statistical Computing (3)
Basic topics in statistical computing; floating point arithmetic; seminumerical computation including generation and test of random numbers, Monte Carlo methods, variance reduction methods, stochastic models and simulation studies; numerical computation including numerical linear algebra, optimization and root-finding, numerical integration; some graphical and symbolic computations, special topics in statistical computing: reampling methods, EM algorithms, Gibbs sampling and projection pursuit. Prereq: STAT 345 or STAT 425 or permission of department.
STAT 432. Statistics for Signal Processing (3)
For beginning graduate students in engineering, physical sciences, life sciences. Introduction to prob-
ability models and statistical methods. Emphasis on probability as relative frequencies. Derivation of
conditional probabilities and memoryless channels. Joint distribution of random variables, transforma-
tions, autocorrelation, series of irregular observations, stationarity. Random harmonic signals with noise,
random phase and/or random amplitude. Gaussian and Poisson signals. Modulation and averaging proper-
ties. Transmission through linear filters. Power spectra, bandwidth, white and colored noise. ARMA processes
and forecasting. Optimal linear systems, signal-to-noise ratio, Wiener filter. Completion of additional assign-
ments required from graduate students registered in this course. Prereq: MATH 122.

STAT 433. Uncertainty in Engineering and Science (3)
Phenomena of uncertainty appear in engineering and science for various reasons and can be modeled in dif-
f erent ways. The course integrates the mainstream ideas in statistical data analysis with models of uncertain
phenomena stemming from three distinct viewpoints: algorithmic/computational complexity; classical
probability theory; and chaotic behavior of nonlinear systems. Descriptive statistics, estimation procedures
and hypothesis testing (including design of experi-
ments). Mathematica notebooks and simulations will be used. Random number generators and their testing.
Monte Carlo methods. Note: Credit given for only one
(1) of STAT 312, 313, 333, 433. Graduate students are
required to do an extra project. Prereq: MATH 223 or
MATH 122.

STAT 437. Stochastic Modeling of Scientific Data (3)
Introduction to stochastic modeling of data. Emphasis on models and statistical analysis of data with a signifi-
cant temporal and/or spatial structure. Markovian and semi-Markovian models, point processes, point cluster
models, queueing models, likelihood methods, estimat-
ing equations. Note: Restricted to declared graduate and undergraduate majors and minors in Statistics and
Biostatistics only. Prereq: STAT 333 or STAT 433
(preferred) or STAT 325, STAT 425, or STAT 445, or permission of department.

STAT 445. Theoretical Statistics I (3)
Topics provide the background for statistical inference. Random variables; distribution and density functions;
transformations, expectation. Common univari-
ate distributions. Multiple random variables; joint,
 marginal and conditional distributions; hierarchical
models, covariance. Distributions of sample quantiles;
distributions of sums of random variables, distributions
of order statistics. Methods of statistical inference.
Graduate students are responsible for mathematical derivations, and full proofs of principal theorems.
Prereq: MATH 122 or MATH 223. Cross-listed as EPBI 481.

STAT 446. Theoretical Statistics II (3)
Point estimation: maximum likelihood, moment
estimators. Methods of evaluating estimators including
mean squared error, consistency, ”best” unbiased and
sufficiency. Hypothesis testing; likelihood ratio and
union-intersection tests. Properties of tests including
power function, bias. Interval estimation by inversion
of test statistics, use of pivotal quantities. Application
to regression. Graduate students are responsible for
mathematical derivations, and full proofs of principal theorems. Prereq: STAT 445. Cross-listed as EPBI 482.

STAT 448. Bayesian Theory with Applications (3)
Principles of Bayesian theory, methodology and appli-
cations. Methods for forming prior distributions using
conjugate families, reference priors and empirically-
based priors. Derivation of posterior and predictive
distributions and their moments. Properties when
common distributions such as binomial, normal or
other exponential family distributions are used. Hier-
archical models. Computational techniques including
Markov chain, Monte Carlo and importance sampling.
Extensive use of applications to illustrate concepts and

STAT 453. Time Series and Wavelets I (3)
Stationary discrete-time and continuous-time models.
Search for hidden periodicities in data. Fast Fou-
tier transform; smoothing and filtering; spectra and
periodograms. Multiple series; cross spectra and cross
periodograms. Prediction problems. Time-frequency
localization and the uncertainty principle, windowed
Fourier transforms. Introduction to wavelet and mul-
tiresolution analysis. Prereq: One (1) of: STAT 333,
346, 433, 446, or permission of department.

STAT 455. Linear Models (3)
Theory of least squares estimation, interval estimation and
-tests for models with normally distributed errors.
-Regression on dummy variables, analysis of variance
and covariance. Variance components models. Model
diagnostics. Robust regression. Analysis of longitudinal
data. Prereq: MATH 201 and STAT 346 or STAT 446.

STAT 466. Theory and Methods of Experimental Design (3)
Experimental design for polynomial regression models
and for multi-factor models. Theory for construction
of increased efficiency designs including fractional
factorials, Latin squares. Designs for response surfaces,
GOSSETI-generated optimal designs for nonstandard

STAT 471. Special Topics in Statistics (1-3)
Topics in specialized areas of statistical theory and
methodology, with emphasis on recent advances in
theory and development of new methodology. Topics
may change from year to year. Number of credit hours
for the class will be predetermined each semester based
on the material to be presented. Prereq: Permission
of department.

STAT 476. Advances in Statistics and Modeling (1-3)
Topics in specialized areas of statistics and stochastic
modeling, with emphasis on recent advances in theory
and formulation of models. Investigation of new areas
of application for statistical or stochastic models. Tops-
ic topics may change from year to year. Number of credit
hours for the class will be predetermined each semester
based on the material to be presented. Prereq: Permis-
sion of department.

STAT 491. Graduate Student Seminar (1-2)
Seminar run collaboratively by graduate students to
investigate an area of current research, the topic chosen
each semester. All graduate students participate in
presentation of material each semester. Satisfies require-
ment for every full-time graduate student to enroll in a
participatory seminar every semester while registered
in any graduate degree program. Prereq: Graduate
standing.

STAT 495A. Consulting Forum With Practicum (1-3)
This course unifies what students have learned in their
course work to apply their knowledge in consulting.
It recognizes the fact that the essence of the statistical
professions is continuing interaction with practitioners
in the sciences, engineering, medicine, economics, etc.
The course presents the views of prominent experts
in the field as obtained from the literature and other
sources. The responsibilities of the consultant and the
client are discussed. Sample consulting problems are
presented and strategies for solving them are provided.
Prereq: STAT 325 or STAT 425.

STAT 495B. Consulting Forum With Practicum (3)
This course is designed to provide a hands-on experi-
ence with statistical consulting under the guidance of
the instructor. It will include discussion of practical
aspects of consulting such as the entrepreneurial nature
of this activity. The students will become involved in
actual consulting projects generated in a collabora-
tive environment. Statistical problems, together with
their substantive background, will be presented by
individuals from the private sector (e.g., from industry)
and/or Case faculty and students. Selected problems
will be addressed in a collaborative fashion; i.e., by a
team involving graduate students from the Statistics
Department, the course instructor, and scientists. Some
of these problems may lead to collaborative research or
entrepreneurial ventures. Prereq: STAT 495A, STAT
325 or STAT 425 or consent of department.

STAT 525. Advanced Data Analysis (3)
Topics drawn from resampling methods (including bootstrapping), MCMC (Gibbs sampling), nonpara-
metric curve and surface fitting, kernel density estima-
tion, projection pursuit, mixture models, time series
(time permitting), approaches to model uncertainty,
models for repeated measures and structural-functional
models, statistical inference for large systems, modern
data analysis techniques. Prereq: STAT 426 or perma-
ission of department.

STAT 527. Advanced Statistical Computing (3)
Special topics drawn from statistical computing,
complex system and dynamic computation. Oriented
to research. Prereq: STAT 427.

STAT 537. Advanced Stochastic Modeling of Scien-
tific Data II (3)
Spatial statistics. Theory and techniques for spatial
or spatial-temporal relationships in high dimensional
data, point pattern analysis, estimation of spatial
covariance either stationary or non-stationary in space,
applications to environmental sciences. Characteriza-
tions and solutions for mapping problems, for image
reconstruction, for analysis of fractal spatial-temporal
processes with particular application to environmental
sciences. Prereq: STAT 446 and STAT 437, or permis-
sion of department.

STAT 538. Advanced Stochastic Modeling of Scien-
tific Data II (3)
Foundations of discrete and continuous-time dy-
amical systems. Complexity of nonlinear dynamical
systems. Descriptive statistics of dynamical systems,
invariant densities and their estimation, Ergodic
properties, space and time-averaging. Chaotic behavior.
Fractals as a signature of chaos. Statistical estimation of
fractal dimension. Asymptotic fluctuations in dynami-
cal systems. Statistical problems in physical sciences;
statistical hydrodynamics. Statistical problems for hy-
drological, atmospheric and oceanic models. Theoreti-
cal foundations of simulation of random phenomena.
Prereq: STAT 437, or permission of department.

STAT 545. Advanced Theory of Statistics I (3)
A systematic development of advanced statistical
theory. Background concepts. Limits, order compari-
sions, convergence. Sample moments, quantiles and
other statistics. Transformations. Characterization of

STAT 546. Advanced Theory of Statistics II (3)

STAT 547. Advanced Theory of Statistics III (3)
Development of empirical process theory with application to censored data with random, fixed or arbitrary censoring mechanism. Characterization of quantile processes, spacings and large deviations as empirical processes. Asymptotic results for nonparametric regression, bootstrap and other resampling estimators. Prereq: STAT 546.

STAT 553. Time Series and Wavelets II (3)
Advanced topics in time series including nonstationary series, nonlinear models. In-depth development and application of wavelet theory. Wavelets as computational tool. Extensive use of computing to illustrate and investigate modeling with wavelets. Prereq: STAT 453 and STAT 446 and MATH 491, or permission of department.

STAT 555. Generalized Linear Models (3)

STAT 571. Advanced Topics in Statistics (1-3)
For advanced graduate students. Topics in specialized areas of statistical theory and methodology, with emphasis on recent advances in theory, developments of new methodology and definition of new research questions. Topics may change from year to year. Number of credit hours for the class will be predetermined at the beginning of each semester based on the material to be presented. Prereq: Permission of department.

STAT 576. Advanced Topics in Modeling (1-3)
Advanced topics in specialized areas of statistics and stochastic modeling designed to define new research directions drawing on recent advances in theory and model formulation. Focus on statistical issues arising in the application of statistical or stochastic models to new substantive research efforts. Topics may change from year to year. Number of credit hours for the class will be predetermined at the beginning of each semester based on the material to be presented. Prereq: Permission of department.

STAT 591. Statistical Research Seminar (1-3)
Seminar to prepare and explore current research topics presented by faculty and invited statistics colloquium speakers. Graduate students lecture on background material for colloquia using recent publications. Following each colloquium, students lead discussion and clarify further the contributions of the research. Newer students are paired with senior students; colloquium assignments coincide with students' research interests insofar as possible. Attendance at statistics colloquia is required. Satisfies requirement for every full-time graduate student to enroll in a participatory seminar every semester while registered in any graduate degree program. Number of credit hours will be determined by prior agreement with the instructor and depends on the extent of the student's responsibility. Prereq: Permission of department.

STAT 601. Reading and Research (1-9)
Individual study and/or project work. Prereq: Permission of department.

STAT 621. M.S. Research Project (1-9)
Completion of statistical design and/or analysis of a research project in a substantive field which requires substantial and/or nonstandard statistical techniques and which leads to results suitable for publication. Written project report must present the context of the research, justify the statistical methodology used, draw appropriate inferences and interpret these inferences in both statistical and substantive scientific terms. Oral presentation of research project may be given in either graduate student seminar or consulting forum. Prereq: Permission of department.

STAT 651. Thesis M.S. (1-18)
(Credit as arranged.) May be used as alternative to STAT 621 (M.S. Research Project) in fulfillment of requirements for M.S. degree in Statistics. Prereq: Permission of department.

STAT 701. Dissertation Ph.D. (1-18)
(Credit as arranged.) Prereq: Permission of department.

STAT 703. Dissertation Fellowship (1-8)

Teacher Education

(Ohio Teacher Licensure Programs)

Teacher Education may be chosen only as a second major by students whose primary major is in a field in which Case has teacher licensure programs approved by the Ohio Department of Education. Ohio teacher licensure can be attained by those undergraduate students who complete the requirements for licensure candidates specified within their content field (primary major) and a second major in Teacher Education, which comprises 35 credit hours in professional education, 12 hours taken at Case and 23 hours taken at John Carroll University.

Adolescence/Young Adult teacher licensure programs are available in integrated language arts (English major), integrated social studies (history major), integrated mathematics (mathematics major), life sciences (biology major), and physical sciences (chemistry or physics major). Multi-age licensure programs are available in French and Spanish. For information concerning specific content requirements in the respective programs, turn to departmental listings in English, History, Mathematics, Biology, Chemistry, Physics, and Modern Languages and Literatures.

A 3.0 grade point average in all professional education courses and a cumulative overall GPA of 2.5 must be maintained to be recommended for Ohio teacher licensure. Completion of the program does not guarantee award of licensure. The Ohio Department of Education also requires that candidates receive passing scores on the PLT (Principles of Learning and Teaching) and Content Area subtests of the Praxis II examinations, as well as fingerprinting and criminal background check by the Ohio Bureau of Criminal Identification. Once licensed, teachers can apply to transfer Ohio licensure to over 40 states. Individual state departments of education can be contacted for reciprocity details.

Teacher licensure programs are also offered in art education and music education at the undergraduate (Bachelor of Science) and graduate (Master of Arts) levels, and school speech-language pathology personnel licensure can also be attained at the graduate level. For further information, turn to the departmental listing for Art History and Art, Music, and Communication Sciences.

Program Faculty

Tim Shuckrow, M.A. (Case Western Reserve University)
Director of Teacher Licensure

Philip Safford, Ph.D. (University of Michigan)
Associate Director of Teacher Licensure

David Bellini, M.A. (Cleveland State University)
Educational Psychology Instructor

Rita Saslaw, Ph.D. (Case Western Reserve University)
Introduction to Education Instructor
EDUCATION (EDUC & EDJC)

Undergraduate Courses
EDUC 301. Introduction to Education (3)
The historical, sociological, and philosophical role of education in a diverse society. Contemporary practices and issues are introduced, researched, and debated. Issues of professional development. Application of research to instructional methodologies. Clinical/Field experiences required.

EDUC 304. Educational Psychology (3)

EDUC 338. Seminar and Practicum in Adolescents (3)
Supervised field placement and attendance in early childhood, child, and adolescent settings including preschools, schools, hospitals, and neighborhood centers. This class is used to fulfill requirements by the Ohio Department of Education teacher licensure program. Prereq: PSCL 101, EDUC 301, EDUC 304, and permission of program director. Cross-listed as PSCL 338 and SOCI 338.

Graduate Courses
EDUC 401. Introduction to Education (3)
(See EDUC 301.) Research project required for graduate students.

EDUC 404. Educational Psychology (3)
(See EDUC 304.) Research project required for graduate students. Prereq: PSCL 101.

Taken at John Carroll University
EDJC 186. Instructional Technology (2)
Principles and techniques of instructional design and use of technology in educational settings. Includes examination of emerging technologies and production of instructional materials. Lab fee required. Prereq: EDUC 301, EDUC 304, and EDUC 338.

EDJC 255. Literacy Across the Curriculum (3)
Literacy development examined through psychological, socio-cultural and historical perspectives. Examines reading as an interactive, problem-solving process. Strategies that foster critical thinking, active engagement and social interaction in the teaching of reading and writing across the curriculum. Includes field experience. Field assignments related to licensure and content area. Prereq: EDUC 301, EDUC 304, and EDUC 338.

EDJC 337. Adolescent Education Special Methods (3)
For Adolescent and Multi-Age licensure program students. General methods and specific content area methods for planning, implementing and integrating curriculum, evaluating pupil achievement, and teaching to individual differences. Aligned with Ohio Department of Education's Competency-Based Models, Praxis 2, INTASC, and learned Society Guidelines. Emphasis given to strategies related to effective teaching and learning in each licensure content area. Additional emphasis placed on nurturing a risk-taking classroom community responsive both to high standards of performance and to students with diverse backgrounds, abilities, and learning styles. Prereq: EDJC 186, EDUC 301, EDUC 304, and EDUC 338.

EDJC 405C. Adolescent Education Seminar (3)

EDJC 405D. Multi-Age Education Seminar (3)
Continued study of all grades’ development, learner achievement, and assessment. Integrates program learning with student teaching experience. Development of the professional portfolio and preparation for job interviewing. Coreq: EDJC 444D and admission to the professional semester.

EDJC 427. Adolescent Education Special Topics (3)
Practical application of issues to pre-student teaching field setting. Taken by adolescent licensure program students the semester preceding student teaching. Issues of conflict negotiation, social justice, curriculum development and school reform as they relate to the secondary school setting. Prereq: Acceptance into pre-student teaching.

EDJC 444C. Adolescent Student Teaching (9)
A full-day, full-semester of teaching in an accredited secondary school under the direction of a classroom teacher qualified in the content area and a university supervisor. Supervision includes personnel with advanced training in the relevant content area. Lab fee required. Coreq: EDJC 405C and admission to the professional semester.

EDJC 444D. Multi-Age Student Teaching (9)
A full-day, full-semester experience of teaching in an accredited secondary school under the direction of a classroom teacher qualified in the content area and a university supervisor. Supervision includes personnel with advanced training in the relevant content areas. Lab fee required. Coreq: EDJC 405D and admission to the professional semester.

FACULTY
Ron Wilson, B.G.S. (Wichita State University)
Katharine Bakeless Nason Professor in Theater and Department Chair
Director of the MFA Graduate Theater Program, Case/Cleveland Play House
Movement for the actor; acting; playwriting; performance theory

Catherine Albers, M.F.A. (University of Minnesota)
Associate Professor and Director of Undergraduate Theater Studies
Acting; audition laboratory; business of the business; on-camera acting

Russ Borski, M.F.A. (Northwestern University)
Associate Professor
Stage and lighting design; stage management

Gary Galbraith, M.F.A. (Case Western Reserve University)
Associate Professor
Contemporary dance technique; choreography; dance history; production; artistic director of Mather Dance Ensemble

Shanna Beth McGee, M.F.A. (University of Georgia)
Associate Professor
Voice

John M. Orlock, M.F.A. (Pennsylvania State University)
Associate Professor
American sign, directing, and playwriting.

Karen Potter, M.F.A. (Case Western Reserve University)
Associate Professor and Director of Dance
Contemporary dance technique; choreography; pedagogy

Jerrold Scott, M.F.A. (University of South Carolina)
Assistant Professor, Climo Junior Professor
Acting; speech; directing.

Department of Theater and Dance

DRAMA AND DANCE

Eldred Hall: Phone 216-368-4868; Fax 216-368-5184
Mather Dance Center: Phone 216-368-2854; Fax 368-6936
Ron Wilson, Chair

The Department of Theater and Dance offers education and participation in all aspects of drama and dance with course offerings in acting, dance technique, choreography, stagecraft, costume, scene design, directing, and playwriting. Students have the opportunity to perform on stage as well as serve on the technical crews in dance concerts and mainstage theatrical productions each year. The high ratio of faculty to students ensures that students will be able to work closely with highly skilled professionals. The department treats all performances as educational experiences and welcomes the participation of all students regardless of their academic majors and career goals.
ADJUNCT AND VISITING FACULTY

Joseph Fahey, Ph.D. (Ohio State University)
Visiting Assistant Professor
History, Dramatic Literature

Dean R. Gladden, M.A. (Drexel University)
Adjunct Assistant Professor and General Manager, The Cleveland Play House
Urban Arts Administration

Mark Alan Gordon M.F.A. (Ohio university)
Adjunct Associate Professor and Associate Director of the Graduate MFA Program, The Cleveland Play House
Acting; script analysis

CAREER OPPORTUNITIES

Acting

Actor education in the Department of Theater and Dance prepares majors for acting career opportunities in the American theater and in theater education. Graduates are currently employed nationally and regionally. The Graduate Acting Program collaboration between the University and The Cleveland Play House provides a unique alliance between one of the oldest theater programs in the United States and the nation's first regional theater.

Directing

A Graduate MFA Program in Directing in partnership with The Cleveland Play House will be offered in the fall of 2005 pending approval.

Stage Design and Technical Theater

Employment opportunities for stage designers and technicians continue to be ample, and demand for the services of talented, well-trained designers and technicians are constant. One aspect of the job market is in college or University Theater, where qualifications include the required M.F.A. degree or, in rare instances, equivalent professional experience. Careers also may be pursued in regional theater, as well as in areas of film, television, and industrial scenic design. A Theater Design MFA Degree is in development. This degree would include a Partnership with the Cleveland Play House and the Cleveland Institute of Art. Begin date TBA.

Dance Training Program

Graduates of the dance program are currently employed as modern dance company members (regionally and nationally), company directors/choreographers, dance production managers, and dance educators in state and private universities. Others have pursued specialized advanced training and work as dance therapists.

UNDERGRADUATE PROGRAMS

An undergraduate major in the department can lead to the Bachelor of Arts degree. The Bachelor of Arts program is a diverse course of study in all the basic crafts of the theater: acting, dance, design, costuming, playwriting, directing and theater history. The undergraduate program is designed to integrate the various elements of theater to prepare students to pursue their chosen field of specialization after graduation. This degree requires 42 to 60 semester hours in theater and is available with areas of concentration in acting, dance, general theater, dramatic writing, directing, theater in society, and design/technical theater.

BACHELOR OF ARTS

The Bachelor of Arts program in theater offers concentrations in general theater, acting, contemporary dance, or design/technical theater, and dramatic writing.

Websites:
Drama: http://www.cwru.edu/artsci/thtr/
Dance: http://Dance.cwru.edu

The following are the basic courses REQUIRED for all Theater majors.
(see listing for the course descriptions)

THTR 101, 102, 103, 201. (12 hrs.)

At least 4 but not more than 8 hours of THTR 385/386 and 6 hours of English above the 300 level. The department strongly recommends Eng. 324 and 325.

Courses required by CONCENTRATION:

GENERAL THEATER: (27 hrs.)
THTR 223, 224, 228, 229, 231 or 232, 329, 331, 375, 312 or 327
Total hours, not including THTR 385/386 - 39

ACTING: (31 hrs.)
THTR 228, 229, 231, 232, 306, 311 (1 hr.), 331, 375, 376, 223 or 224 or 352, 327 or 329.
Total hours, not including THTR 385/386 - 43

DESIGN/TECH: (30 hrs.)
THTR 105, 223, 224, 228, 229, 331, 352, 380, 327 or 329, 424 or 440
Total hours, not including THTR 385/386 - 42

DRAMATIC WRITING: (30 hrs.)
THTR 223, 228, 312, 314, 316, 327, 329, 331, 399
Total hours, not including THTR 385/386 - 42

All majors are encouraged to apply for Honors Studies, THTR 397 and 398, in their final year. This adds 6 hours to the total.

DIRECTING: (30 hrs.)
THTR 223, 224, 228, 229, 327 or 329, 330, 331, 380, ARTH 272, MUSC 221
Total hours, not including THTR 385/386 - 42

THEATER AND SOCIETY: (21)
THTR 228, 229, 235 or 370, 312, 327 or 329, 330, 352
An additional 9-10 hours from a variety of course options, to be scheduled with the advisor.
MINOR (FOR THE B.A.)

Concentration for the Minor

Hours: 18

1. General Theater: THTR 101, 103, 223 or 224 or 352, 228, 229 and 327 or 235 or 370.
2. Acting: THTR 101, 102, 231, 228, 229 and 375.
3. Design/Tech: THTR 105, 228, 229; two of the following: 223, 224 or 352, and one of the following: 327 or 329.
4. Directing: THTR 228, 229, 223 or 224, 327, 330, 331.
6. Theater and Society: There is no minor concentration in this area.

Humanities Sequence (for the B.S.-based Engineering Core)

Hours: 9

Note: All sequences must include THTR 123 or 124 and TWO additional courses selected in consultation with advisor.

Sample programs:
1. Acting: THTR 123 or 124, 101, 102.
2. Stagecraft: THTR 123 or 124, 105, and 223 or 224.
3. Costume Crafts and History: THTR 123 or 124, 352, and one of the following: 228 229 or 327.

DANCE

The following are the basic courses REQUIRED for all Theater/Dance majors.

(see listing for course descriptions)
DANC 103 or 104, 160 or 161, 203, 204 (260 or 261), 303, 304.

DEPARTMENTAL HONORS

Majors wishing to take a Bachelor of Arts degree with honors in theater and dance must make WRITTEN application to the Director of Undergraduate Theater Studies no later than May 1 of the junior year. Students must have a minimum 3.25 overall grade point average and a minimum 3.75 grade point average in theater. Acceptance into the honors program is contingent upon faculty support and recommendation by the Director of Undergraduate Theater Studies and the department chairperson. Those accepted must register for THTR 397 and 398 (Honors Studies) or DANC 397, 398 during their senior year, a total of six hours. The honors project is defined as a production project in acting, design, playwriting, directing, management/outreach, or dance. A supporting paper discussing the concept, execution, and performance of the project must be filed with the Director of Undergraduate Theater Studies no later than one week after the project presentation. Preparation of the project will be supervised by a department faculty member. This project may be accepted for honors only if it receives a grade of A from both the project advisor and the Director of Undergraduate Theater Studies. The grade of A must be received both semesters. Students who qualify will receive the notation “Departmental Honors in Theater and Dance” on their diplomas. Information about the structure and specific requirements of the honors project is available from the Director of Undergraduate Theater Studies.

GRADUATE PROGRAM

Master of Arts

Although the Department of Theater and Dances Graduate Programs are geared toward the Master of Fine Arts degrees, the appropriate candidate may select or be encouraged to direct their graduate studies in pursuit of the Master of Arts degree, a 30 hour degree program. The focus of the studies may include similar course work to the Master of Fine Arts while also facilitating particular studies that may be enhanced or assisted by related studies both within the Department of Theater and Dance as well as with other complementary studies in other departments. The candidate’s program of study will be designed by the primary faculty of the designated program (i.e. Acting, Directing, Dance or Design) within the Department of Theater and Dance. As required by the School of Graduate Studies, a minimum grade point average of 2.75 must be maintained.

M.A. candidates must complete a minimum of 30 hours following a recommended program similar to the courses
1. Nine to twelve hours of Technique Classes from: DANC 303/4, 407/8, 460/1
2. Six to nine hours of Choreography from: DANC 413, 414, 415, 416
3. One to two hours of Improvisation from: DANC 405/6
4. Twelve hours of Eurhythmics from: MUSC 501
5. Three hours of Normative Techniques from: DANC 445/6
6. Three hours of Suggested Advanced electives: i.e. DANC 535 (Pedagogy) or 455 (History)
7. Three hours of Music Resources: DANC 505
8. Two to four hours of project oriented seminars from: DANC tr. 601, 423 or 451

Recommended is Plan B with requirements including a non-performance, non-production topic approved by the primary program faculty. The thesis must be a substantial and contributive work with potential for publication or presentation. The M.A. thesis must be completed no later than one academic year beyond the completion of the course requirements.

Master of Fine Arts

The Master of Fine Arts degree, available with concentrations in acting and contemporary dance, is a terminal pre-professional degree with candidacy limited to students who wish to serve the professional theater. Candidacy for the Master of Fine Arts program requires either an undergraduate major in the field of theater arts, equivalent training and experience, or demonstrable potential for work in the theater arts at the Master of Fine Arts level. In addition, each candidate must provide evidence of technical skill and creative ability in his or her area of concentration.

At the end of each semester in residence, the student’s skill and creative ability are evaluated in light of their work in the department. Only students who have clearly demonstrated growth and excellence are permitted to remain in the program. The award of the Master of Fine Arts degree is contingent upon the student’s academic progress and upon the assessment on the part of the faculty that the candidate possesses the potential to serve the theater on a professional level.

Requirements for the Master of Fine Arts degree include:
1. A minimum of 60 semester hours of graduate work beyond the bachelor's degree.
2. A cumulative grade point average of 3.0 for all course work on the graduate level.
3. Completion of the course requirements for the M.F.A. Thesis Portfolio.
4. Performance in the Eldred Theater or Mather Dance Center mainstage season.

Specific requirements in each area of emphasis include:

Acting

In 1996 The Cleveland Play House and Case Western Reserve University joined forces to create a new program in professional actor training. The students begin their involvement with the Play House in their first semester. The level of involvement with the Play House increases every semester, and in the third year the graduates become the professional apprentices in the Play House Company.
1. Eighteen semester hours of acting including script analysis, implementation of acting theory, characterization, and Shakespeare.
2. Seven to twelve semester hours of movement chosen from period movement, stage combat, and commedia.
3. Ten to twelve semester hours of voice chosen from voice production, articulation, and interpretation, dialects, verse and lyric drama, and Shakespeare.
4. Twelve semester hours of performance theory and professional seminars.
5. Up to six semester hours, under advisement, in allied fields.

Directing

Program pending approval.

Contemporary Dance

1. Eighteen semester hours of dance technique.
2. Twelve semester hours of choreography.
3. Four semester hours (two each) of light and costume design.
4. Two semester hours of eurythmics, MUSC 501.
5. Three semester hours of contemporary dance history.
6. Two semester hours of music resources.
7. Twelve to fifteen semester hours under advisement from among kinesiology, pedagogy, and/or allied fields.
8. Six semester hours of creative thesis.

Required Total: 60 hours

SPECIAL PROGRAMS

The Marc A. Klein Playwriting Award

The Department of Theater Arts serves as the production agency for the Marc A. Klein Playwriting Competition, an annual national award designed to encourage and stimulate artistic growth among student playwrights, which features a cash prize of $1,000 and a full mainstage production. The Klein award has been responsible for the pre-professional production of a number of scripts that have moved on to Broadway, Off-Broadway, and regional theaters.

National Theater Institute

The Department of Theater and Dance has an affiliation with the National Theater Institute, located in Waterford, Connecticut, for both their Moscow semester and the semester at NTI. This prestigious program gives our students the opportunity to be exposed to the best in concentrated theater training, as well as providing a different and unique cultural perspective. Full credit is available with no loss of scholarship aid. This is available
for either semester. See the Director of Undergraduate Theater Studies for more information.

Junior Year Abroad

Many of our Drama students go abroad for either one semester at the BADA Program (British American Drama Academy) or a full year in many other programs. The BADA program is a conservatory based intensive in all aspects of actor training, with full credit transfer and no loss of financial aid. In Dance, there are opportunities for semesters abroad with the London Contemporary School of Dance, the Laban Center in London and Yildiz University in Istanbul, Turkey, and Taiwan Women's College. Dance students are eligible for scholarships at both the Martha Graham School of Contemporary Dance and the Paul Taylor School and for internships at SOAR Research at Long Island University. For more information on these and other programs, contact the Director of Undergraduate Theater Studies or the Academic Representative for Dance.

DANCE (DANC)

Undergraduate Courses

DANC 103. First-Year Modern Dance Techniques I (3)
Comprehensive perspective of theory established, through active participation, to serve individual development of normative movement principles in a broad spectrum of applications including theater movement dance, and sports. Content is directly and fundamentally serviceable to subsequent specialized training applications of the actor, dancer, musician, athlete, physiotherapist, and educator.

DANC 104. First-Year Modern Dance Techniques II (3)
Continuation of DANC 103.

DANC 121. Dance in Culture - Ethnic Forms (3)
A lecture class designed to introduce dance as an art form and the many roles it plays in a variety of cultures. Focus will be on ethnic forms and primal cultures.

DANC 122. Dance in Culture - Theatrical Forms (3)
Introduction to an historical and cultural overview of many different forms of dance from various cultures specifically selected to encompass geographic diversity and represent different periods in history. Basic craft elements of the structures of dance will be introduced to provide a foundation for viewing dance and developing a personal aesthetic.

DANC 160. Introduction to Ballet Technique I (3)
This introductory-level course offers the beginning ballet student the basic tenets and principles of ballet technique. Classwork will involve strong emphasis on proper alignment of the body, dynamic timings, and a command of ballet terminology.

DANC 161. Introduction to Ballet Technique II (3)
Continuation of DANC 160. Prereq: DANC 160 or consent of department.

DANC 189. Improvisation I (1)
Movement and dance structures designed to engage responsibility in group dynamics applied to challenge specific technical components which include time, effort, shape, and kinetic awareness. Prereq: DANC 103.

DANC 190. Improvisation II (1)
Continuation of DANC 189. Prereq: DANC 189.

DANC 203. Second-Year Modern Dance Techniques I (3)
For the performing arts student, normative movement principles are formally extended in both theory and application to include individual correction, modification of adaptation as foundational preparation for the subsequent specialized training needs of the actor, dancer, and singer. Prereq: DANC 103 and DANC 104.

DANC 204. Second-Year Modern Dance Techniques II (3)
Continuation of DANC 203. Prereq: DANC 103 and DANC 104.

DANC 260. Second-Year Ballet Technique I (3)
In-depth exploration of principles and foundations of ballet technique as preparation for the specialized training needs of dancers.

DANC 261. Second-Year Ballet Technique II (3)
Continuation of DANC 260. Prereq: DANC 260 or consent of department.

DANC 303. Third-Year Modern Dance Techniques I (3)
For the dance major and advanced non-major. D天赋al formalities of dance technique as a contemporary American art form structure the aesthetic and technical challenges of development. Prereq: DANC 204.

DANC 304. Third-Year Modern Dance Techniques II (3)
Continuation of DANC 303.

DANC 385. Rehearsal and Production (1-3)
Practicum for students participating in production work in the Department of Theater and Dance. Supervised laboratory experience in technical theater, construction techniques, scenery, costumes, lighting, and props; production; ticket office operations, promotion, publicity and public relations; house management; wardrobe responsibilities; stage management; assistant directing; and other production positions relating to the mainstage performances in Mather Dance Center. Students are recommended to take one credit hour per production, with a maximum of 8 credit hours allowed during their undergraduate career.

DANC 386. Rehearsal and Performance (1)
Practicum for students participating in performance in the Department of Theater and Dance, relating to the mainstage productions at Mather Dance Center. This course may be repeated, for a maximum total of 2 credits.

DANC 397. Honors Studies I (3)
Individual projects in dance. Prereq: Consent of department.

DANC 398. Honors Studies II (3)
Individual projects in dance. Prereq: Consent of department.

DANC 399. Independent Study in Theater Arts (1-3)
Independent research and project work in areas of dance and pedagogy.

Graduate Courses

DANC 405. Improvisation I (1)
Movement and dance structures designed to engage responsibility in group dynamics applied to challenge specific technical components which include time and effort, shape, and kinetic awareness.

DANC 406. Improvisation II (1)
Continuation of DANC 405.

DANC 407. Fourth-Year Modern Dance Techniques I (1-3)
A logical progression of advanced technique. Performing skills assessed and developmentally stressed. Sections from repertory works learned. Prereq: DANC 303.

DANC 408. Fourth-Year Modern Dance Techniques II (1-3)
Continuation of DANC 407.

DANC 413. Choreography I (1-3)
Principles governing the dynamics of concrete and imagistic space applicable to stage values defined, differentiated, and tested through applied studies. Exercising the dual role of choreographer/performer, the sequencing is designed to enlarge active perception of space values, spatial dynamics, and relationships with spatial determinants. Introduced are the psychological principles involved in the development of one's own creative process; involvement of these principles integrates the subsequent work in the choreography and production sequences.

DANC 414. Choreography II (3)
A perspective of choreographic craft elements through lecture and practical involvement with specified studies. Emphasized are the craft components of time structures. Prereq: DANC 413.

DANC 415. Choreography III (3)
Combining craft resources with emphasis on use of music. Music selections, historically categorized, are chosen for the purpose of analyzing metric and structural characteristics in accord with which choreography will be created. Prereq: DANC 414.

DANC 416. Choreography IV (3)
Use of properties, costumes, and scenic elements in both first and second function. (Northrop) applicable challenges the functional and aesthetic appropriateness of conjoint choices. Dance structures fully developed under supervision. Prereq: DANC 415.

DANC 417. Fifth-Year Modern Dance Techniques I (1-3)
Performing skills enlarged to include rehearsal and performance of full repertory works. Adaptability, versatility, and fidelity to choreographic intention stressed. Prereq: DANC 408.

DANC 418. Fifth-Year Modern Dance Techniques II (1-3)
Continuation of DANC 417.

DANC 423. Light Design for Theatrical Dance (2)
Elements of stage light design and technology for theatrical dance. Lectures and laboratory experience on color, instruments, and computerized design.

DANC 445. Principles and Philosophies of Normative Movement I (1-3)
Seminar and laboratory for assessment of kinesiological and biomechanical principles as related to dance.
DANC 446. Principles and Philosophy of Normative Movement II (1-3)
Continuation of DANC 445. Prereq: DANC 445 or consent of department.

DANC 451. Costume Design and Construction for Dance (2)
Lecture and studio course in selecting fabrics, draping techniques, construction, and design for concert dance.

DANC 455. History of Modern Dance (3)
Origin and development of modern dance in its historical context.

DANC 460. Ballet Technique for Modern Dance Students I (3)
Ballet Technique for Dancers will focus on developing the ballet skills required of the Modern Dance major. The technical level of the class will range from intermediate to advanced where applicable in barre work as well as center. Consent of department is required.

DANC 461. Ballet Technique for Modern Dance Students II (3)
Ballet Technique for Dancers will focus on developing the ballet skills required of the Modern Dance major. The technical level of the class will range from intermediate to advanced where applicable in barre work as well as center. Consent of department is required. Prereq: DANC 460.

DANC 485. Rehearsal, Performance and Production (1-3)
(See DANC 385.)

DANC 505. Music Resources for Contemporary Dance (3)
Resources in the various periods and styles of music for the dancer/choreographer. Study of the choreographic use of music.

DANC 509. Seminar: Introduction to Performance Theory (3)
Research seminar designed to acquaint the dance student with the major theoretical writings of performance theory. Readings on the creative process and archetypal mythology, Exploration of anthropological, psychological, and cultural sources of art and the theatrical impulse.

DANC 535. Contemporary Dance Pedagogy (3)
The study and investigation of the approaches and methods of teaching contemporary dance. Detailed study is made of kinesthetic, oral, and creative factors in teaching of dance. Opportunity to assist and teach under supervision.

DANC 601. Special Projects (1-3)
(Credit as arranged.)

DANC 610. Professional Internship (1-4)
Involvement in intensive internships with professional dance companies in the Cleveland area bridging academic and professional lives. Internships range from six weeks to one semester.

DANC 640. M.F.A. Thesis Production I (3)
Preproduction conception in area of specialization researched and documented under appointed advisee, in accord with production syllabus, and subcommittee approval.

DANC 641. M.F.A. Thesis Production II (3)
Production implementation, post production evaluation/defense, and advisory assessment.

DANC 644. M.A. Project (1-12)
Research and development of a Master of Arts project in Theater.

THEATER (THTR)

Undergraduate Courses

THTR 100. Introduction to Performance (3)
A course designed to provide the non-major or undeclared liberal arts major limited experience with a basic understanding of performance and the theater. Fundamentals in improvisation, vocabulary, and scene study are stressed. This course fulfills THTR 101 should the undeclared student select theater as his or her major or minor.

THTR 101. Acting I: Fundamentals (3)
This course is designed to expose the theater major or minor to the development of the actor's basic tools. Relaxation, concentration, and improvisation are taught along with basic scene study work.

THTR 102. Acting II: Exploration of Craft (3)
This course continues the work begun in THTR 101 with emphasis on action, emotional life, and text analysis as the essential elements of the actor's work. Prereq: THTR 101 and consent of department.

THTR 105. Introduction to Stagecraft (3)
An introduction to scenic construction and painting, hands-on oriented to workshop skills.

THTR 123. Theater in Culture: From Shaman to Steam Engine (3)
An introductory exploration of theater forms and practice from their origins in ritual to the scripts and staging of 19th century Europe. In addition to material presented in lecture/discussion format, the class will attend local University and professional theater productions.

THTR 124. Theater in Culture: From Steam Engine to Cyberspace (3)
Using selected dramatic texts from the 19th century to present day, the course explores the roles of production participants and audiences in their historical, cultural, and contemporary contexts. Material is presented in lecture/discussion format, augmented by live theater performances and audio-visual resources.

THTR 201. Movement for the Actor (3)
The course focuses on developing a kinesthetic awareness of the body and its use as a theatrically expressive instrument. Exercises will encompass development of flexibility, strength building, alignment, motor skills, and concentration. Prereq: THTR 101 or THTR 102 or consent of department.

THTR 223. Introduction to Scenic Design (3)
An introduction to visual design for the stage through established theories and knowledge of the theater as a physical space. Approaches practical problems of scenic design as well as professional potential of the field.

THTR 224. Introduction to Lighting Design (3)
A "grounds up" guide to theatrical lighting for the stage. Focus made upon instrumentation, choices made in the design process, aesthetics of presentation. Combines theory with practical application.

THTR 228. Theater History I (3)
Acquaints the student with theatrical and dramatic realism in Europe, the United States, and Russia (1880s through 1960s). Cross-listed as WLIT 228.

THTR 229. Theater History II (3)
Modern periods in Western theater history, from the sixteenth century to the turn of the twentieth. The course investigates materials, texts, and artifacts of theater from the Renaissance to the Modern era. Cross-listed as WLIT 229.

THTR 231. Acting III: Contemporary Technique (3)
An exploration of advanced contemporary acting technique based on the work of Michael Chekhov. Provides advanced acting students with the tools necessary to work effectively and consistently with contemporary texts, with emphasis placed on psychological gesture and geste. Prereq: THTR 101 and THTR 102 or consent of department.

THTR 232. Acting IV: Classical Technique (3)
An exploration of techniques to approach classical theater, with emphasis on the works of Shakespeare. Presents the challenges of working with heightened language, classical texts, and provides skills necessary to transfer modern acting methods to these more poetic plays. Prereq: THTR 102 or consent of department.

THTR 235. Theater and Identity: Multicultural (3)
This course will examine competing images of identity through reading of plays and critical essays from a wide range of identity groups. Themes such as “The Self and the Other,” “Gender Equality,” “Social Justice,” and “The American Dream” will be considered from the cultural perspectives of disparate artists. Frequently studied perspectives include: Native American, Asian and Asian-American, African and African-American, Gay, Lesbian, and Transgendered, Latino, Latina, and Hispanic, and women writing from a self-identified “woman’s” perspective.

THTR 306. Acting V: Camera Technique (3)
Acting for the Camera class with emphasis on how it differs from onstage work. Interviews, scenes, and exercises will be used to highlight the differences and similarities. Emphasis on contemporary works. Prereq: THTR 251 or THTR 252 or consent of department.

THTR 311. Audition Laboratory (1)
A discussion and practicum exploring the problems faced by an actor in various audition situations. Development of an audition repertory for the actor for stage, video and film. Prereq: Senior Theater major or consent of department.

THTR 312. Playwriting (3)
Theory and practice of dramatic writing, in the context of examples, classic and contemporary. Cross-listed as ENGL 305.

THTR 314. Advanced Playwriting (3)
Theory and practice of dramatic writing with special focus on the craft of writing a full-length play. Prereq: THTR 312 or consent of department.

THTR 316. Screenwriting (3)
A critical exploration of the craft of writing for film, in which reading and practical exercises will culminate in the student submitting an original full-length screenplay. Prereq: THTR 312.

THTR 327. American Theater and Playwrights (3)
Designed to provide students an overview of the development of theater in the United States and to familiarize them with the work and themes of selected American playwrights. Cross-listed as AMST 327.

THTR 329. Dramatic Literature (3)
Dramatic text analyzed in the context of theatrical production. Major analytical tools introduced.

THTR 330. Play Directing I (3)
This course will begin a two-semester study of the art and craft of stage direction of plays. Topics covered will include history of the profession, directorial theory and practice, development of skills such as text analysis, design and concept, and general problem solving. Prereq: THTR 101 and THTR 102, upperclass status and permission of department.
THTR 331. Play Directing II (3)
This course will continue with the basic concepts learned in THTR 330 and will expand those concepts into practical use. Topics will include directing mechanics, ground planning, blocking, and visualization, staging and working with actors. The course will culminate in a directing project. There are three evening labs for this course. Prereq:THTR 330, upperclass status, and permission of department.

THTR 334. Shakespeare: Histories and Tragedies (3)
(See ENGL 332.) Cross-listed as ENGL 334.

THTR 335. Shakespeare: Comedies and Romances (3)
(See ENGL 335.) Cross-listed as ENGL 335.

THTR 352. Costume Design and Construction (3)
Design and ornamentation of stage costumes and accessories. Laboratory. Prereq: THTR 123 and THTR 124 or consent of department.

THTR 370. Modern Acting Theories in Practice (3)
From Boleslavsky to Bogart, this course is designed to offer the advanced undergraduate student an introduction to a wide range of modern acting theories through reading, seminar discussion, and comparison of select theories in extended scene study. Readings and exercises are drawn from the works of Stanislavski-based theorists and practitioners as well as leading anti-realists. Texts reflect both character-based approaches and movement-based approaches to modern actor training. Prereq: THTR 101 and THTR 102 or THTR 103 and THTR 104.

THTR 375. Voice for the Stage I (3)
Development of the actor’s vocal instrument. Work in articulation, range, and flexibility. Prereq: Theatre major or consent of department.

THTR 376. Voice for the Stage II (3)
Continuation of THTR 375. Prereq: THTR 375.

THTR 380. Stage Management (3)
Designed to acquaint student with the numerous aspects of stage management.

THTR 385. Rehearsal and Production (1–3)
Practicum for students participating in production work in the Department of Theater and Dance. Supervised laboratory experience in technical theater, construction techniques, scenery, costumes, lighting, and props; production; ticket office operations, promotion, publicity and public relations; house management; wardrobe responsibilities; stage management; assistant directing; and other production positions relating to the mainstage performances in Eldred Theater. Students are recommended to take one credit hour per production, with a maximum of 6 credit hours allowed during their undergraduate career.

THTR 386. Rehearsal and Performance (1–3)
Practicum for students participating in performance in the Department of Theater and Dance, relating to the mainstage productions at Eldred Theater. This course may be repeated, for a maximum total of 2 credits.

THTR 397. Honors Studies I (3)
Individual projects in acting, dance, and directing. Prereq: Consent of department.

THTR 398. Honors Studies II (3)
Individual projects in acting, design, playwriting, and directing. Prereq: Consent of department.

THTR 399. Independent Study in Theater Arts (1–3)
Independent research and project work in areas of acting, design, voice, theater history, playwriting, directing, or theater management.

Graduate Courses

THTR 401. Advanced Stage Movement I (3)
This beginning class focuses on developing flexibility, alignment, strength, concentration and basic motor skills and serves as a base for the remaining three semesters. Yoga and Tai Chi exercises are used to develop flexibility and a relaxation of the breath. Elements of Decroux based corporeal mime technique will strengthen the student’s physical instrument as well as address alignment problems. Motor skills (articulations, inclinations and design work) will be developed with Decroux, as well as LeCoq based exercise. This work will be accompanied by Tai Chi and Aikido based chi energy work to develop the actor’s concentration. Prereq: Must be candidate in M.F.A. Acting program.

THTR 402. Advanced Stage Movement II (3)
Continuation of THTR 401. The course focuses on simplifying and empowering motor activity by continuing to connect breath to action to discover relaxation within the given task, and beginning work in characterization. Strength, flow, energy and the shedding of intrusive mannerisms will be gained from a study of Tai Chi form, and LeCoq based neutral mask work. Following the neutral mask work, students will progress to character work through the use of Physical Acting techniques. Stage combat work continues. Prereq: THTR 401 or consent of department.

THTR 403. Advanced Stage Movement III (3)
The class focuses on expanding the actor’s physical and imaginative range which will enable students to support larger and bolder physical choices in characterization. Building upon the Neutral Mask work from the previous semester, the student will experience, through LeCoq based techniques, the Expressive Mask. Following this work, the students will experience the mask work of the commedia dell’arte and create and perform a commedia scenario. Stage combat work continues. Prereq: THTR 402 or consent of department.

THTR 404. Advanced Stage Movement IV (3)
This class gives the actor the advanced physical skills and techniques needed to encompass the demands of historical dramatic texts. The work will center around period movement for the theater. The actor will experience the philosophies of carriage and deportment; religious, scientific thought and art from particular historic periods most often encountered in the professional theater. Stage combat work continues. Prereq: THTR 403 or consent of department.

THTR 424. Stage Lighting (3)
Elements of stage lighting design and technology. Lighting, instruments, and operating procedures. Laboratory lighting experience with main stage productions. Laboratory requirement.

THTR 428. Theatre History Seminar I (3)
A study of classical, medieval, and Renaissance theatrical forms, through primary and secondary source examination.

THTR 429. Theater History Seminar II (3)
Modern periods in Western theater history, from the eighteenth century to the turn of the twentieth. The course investigates materials, texts, and artifacts of theaters from the Renaissance to the Modern era.

THTR 430. Theater History Seminar III (3)
Theater historical research methods, literary critical approaches, and case studies.

THTR 431. Play Directing I (3)
Fundamentals of directing. Concept and development.

THTR 435. Scene Design I (3)
Special projects in mainstage design for theatrical settings.

THTR 440. Portfolio Designs (3)
Independent projects involving presentation and criticism of scenic or costume designs for given play, musical, or opera. Culminates in presentation of portfolio.

THTR 443. Beginning Contemporary Dance I (1)
Through active participation, a comprehensive theoretical perspective on normative movement principles for the actor and singer. Prereq: Consent of department.

THTR 444. Beginning Contemporary Dance II (1)
Continuation of THTR 443. Prereq: THTR 443.

THTR 452. Costume and Construction (3)
Special projects in costing for mainstage productions.

THTR 456. Costume Design I (3)
Lecture-studio course. The study of costume design. Theory, technique, and principles of the fundamental approach to costing a production. Prereq: THTR 352.

THTR 473. Graduate Voice Technique I (3)
Assessment of students’ current vocal and alignment skills. Laboratory for exploring new vocal and alignment habits supportive of healthy vocal functioning. Exploration of the body and voice as it relates to breath, articulation, resonance, and the healthy exhalation of sound. Prereq: Must be candidate in M.F.A. Acting program.

THTR 474. Graduate Voice Technique II (3)
Continued laboratory for the exploration of alignment and vocal skills supportive of healthy vocal functioning. Continued exploration of the body and voice as it relates to breath, articulation, resonance, and the healthy exhalation of sound. Emphasis on the physical and energetic skills needed to produce full-bodied, healthy sound capable of being heard and understood while acting in theatrical productions. Required of M.F.A. candidates in the Acting program. Prereq: THTR 473.

THTR 475. Voice for Stage: Shakespeare (3)
Development of skills needed to address the specific needs of Shakespeare in performance, including vocal skills, the use of breath, using imagery, and textual studies. Required of M.F.A. candidates in the Acting program.

THTR 479. American Stage Speech (2)
Designed to evaluate the graduate student actors’ current speech skills, to teach them a stage-appropriate dialect using the Skinner narrow IPA set, and to achieve a level of mastery over articulation and diction. Prereq: Course limited to first-year M.F.A. candidates in Acting Program.

THTR 485. Rehearsal, Performance and Production (1–3)
(See THTR 385.)

THTR 501. Text Analysis for the Actor (2)
An introduction to the craft of reading a theatrical text from an actor’s point of view. Methods for analyzing the action of a play will be applied to dramatic text so that the actor can learn to transform a one-dimensional text into a three-dimensional performance.
The various elements of the actor's process considered and performance situations. Prereq: Must be candidate for M.F.A. Acting program.

THTR 521. Graduate Audition Lab (1-2)
For design graduates in Theater Arts.

THTR 522. Advanced Problems/Design I (3)
For design graduates in Theater Arts.

THTR 530. Ensemble Technique (1-2)
A practicum course structured to explore the use of ensemble dynamic techniques in a rehearsal/performance environment, as well as to develop a set of exercises which encourage and sustain the actor's channels of interpersonal communication during a range of rehearsal and performance situations. Prereq: Must be candidate in M.F.A. Acting program.

THTR 531. Acting: Research and Performance I (3)
The various elements of the actor's process considered on advanced levels. Integration of rehearsal discoveries into a practical performance situation. Limited to M.F.A. candidates.

THTR 532. Acting: Research and Performance II (3)
The various elements of the actor's process considered on advanced levels. Integration of rehearsal discoveries into a practical performance situation. Limited to M.F.A. candidates.

THTR 533. Acting: Research and Performance III (3)
Sequential courses designed to explore the various elements of the actor's process on advanced levels and to integrate the discoveries made into a practical performance situations. Limited to M.F.A. candidates. Prereq: THTR 531 or THTR 532.

THTR 534. Acting: Research and Performance IV (3)
Sequential courses designed to explore the various elements of the actor's process on advanced levels and to integrate the discoveries made into a practical performance situation. Prereq: THTR 531 or THTR 532 or THTR 533.

THTR 536. Theater Pedagogy (1-3)
The study and investigation of the approaches and methods of teaching theater. The emphasis of study will be to prepare graduate acting students to teach a program designed for the beginning actor.

THTR 540. The Business of the Business (2)
This course covers the basic knowledge needed for an actor to plan and manage a career in the theater. Included is discussion of union rules and applications for AEA, AFTRA, and SAG. Discussion of basic marketing techniques, including development of an individual marketing plan for each student. Guest lecturers might include IRS experts on the actor's special needs, casting directors, and commercial agents.

THTR 576. Advanced Voice Technique (3)
Vocal instruction individualized to the particular needs of advanced M.F.A. Acting students. This may include the exploration of dialect skills, developing the skills for extraordinary uses of the voice, the coaching of vocal performances, or continued exploration of skills necessary for classic and poetic texts. Required of M.F.A. candidates in the Acting program. Prereq: THTR 473 and THTR 474.

THTR 579. American Stage Speech II (3)
This course will continue the work begun in THTR 479 American Stage Speech, continuing the work on IPA, articulation, and general speech clarity for the stage. Exercises from the Berry and Rodenberg Schools of thought will be used in addition to the speech basics of Skinner. Prereq: THTR 479.

THTR 580. Stage Dialects (2)
This course will examine the use and application of major stage dialects in the American theatre using a phonetic tool set as a basis for understanding sound substitutions. The student will also study the ways in which rhythmic changes and resonance and tension shifts affect the dialects. Prereq: THTR 421 and graduate standing.

THTR 581. Classical Speech and Text (2)
This course will study ways in which the actor's speech instrument is used differently in classical texts, particularly those of Shakespeare. Students will study tools for analyzing a line of text in order of understand how to use the words and sound of the line.

THTR 601. Special Projects (1-3)
(Credit as arranged.)

THTR 610. Professional Internship (1-4)
Involvement in intensive internships with professional theaters in the Cleveland area bridging academic and professional lives. Internships range from six weeks to one semester.

THTR 620. Advanced Role Analysis Preparation I (3)
Study and performance of scenes involving methods of approaching various types of plays and the specific problems they present to the individual actor. Analysis, action, characterization, and subtext are also explored. Open only to third-year M.F.A. Acting students enrolled in THTR 640. Coreq: THTR 640.

THTR 621. Advanced Role Analysis Preparation II (3)
Continued study and performance of scenes involving methods of approaching various types of plays and the specific problems they present. Prereq: THTR 620. Coreq: THTR 641.

THTR 630. Performance Studio (3)
A performance laboratory, ensemble-based practicum in which the student works to integrate effectively a wide range of performance skills culminating in a studio production. May be taken two times in the last two semesters of graduate study. Prereq: THTR 534.

THTR 642. Thesis Portfolio I (1)
Course designed specifically for candidates in the Master of Fine Arts program in Acting. Graduate students enroll for the course during their third year of study, although work spans three years of study, based on roles the M.F.A. actor has created. A portfolio is prepared, according to requirements set forth in the department's M.F.A. Handbook, and is presented to the faculty during the spring semester of the third year, in a formal oral defense. Satisfactory completion of the portfolio and its oral defense are among the requirements for awarding the Master of Fine Arts degree. Course limited to M.F.A. candidates in the Acting program.

THTR 643. Thesis Portfolio II (1)
Course designed specifically for candidates in the Master of Fine Arts program in Acting. Graduate students enroll for the course during their third year of study, although work spans three years of study, based on roles the M.F.A. actor has created. A portfolio is prepared, according to requirements set forth in the department's M.F.A. Handbook, and is presented to the faculty during the spring semester of the third year, in a formal oral defense. Satisfactory completion of the portfolio and its oral defense are among the requirements for awarding the Master of Fine Arts degree. Course limited to M.F.A. candidates in the Acting program.

THTR 644. M.A. Project (1-12)
Research and development of a Master of Arts project in Theater.

Washington Study Program
111 Mather House
Phone 216-368-1015
Emory G. Lee, Director
(egl4@po.cwru.edu)

Students receive credit for internships in Washington, D.C., through the Washington Center program. The emphasis is on practical experience in the form of a full-time internship which provides the opportunity for intensive research. For participating in a semester-length program during the fall and spring semester, students receive 9 hours for their internship course (WASH 002A). For a summer internship, students receive 3 credit hours (WASH 002D). In addition, students receive 3 credit hours for developing a portfolio based on their internship experiences (WASH 002B). Also, as part of the Washington Center program, students participate in a seminar and attend a weekly lecture/discussion group (WASH 002C). The credits earned can be counted as general electives or applied to a student's major or minor, with the prior consent of the individual department(s).

WASHINGTON STUDY PROGRAM (WASH)

Undergraduate Courses

WASH 002A. Washington Center Internship (9)
Credit for internship experience taken as part of the Washington Center Program.

WASH 002B. Washington Center - Politics and Public Policy Course (3)
Credit for the Politics and Public Policy course taken as part of the Washington Center Program.

WASH 002C. Washington Center - Portfolio (3)
Credit for the student's portfolio taken as part of the Washington Center Program.

WASH 002D. Washington Center Summer Internship (3)
Women's Studies Program

301 Guilford House
Phone 216-368-2303; Fax 216-368-2216
Margaretmary Daley, Ph.D., Director

PROGRAM FACULTY

Alice Bach, Ph.D. (Union Theological Seminary)
Archbishop Hallinan Associate Professor of Catholic Studies, Religion
Bible, women and religion, religion and film, cultural theory.

Rachel Chapman, Ph.D. (University of California, Los Angeles)
Assistant Professor, Anthropology
Social cultural anthropology, reproductive health, pregnancy and pre-natal care, gender systems, women's health in Africa; political economy, applied international health, medical pluralism, medical anthropology; Africa, Mozambique.

Margaretmary Daley, Ph.D. (Yale University)
Associate Professor of German and Comparative Literature
Eighteenth- and nineteenth-century German literature; German women writers; women's studies; feminist literary criticism.

Kimberly K. Emmons, Ph.D. (University of Washington)
Assistant Professor, English
Discourse Analysis; medical discourse, gender and language, rhetoric and composition.

Laura E. Henegholt Ph.D. (Loyola University of Chicago)
Assistant Professor, Philosophy
Political and social philosophy; philosophy of feminism; Foucault; continental philosophy.

Susan W. Hinze, Ph.D. (Vanderbilt University)
Assistant Professor, Sociology
Medical sociology; social inequality, sex and gender.

Janis H. Jenkins, Ph.D. (University of California, Los Angeles)
Professor, Anthropology; Associate Professor of Psychiatry, School of Medicine
Marie Lathers, Ph.D. (Brown University)
Treuhaft Professor of French and Comparative Literature

Women and the visual arts; Nineteenth-century French literature and the arts; Gender, science, and technology; Feminist theory.

Heather Meakin, Ph.D. (Hertford College, Oxford)
Assistant Professor, English
Renaissance literature, women's studies.

Jacqueline C. Nanfito, Ph.D. (University of California, Los Angeles)
Associate Professor, Spanish and Comparative Literature
Colonial and 19th-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.

Renée Sentilles, Ph.D. (College of William and Mary)
Assistant Professor, History
American women's history; cultural history; American studies.

Eleanor P. Stoller, Ph.D. (Washington University)
Selah Chamberlain Professor, Sociology
Social gerontology, medical sociology, and gender.

Cheryl Toman, Ph.D. (University of Illinois, Urbana-Champaign)
Assistant Professor, French
French and Francophone literature, Cameroonian feminist writing.

Athena Vrettos, Ph.D. (University of Pennsylvania)
Associate Professor, English
19th-century British literature and culture; literature and the body; feminist criticism and theory; women writers; 19th-century history of medicine and psychology.

Rhonda Williams, Ph.D. (University of Pennsylvania)
Assistant Professor, History
African-American history; U.S. social history.

UNDERGRADUATE PROGRAM

The goal of the Women's Studies Program is to educate students in interdisciplinary approaches to feminist theories of women, gender, culture, and society. Students are exposed to a variety of forms of critical thinking in relation to (1) the social construction of knowledge and philosophy; (2) approaches to science and medicine informed by “feminist empiricism” and “feminist standpoint” theories; (3) historied and cross-cultural accounts of gender and gender inequality; (4) literary criticism; (5) contemporary theories of art, performance, language, jurisprudence, psychology and religion in the context of women's experience; and (6) studies of the body as a focal point for theorizing relations among the arts and sciences.

Women's studies encompasses an interdisciplinary program that prepares students to think critically and creatively within a framework employing gender as a central category of analysis. The program is set up to test and challenge the technologies and limitations of gender roles in a multitude of cultural and historical settings. It is designed to familiarize students with the analytical and hermeneutic tools of research and interpretation, and to create awareness of the ethical, political, and aesthetic dimensions of gender in history and culture. The program's focus is the study of women cross-culturally and in history.

MAJOR

The Women's Studies Program offers a major leading to the Bachelor of Arts degree. It may be elected as a second major only. As a double major, the program offers a sound course of study, with a disciplinary concentration grounding the interdisciplinary program objective. To declare a women's studies major, students must have already declared their first major. Up to six hours credits in required or elective courses for the first major may be applied to the women's studies major, with the exception of two women's studies core classes.

Required Courses (6 hours)

In the required two courses, students will become fluent in the tools of research and interpretation currently used in women's studies. WMST 201 Introduction to Gender Studies (cross listed as HSTY 270/ENGL 270/PHIL 270, RLGN 270) and a capstone class in one of the following disciplines: ANTH 365 Seminar in Women and Gender Studies, ENGL 371.
Topics in Women's Studies, or HSTY 400 Seminar in Women's Studies. Major courses: 24 credit hours in approved women's studies courses, at least two from each of the three areas listed.

MINOR

The program in women's studies also offers an undergraduate minor. Fulfillment of the minor requires completion of eighteen credit hours according to the following course distribution:

- Introduction to Gender Studies (offered every fall and spring semester)
- Four cross-listed courses (see list below)
- Independent study

To help ensure a comprehensive course of study in a particular area of interest, the specific combination of courses and structure of the independent study must be approved by the program advisor.

Available approved courses:
ANTH 306 Anthropology of Childhood and the Family
ANTH 309 Child Abuse and Family Violence
ANTH 345 Ethnicity, Gender and Mental Health
ANTH 354 Women and International Health
ANTH 356 Gender and Sex Difference: Cross Cultural Perspectives
ANTH 372 Women and Family in the United States
SPAN 342 Latin American Women Authors

WOMEN’S STUDIES (WMST)

Undergraduate Courses

WMST 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

WMST 201. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women's studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, art history, and religion. It is the required introductory course for students taking the women's studies major. Cross-listed as ENGL 270, HSTY 270, PHIL 270, and RLGN 270.

WMST 222. Gender in U.S. Society (3)
(See SOCI 222.) Cross-listed as SOCI 222.

WMST 232. Women in India (3)
(See HSTY 232.) Cross-listed as HSTY 232.

WMST 312. Women in the Ancient World (3)
(See CLSC 312.) Cross-listed as CLSC 312.

WMST 322. Feminist Theory, Women's History, Gender History (3)
(See HSTY 322.) Cross-listed as HSTY 322.

WMST 326. Women in Societies in the Modern World (3)
(See SOCI 326.) Cross-listed as SOCI 326.

WMST 372. Work and Family: U.S. and Abroad (3)
(See SOCI 372.) Cross-listed as SOCI 372.

Graduate Course

WMST 422. Feminist Theory, Women's History, Gender History (3)
(See WMST 322.) Cross-listed as HSTY 422.
present. It understands “minority” or “third world” literatures as being just as worthy of study as European literatures; it recognizes the importance of the “classics” of both the West and East. The program requires study in a language other than English, thus emphasizing that literature and language are intimately related. Comparative courses and courses on individual authors, periods, and literatures are offered. Students who major or minor in World Literature learn to approach literature from a truly multi-cultural and multi-lingual standpoint. They also become conversant in the major schools of literary criticism and theory.

Major in World Literature (33 hours)
The World Literature program offers a major leading to the Bachelor of Arts degree. Majors in World Literature take three foundational courses (WLIT 211, 212, and one of the following: ENGL/WLIT 290, 291, CLCS/WLIT 203, 204); either Translation or Literary Theory (WLIT 388 or ENGL/WLIT 387); two courses in literature at the 300-level in a language other than English (see Modern Languages and Literatures and Classics offerings); WLIT 390; and 12 credits of electives, chosen in consultation with the World Literature faculty adviser.

Minor in World Literature (15 hours)
The minor in World Literature requires the foundation sequence WLIT 211-212, and nine credits of electives, chosen in consultation with the World Literature faculty adviser. These are normally chosen from World Literature, Modern Languages and Literatures, English, and Classics offerings. At least one of these must be a course in a literature originally not in English, although it may be in translation.

Undergraduate Honors in World Literature
The Honors Program in World Literature is for especially talented and dedicated majors. Requirements for Honors are: 1) a grade point average of at least 3.5 in the major; 2) an honors thesis completed over the course of two semesters in the senior year devoted to the investigation of a literary or cultural topic (WLIT 397 and 398; these count beyond the 33 hours required for the major). The thesis is supervised by a WLIT faculty adviser and must be approved by a second faculty member. It must receive a grade of B or better. Students who qualify receive their degrees “with Honors in World Literature.” A registration/proposal form for students electing Honors is available in the departmental offices; it must be completed by the end of the second week of classes in each of the two semesters.

GRADUATE PROGRAM
The program offers the Master of Arts degree in World Literature in cooperation with the Departments of English and Modern Languages and Literatures; the emphasis is on Francophone and Anglophone literatures. Interested students should consult with one of the program directors.

Available Approved Courses
All literature courses at the 200 and 300-levels offered by the Departments of Modern Languages and Literatures, Classics, and English are approved as World Literature courses.

WORLD LITERATURE (WLIT)

Undergraduate Courses
WLIT 203. Heroes, Myth, and Performance in Greek Literature (3)  (See CLSC 201.) Cross-listed as CLSC 203.
WLIT 204. Heroes and Hustlers in Latin Literature (3)  (See CLSC 204.) Cross-listed as CLSC 204.
WLIT 211. World Literature I (3)  Survey of literature from antiquity to 1600. May include Western and non-Western texts by Homer, Virgil, Ovid, St. Augustine, Dante, Boccaccio, Rabelais, Cervantes, Ste Thonagon, Basho, and the Baghavad Gita.
WLIT 212. World Literature II (3)  Survey of literature from 1600 to present. May include Western and non-Western texts by Swift, Voltaire, Rousseau, Tolstoi, Baudelaire, Austen, Mann, Kafka, Lisepector, Marmon Silko, Soyinka.
WLIT 225. Japanese Popular Culture (3)  (See JAPN 225.) Cross-listed as JAPN 225.
WLIT 228. Theater History I (3)  (See THTR 228.) Cross-listed as THTR 228.
WLIT 229. Theater History II (3)  (See THTR 229.) Cross-listed as THTR 229.
WLIT 235. Asian Cinema and Drama (3)  (See ASIA 235.) Cross-listed as ASIA 235.
WLIT 245. Classical Japanese Literature in Translation (3)  (See JAPN 245.) Cross-listed as JAPN 245.
WLIT 255. Modern Japanese Literature in Translation (3)  (See JAPN 255.) Cross-listed as JAPN 255.
WLIT 285. The Hispanophone World (3)  (See SPAN 285.) Cross-listed as SPAN 285.
WLIT 290. Masterpieces of Continental Fiction (3)  (See ENGL 290.) Cross-listed as ENGL 290.
WLIT 291. Masterpieces of Modern Fiction (3)  (See ENGL 291.) Cross-listed as ENGL 291.
WLIT 295. The Francophone World (3)  (See FRCH 295.) Cross-listed as FRCH 295.
WLIT 300. The City in Literature (3)  Focus on major cities of the world as catalysts and reflections of cultural and historical change. Interdisciplinary approach utilizing the arts, literature, social sciences. Examples include Berlin at the turn of the century; Paris in literature and film; Tokyo in history and literature.
WLIT 308. The Paris Experience (3)  (See FRCH 308.) Cross-listed as FRCH 308.
WLIT 314. Love Poetry from Sappho to Shakespeare (3)  (See CLSC 314.) Cross-listed as CLSC 314.
WLIT 345. Japanese Women Writers (3)  (See JAPN 345.) Cross-listed as JAPN 345.
WLIT 355. Modern Japanese Novels and the West (3)  Comparing a selection of modern Japanese novels with their Western counterparts, this course will clarify Japan’s premodern sensibility and its transformation after the Meiji Restoration (1868). Comparisons will focus on a group of interrelated themes such as modernity/modernism, alienation, innocence, death, male-female relationships, and Nature. All readings are in English translation. No prior training in Japanese language or culture required.
WLIT 363H. African-American Literature (3)  (See ENGL 363H.) Cross-listed as ENGL 363H.
WLIT 365. German Literature in Translation (3)  (See GRMN 365.) Cross-listed as GRMN 365.
WLIT 365E. The Immigrant Experience (3)  (See ENGL 365E.) Cross-listed as ENGL 365E.
WLIT 365N. Topics in African-American Literature (3)  (See ENGL 365N.) Cross-listed as ENGL 365N.
WLIT 365Q. Post-Colonial Literature (3)  (See ENGL 365Q.) Cross-listed as ENGL 365Q.
WLIT 366G. Minority Literatures (3)  (See ENGL 366G.) Cross-listed as ENGL 366G.
WLIT 368A. Introduction to Film Studies (3)  (See ENGL 368A.) Cross-listed as ENGL 368A.
WLIT 368C. Topics in Film (3)  (See ENGL 368C.) Cross-listed as ENGL 368C.
WLIT 375. Russian Literature in Translation (3)  (See RUSN 375.) Cross-listed as RUSN 375.
WLIT 385. Hispanic Literature in Translation (3)  
(See SPAN 385.) Cross-listed as SPAN 385.

WLIT 387. Literary and Critical Theory (3)  
(See ENGL 387.) Cross-listed as ENGL 387.

WLIT 388. Translation (3)  
Literary translation forms the basis of most readers’ familiarity with world literature. In an age of globalization, translation will be of increasing importance. The practice of translation has long been the province of creative writers. This course complements and draws together creative writers and students of foreign languages, showing that their practices overlap. Students should have knowledge of one language other than English to the 202 (intermediate) level. Prereq: Language other than English to the 202 level.

WLIT 390. Topics in World Literature (3)  
In-depth examination of specific critical and literary theories and of their relevance for literature and culture studies. Authors, works and instructor may vary.

WLIT 395. French Literature in Translation (3)  
(See FRCH 395.) Cross-listed as FRCH 395.

WLIT 397. Honors Thesis I (3)  
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper. Permit required. Prereq: Senior status and consent of department.

WLIT 398. Honors Thesis II (3)  
Continuation of WLIT 397. Permit required. Prereq: Senior status, consent of department and WLIT 397.

WLIT 399. Independent Study (1-3)  
For majors and advanced students under special circumstances. Permit required. Prereq: Consent of department.

Graduate Courses

WLIT 400. The City in Literature (3)  
(See WLIT 300.) Prereq: Graduate standing.

WLIT 463H. African-American Literature (3)  
(See ENGL 363H.) Cross-listed as ENGL 463H.

WLIT 465E. The Immigrant Experience (3)  
(See ENGL 365E.) Cross-listed as ENGL 465E.

WLIT 465N. Topics in African-American Literature (3)  
(See ENGL 365N.) Cross-listed as ENGL 465N.

WLIT 465Q. Post-Colonial Literature (3)  
(See ENGL 365Q.) Cross-listed as ENGL 465Q.

WLIT 466G. Minority Literatures (3)  
(See ENGL 366G.) Cross-listed as ENGL 466G.

WLIT 468A. Introduction to Film Studies (3)  
(See ENGL 368A.) Cross-listed as ENGL 468A.

WLIT 468C. Topics in Film (3)  
(See ENGL 368C.) Cross-listed as ENGL 468C.

WLIT 485. Hispanic Literature in Translation (3)  
(See SPAN 385.) Prereq: Graduate standing. Cross-listed as SPAN 485.

WLIT 487. Literary and Critical Theory (3)  
(See ENGL 387.) Cross-listed as ENGL 487.

WLIT 488. Translation (3)  
(See WLIT 388.) Prereq: Graduate standing.

WLIT 490. Topics in World Literature (3)  
(See WLIT 390.) Prereq: Graduate standing.

WLIT 495. French Literature in Translation (3)  
(See FRCH 395.) Prereq: Graduate standing. Cross-listed as FRCH 495.

WLIT 590. Seminar in World Literature (3)  
Topics vary depending on student and instructor interests; may include Postcolonial literature; Latin American literature and film; African Anglophone and Francophone literature. Prereq: Graduate standing.

WLIT 595. Independent Research (1-3)  
For graduate students under special circumstances. Prereq: Graduate standing and consent of department.

WLIT 601. Independent Study (1-18)  
For graduate students under special circumstances. Prereq: Graduate standing and consent of department.
Mandel Center for Nonprofit Organizations

The Mandel Center for Nonprofit Organizations, currently ranked among the top ten graduate business programs with a specialty in nonprofit organizations in the nation by U.S. News and World Report, offers the most comprehensive nonprofit leadership and management education programs in the United States. This university-wide academic center, founded in 1984, is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law, and the College of Arts and Sciences. These schools have joined together to address the growing need for the professional education of leaders and managers of nonprofit organizations and to foster and disseminate research on the nonprofit sector. The Mandel Center’s mission is to enhance the effectiveness of nonprofit leaders and managers and the organizations they serve through education, research, and community service.

In pursuit of that mission, the Mandel Center offers the Master of Nonprofit Organizations (M.N.O.) degree, an executive M.N.O. degree option, a Certificate in Nonprofit Management (CNM), and several dual degree and credential programs in cooperation with its four partner schools. The Mandel Center also collaborates with the Executive Doctor of Management (E.D.M.) program at the Weatherhead School of Management to offer practice-oriented nonprofit studies at the doctoral level. Policy and research issues in nonprofit leadership and management are addressed through research colloquia, affinity groups, conferences, and publications. The Mandel Center founded and continues to sponsor Nonprofit Management & Leadership, the first and foremost journal of nonprofit management in the United States. Finally, the Center provides leadership development services to the community of nonprofit organizations in the form of executive education, peer-to-peer learning, leadership roundtables, distinguished public lectures, and the Youth Philanthropy and Service (YPS) project.

ADMINISTRATION
Susan Lajoie Eagan, Ph.D.
Executive Director and Mandel Professor
Susan B. Freimark
Director of Career Services
Ann Lucas
Director of Professional Development Programs
Brenda Marshall
Associate Executive Director
Jim Saporito
Director of Development and Marketing
Linda Serra
Managing Editor, Nonprofit Management and Leadership and Coordinator of Research Services
Jennifer Shiner
Director of Youth Philanthropy and Service
Carol K. Willen, Ph.D.
Director of Academic Programs and Student Services
Rebecca W. Zirm
Director of Recruitment

PROGRAM FACULTY
Diana Bilimoria, Ph.D. (University of Michigan)
Associate Professor of Organizational Behavior
Weatherhead School of Management
Pranab Chatterjee, Ph.D. (University of Chicago)
Professor of Social Work
Mandel School of Applied Social Sciences
Laura B. Chisolm, J.D. (Case Western Reserve University)
Professor of Law
School of Law

David L. Cooperrider, Ph.D. (Case Western Reserve University)
Associate Professor of Organizational Behavior
Weatherhead School of Management
Claudia Coulton, Ph.D. (Case Western Reserve University)
Lillian F. Harris Professor of Urban Research and Social Change
Mandel School of Applied Social Sciences
Susan Lajoie Eagan, Ph.D. (Harvard University)
Executive Director and Mandel Professor
Mandel School of Applied Social Sciences
Steven P. Feldman, Ph.D. (University of Pennsylvania)
Associate Professor of Management Policy
Weatherhead School of Management
David C. Hambuck, Ph.D. (Columbia University)
Hiram C. Haydn Professor of History
College of Arts and Sciences
Frances Lee, Ph.D. (Vanderbilt University)
Associate Professor of Political Science
College of Arts and Sciences
Sharon Milligan, Ph.D. (University of Pittsburgh)
Associate Professor of Social Work
Mandel School of Applied Social Sciences
Duncan Neuhauser, Ph.D. (University of Chicago)
Professor of Epidemiology and Biostatistics
School of Medicine
Paul Salipante, Jr., Ph.D. (University of Chicago)
Professor of Labor and Human Resource Policy
Weatherhead School of Management
Marcus Stanley, Ph.D. (Harvard University)
Assistant Professor of Economics
Weatherhead School of Management
Betty Vandenbosch, Ph.D. (University of Western Ontario)
Associate Professor of Information Systems
Weatherhead School of Management
ASSOCIATE PROGRAM FACULTY MEMBERS

Steve Bullock, M.B.A. (College of St. Thomas)  
*Adjunct Instructor*  
Mandel School of Applied Social Sciences

Susan Case, Ph.D. (State University of New York at Buffalo)  
*Associate Professor of Organizational Behavior*  
Weatherhead School of Management

Rachel Chapman, Ph.D. (University of California at Los Angeles)  
*Assistant Professor of Anthropology*  
College of Arts and Sciences

Fred Collopy, Ph.D. (University of Pennsylvania)  
*Professor of Information Systems; Chair, Department of Information Systems*  
Weatherhead School of Management

David Crampton, Ph.D. (University of Michigan)  
*Assistant Professor of Social Work*  
Mandel School of Applied Social Sciences

Eileen Doherty, Ph.D. (University of California at Berkeley)  
*Lecturer, EDM Program*  
Weatherhead School of Management

Paul H. Feinberg, LL.M. (New York University)  
*Adjunct Professor of Law*  
School of Law

Ronald E. Fry, Ph.D. (Massachusetts Institute of Technology)  
*Associate Professor of Organizational Behavior*  
Weatherhead School of Management

Brian Gran, Ph.D. (Northwestern University)  
*Assistant Professor of Sociology*  
College of Arts and Sciences

Timothy Hagan, B.A. (Cleveland State University)  
*Visiting Professor for Community Affairs*  
Mandel School of Applied Social Sciences

Robert D. Hisrich, Ph.D. (University of Cincinnati)  
*Professor of Management Policy; Mixon Chair of Entrepreneurship*  
Weatherhead School of Management

Merl C. Hokenstad, Jr., Ph.D. (Brandeis University)  
*Ralph S. and Dorothy P. Schmitt Professor*  
Mandel School of Applied Social Sciences

Robert P. Lawry, J.D. (University of Pennsylvania)  
*Professor of Law*  
School of Law

Miriam R. Levin, Ph.D. (University of Massachusetts)  
*Associate Professor of History*  
College of Arts and Sciences

Robert L. Lewis, L.L.B., J.D. (Case Western Reserve University)  
*Adjunct Professor of Law*  
School of Law

Roger Lohmann, Ph.D. (Brandeis University)  
*Adjunct Instructor*  
Mandel School of Applied Social Sciences

Kelly McMann, Ph.D. (University of Michigan)  
*Assistant Professor of Political Science*  
College of Arts and Sciences

August Napoli, Jr., B.A. (University of Steubenville)  
*Adjunct Instructor*  
Mandel School of Applied Social Sciences

John Orlock, M.F.A. (Pennsylvania State University)  
*Samuel B. and Virginia C. Knight Professor of Humanities*  
College of Arts and Sciences

N. Mohan Reddy, Ph.D. (Case Western Reserve University)  
*Associate Professor of Marketing; Nancy and Joseph Keithley Professor in Technology Management*  
Weatherhead School of Management

Judy Simpson, M.A. (Goddard College)  
*Adjunct Instructor*  
Mandel School of Applied Sciences

Louis Stokes, J.D. (Cleveland Marshall Law School)  
*Senior Visiting Scholar in the Practice of Social Policy and Community Revitalization*  
Mandel School of Applied Social Sciences

EMERITUS PROGRAM FACULTY

Art Blum, D.S.W. (Western Reserve University)  
*Grace Longwell Coyle Professor Emeritus*  
Mandel School of Applied Social Sciences

MANDEL CENTER PROGRAMS

The Mandel Center offers graduate and executive education, research, publications, and community service programs of interest to practitioners and scholars of nonprofit organizations.

MASTER OF NONPROFIT ORGANIZATIONS (M.N.O.)

The M.N.O. degree is a comprehensive, multidisciplinary degree in the management of nonprofit organizations. The Mandel Center administers this professional degree, which is conferred jointly by the Weatherhead School of Management and the Mandel School of Applied Social Sciences.

The Center also offers an Executive Master of Nonprofit Organizations degree option for individuals with ten years of experience, either in a paid position or in a high-level volunteer capacity, and five years of managerial, supervisory, and/or professional experience in either a paid position or a significant, comparable, high-level volunteer capacity.

CERTIFICATE PROGRAM IN NONPROFIT MANAGEMENT (CNM)

An advanced credential which provides the practicing manager with knowledge in essential areas of nonprofit management and the environment of nonprofit organizations.
LEADERSHIP EDUCATION

Open enrollment workshops and training programs of interest to nonprofit managers, leaders, volunteers, and paid staff. The Mandel Center also works with nonprofit organizations to design programs to meet their special requirements.

RESEARCH

Colloquia, working paper series (that offers articles written by faculty and other scholars, practitioners of nonprofit management, and graduate students) and the quarterly, peer-refereed journal Nonprofit Management and Leadership address practitioners and scholars. The research program is especially strong in the fields of economic analysis, the history and current status of nonprofit organizations, the welfare state, law, strategic alliances and leadership for nonprofit organizations, human resource management for nonprofits, accounting, and foundations.

DISTINGUISHED PUBLIC LECTURES

Distinguished Public Lectures bring nationally recognized leaders and scholars to the local community, thus providing a forum for discussion and debate about the issues of most concern to nonprofit organizations.

CONFERENCES

Conferences bring together scholars and professionals to discuss current issues of nonprofit research and practice.

PUBLICATIONS PROGRAM

The Mandel Center, along with publisher Jossey-Bass, sponsors Nonprofit Management & Leadership, the first peer-refereed nonprofit management journal focusing on the sector. The journal continues to bring together the best thinking and most advanced knowledge about the special needs, challenges and opportunities of nonprofit organizations. A working paper series also offers articles written by faculty and other scholars, practitioners of nonprofit management and graduate students. An electronic newsletter about the Center and the nonprofit sector is distributed on a bi-monthly basis.

CAREER SERVICES

The Career Services office offers a number of services to enhance career exploration in the nonprofit sector. Assistance is available with résumé writing, interview preparation and other job search skills. Highlights include the Mentor Program, Externships and job search assistance. Career seminars are offered throughout the year and a website offers up-to-the-minute postings.

THE MASTER OF NONPROFIT ORGANIZATIONS (M.N.O.)

The Master of Nonprofit Organizations is a rigorous professional degree. It is designed to produce leaders and managers in human services, cultural, educational, community development, religious, and other nonprofit organizations. The curriculum recognizes the special concerns of nonprofit organizations in such areas as:
- Management of volunteers and professionals
- Resource development and fund raising
- Governance by volunteer boards of trustees and directors
- Management of multiple sources and types of funding
- A unique legal and regulatory framework
- Special values of service, community, and charity
- The entrepreneurial character of nonprofit leadership
- Special ethical and moral issues
- Measurement of performance without a profit criterion

Standard M.N.O. Program

The M.N.O. degree is a 60-credit-hour program, including 33 hours of required course work, 12 hours from a menu of “choice” courses, and an additional 15 hours of elective courses. Electives may be selected from either the “choice” courses or from an array of relevant courses offered by the university’s professional schools and the College of Arts and Sciences. Students may pursue the M.N.O. on a full- or part-time basis.

The M.N.O. curriculum covers many of the same areas as master’s degree curricula for business and governmental managers and leaders. Financial management, human resources management, marketing management, entrepreneurship, and research and analysis methods are emphasized, but the application and focus are within a nonprofit organizational context. In addition, the M.N.O. includes special areas of analysis such as nonprofit law, ethics, and the historical and social science basis of the nonprofit sector.

Executive M.N.O. Program Option

The Mandel Center also offers a 45-credit-hour Executive M.N.O. degree program option for candidates with demonstrably high potential as nonprofit leaders. Applicants to this program option should have ten years of professional and/or volunteer experience, five years of managerial and/or supervisory experience, and excellent academic qualifications. The foundation for this option is the curriculum of the 60-hour M.N.O. degree with an emphasis on the 33-credit “core” of the degree plus 12 credits of “choice” courses.

For further information, contact the Mandel Center’s Director of Recruitment, Rebecca W. Zirm, at (216) 368-6025, or by e-mail at admissions@mcno.cwru.edu.

M.N.O. Program Structure
- 60 credit hours
- Two years full-time and varying sequences for part-time study
- Classes offered during the evening and occasional intensive sessions to accommodate working students and those seeking employment while in the program.
M.N.O. Curriculum (60 credits total)

**Required Courses (33 credits)**
MAND 401. Introduction to the Nonprofit Sector (3)
MAND 409A. Strategic Planning for Nonprofit Organizations: Practicum I (3)
MAND 409B. Strategic Planning for Nonprofit Organizations: Practicum II (3)
MAND 410. Quantitative Analysis for Nonprofit Leaders (3)
MAND 411. Nonprofit Leadership Dialogs: Major Issues and Trends (1)
MAND 420. Nonprofit Organization and Management (3)
MAND 424. Economics for Nonprofit Managers (3)
MAND 425. Financial Accounting and Reporting for Nonprofit Organizations (2)
MAND 426. Financial Management for Nonprofit Organizations (3)
MAND 430. Managing Human Resources in Nonprofit Organizations (3)
MAND 432. Marketing for Nonprofit Organizations (3)
MAND 450. Law of Nonprofit Organizations (3)
MAND 455. Decision Making for Nonprofit Leaders (3)
MAND 469. Trustee: The Governance of Nonprofit Organizations (3)
MAND 486. Leading and Managing Nonprofit Arts and Cultural Organizations (3)
MAND 467. Cross-listed as SSWM 567.
MAND 469. Cross-listed as SSWM 569.

**The Practica**
The curriculum includes two practica. They stress experiential learning and teamwork under the supervision of faculty and in cooperation with participating nonprofit organizations in a variety of fields. This approach is designed to produce useful results for the participating organization as well as critical knowledge and experience for the student.

**Part-Time Study**
There are various options for part-time study in the M.N.O. program. Those interested should contact the Mandel Center for details.

**Advanced Standing for Certificate Holders**
Students who have completed the Certificate in Nonprofit Management (CNM) program with a high level of overall performance, hold an undergraduate degree from an accredited institution, and demonstrate the leadership potential required of master’s candidates may apply to the M.N.O. program and, if accepted, may be eligible for advanced standing, based on certificate course work completed with a grade of B or better. Entry into the M.N.O. program from the certificate program is not automatic.

**DUAL DEGREE PROGRAMS**
The Mandel Center currently offers dual degree programs with the Mandel School of Applied Social Sciences, the School of Law at Case Western Reserve University and the Department of Music in the School of Graduate Studies. Students must apply and be accepted for each degree program to qualify.

**M.N.O./M.S.S.A.**
This program combines the Master of Nonprofit Organizations (M.N.O.) with the Master of Science in Social Administration (M.S.S.A.). It provides career preparation for a student with interests in nonprofit management, social service, and the social work profession.

Students beginning their studies in the M.S.S.A. program must apply to the M.N.O. program prior to the completion of their first semester in the M.S.S.A. program. Students must finish one complete year of study in both the M.N.O. and M.S.S.A. programs (in either order) before they can mix courses in their final semesters of study.

- Dual degree students must receive the M.N.O. and M.S.S.A. degrees simultaneously to be granted credit for specific courses taken in the other program.
- M.N.O./M.S.S.A. students continue to register at their initial school of enrollment throughout the dual program.

For more information, contact:
Rebecca W. Zirm, Director of Recruitment
Mandel Center for Nonprofit Organizations
Case Western Reserve University
10900 Euclid Avenue
11206 Euclid Avenue, Lower Level (visitors)
Cleveland, Ohio 44106-7164
(216) 368-6025
admissions@mcno.cwru.edu

M.S.S.A./M.N.O. Advisor
Mandel School of Applied Social Sciences
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7164
(216) 368-2280

**M.N.O./J.D.**
This program combines the Master of Nonprofit Organizations (M.N.O.) with the Doctor of Jurisprudence (J.D.). It provides preparation for students who desire to practice law within a nonprofit
organizational context or serve as managers in nonprofit organizations.

Students in either program must be admitted to the other degree program to be granted dual degree status and receive credit for specific courses taken in the other program. New students can apply to both programs simultaneously. Several program study options are available. For more detailed information, contact: Rebecca W. Zirm, Director of Recruitment, Mandel Center for Nonprofit Organizations, Case Western Reserve University.

**General Provisions**

In addition to the considerations indicated above, the following provisions apply to all dual degree programs:

1. Students must meet the admission requirements and standards of both programs and be accepted into each program. This may be done at the time of application, or within the first year of study in the M.N.O., M.A., M.S.S.A., or J.D. programs.

2. A specified amount of transfer credit will be granted for academic course work taken in each of the two programs.

3. Students must adhere to the specific requirements outlined for each degree program consistent with the dual degree agreement.

4. Degrees are conferred simultaneously.

Contact the Mandel Center or the appropriate professional school for specific curriculum, sequence options, and complete information about dual degree programs.

**CERTIFICATE PROGRAM IN NONPROFIT MANAGEMENT (CNM)**

The Certificate in Nonprofit Management (CNM) program is designed for practicing leaders and managers in human service, fine and performing arts, cultural, educational, community development, civic, religious, and other nonprofit organizations, who aspire to senior-level executive positions.

The program provides knowledge in critical areas of management methodology and the operational environment of the nonprofit sector. The courses address the special concerns of the nonprofit sector in such areas as:

- Management of volunteers and professionals
- Resource development and fund raising
- Governance by volunteer boards of trustees and directors
- Management of multiple sources and types of funding
- A unique legal and regulatory framework
- Special values of service, community, and charity
- The entrepreneurial character of nonprofit leadership

CNM students must satisfactorily complete a set of five approved Mandel Center courses (15 credits), one of which must include MAND 401. They must also attend all meetings of the Nonprofit Leadership Dialogs series (MAND 411).

Admission criteria include satisfactory undergraduate work, demonstrated ability to master graduate-level course work, familiarity and experience with nonprofit organizations, and potential for executive-level management and leadership.

CNM students may take one or more courses per semester and usually complete the program in one year. Tuition and time for completion can vary depending on the courses selected. Classes are offered in a format that is designed to accommodate working students. Students who have completed the Certificate Program and hold an undergraduate degree may apply for admission to the M.N.O. program. If acceptance is granted, CNM course work completed within five years of the date of application with a grade of “B” or better is applicable toward degree requirements for the Master of Nonprofit Organizations (M.N.O.) degree.

Certificates are awarded to students who satisfactorily complete all course work and comply with Mandel Center policies pertaining to the CNM program.

Financial aid is available to qualified CNM students in the form of scholarships. Contact the Mandel Center for details.

**DEGREE/CERTIFICATE PROGRAMS**

The Mandel Center currently offers degree/certificate programs (M.B.A./CNM, M.S.S.A./CNM, and J.D./CNM) with the Mandel School of Applied Social Sciences, the Weatherhead School of Management, and the School of Law at
M.B.A./CNM

M.B.A. students with a career focus in the management of nonprofit organizations may obtain a Certificate in Nonprofit Management (CNM) by completing an M.B.A. specialization in nonprofit management (nine credit hours) plus six credit hours of nonprofit management course work above their M.B.A. requirements. By enrolling in one additional course during two semesters of the M.B.A. program, full-time students may complete the M.B.A. and the CNM without extending their course of study or incurring additional tuition fees.

**Credit Requirements for the M.B.A./CNM**

Students in the dual program must fulfill 15 credits toward the CNM certificate and 63 or 47 hours (traditional or accelerated full-time curriculum) toward the M.B.A. degree. These students may double count nine credit hours of Mandel Center courses that have been approved for credit in both programs.

**Courses in the CNM/M.N.O. Curriculum Currently Approved for M.B.A. and CNM Credit**

There is one required course for the M.B.A./CNM: MAND 401, Introduction to the Nonprofit Sector. The most appropriate sequence of study would generally include Law of Nonprofit Organizations as well. In addition, students choose three courses selected from among the following:

- Community Organization and Development Strategies
- Decision Making for Nonprofit Leaders
- Earned Income for Nonprofit Organizations
- Ethics and Professionalism for Nonprofit Leaders
- Government Funding for Nonprofit Organizations
- International Non-Governmental Organizations
- Leading and Managing Nonprofit Arts and Cultural Organizations
- Management of Community-Based Development
- Managing Human Resources in Nonprofit Organizations
- Marketing for Nonprofit Organizations
- Nonprofit Public Policy and Advocacy
- Organizational Assessment and Program Evaluation in Nonprofit Organizations
- Philanthropic Fundraising for Nonprofit Organizations
- Strategic Planning for Nonprofit Organizations: Practicum I
- Strategic Planning for Nonprofit Organizations: Practicum II
- Trusteeship: The Governance of Nonprofit Organizations

Students wishing to propose any modification in the recommended sequence of study on the basis of prior course work, past experience, or professional interest must present a request, in writing, for consideration by the Weatherhead M.B.A./CNM faculty advisor.

Students pursuing the M.B.A./CNM are also expected to attend all meetings of MAND 411, the Mandel Center’s Nonprofit Leadership Dialogs series.

**M.S.S.A./CNM**

The M.S.S.A./CNM combines the Master of Social Science Administration (M.S.S.A.) with the Certificate in Nonprofit Management. It provides excellent preparation for students who have a career focus in the management of economic and community development and nonprofit organizations.

The program consists of five courses that must include MAND 406. The remaining four courses are chosen in consultation with the M.S.S.A./CNM faculty advisor. Candidates must complete both applications and be admitted to each program separately. M.S.S.A. students must apply by no later than the end of the first semester in the M.S.S.A. program.

For more information, contact Rebecca W. Zirm, Director of Recruitment, 216-368-6025, or by e-mail at admissions@mcno.cwru.edu.

**FACILITIES AND SERVICES**

The Mandel Center for Nonprofit Organizations, Office of Academic Programs, is located in the Cleveland Hearing and Speech Center. Mandel Center classes are generally scheduled at the Weatherhead School of Management, the Mandel School of Applied Social Sciences, and the School of Law (Gund Hall). However, other campus facilities are also utilized.

Mandel Center students are entitled to full use of university facilities and services, including libraries, computer labs, career planning, and housing services. See the appropriate sections of this bulletin for details.
ADMISSION

Master of Nonprofit Organizations
Requirements

Applicants with academic records from accredited institutions of higher education who submit a complete application will be considered for admission to the program. No previous academic work in business, management, or nonprofit studies is required.

Admission requirements include:

- Completion of a baccalaureate degree
- Evidence of potential for leadership and executive-level management of nonprofit organizations
- Experience and/or familiarity with nonprofit organizations
- Submission of official scores from the Graduate Management Admission Test (GMAT)

Detailed information about GMAT dates, registration, and score reporting is available by contacting:
Graduate Management Admission Test
Educational Testing Service
P.O. Box 6103
Princeton, New Jersey, 08541-6103
1-800-462-8669 or at http://www.gmat.org

Foreign Applicants

Foreign applicants whose previous college work was completed in non-English speaking countries are required to submit an official Test of English as a Foreign Language (TOEFL) and score 550 or better on the paper test or 250 or better on the computer test. For details, see “Students from Other Countries” in the front section of this Bulletin.

Application Procedure

Applications for the M.N.O. program are available from the Mandel Center for Nonprofit Organizations at Case Western Reserve University: (mailing address - 10900 Euclid Avenue, Cleveland, Ohio 44106-7167) (visitors' address - Cleveland Hearing and Speech Center, 11206 Euclid Avenue) (by phone at 216-368-6025 or on the web at http://www.case.edu/mandelcenter). Applicants should arrange to have the following items on file at the Mandel Center for admission consideration:

- Completed application
- Current résumé or vitae
- Non-refundable $25 application fee, made payable to the Mandel Center for Nonprofit Organizations or the University
- Official sealed transcript(s) of all academic work sent directly from each higher education institution attended
- Two letters of recommendation (three letters for Executive M.N.O. applicants)
- Personal essay as outlined in application materials
- Official GMAT Test Scores

Applicants to the M.N.O. Program should submit the items listed above to:
Office of Admissions
Mandel Center for Nonprofit Organizations
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7167

Only completed applications will be processed.

For the fall semester, the application deadline for the M.N.O. program is June 1. Those requesting scholarship funding are encouraged to apply early. Applications for admission and financial assistance must be received by June 1. Those arriving after June 1 will be reviewed and considered on the basis of space and fund availability.

Students accepted for admission begin the M.N.O. program with an orientation in August, one week prior to the start of the fall semester.

Spring (January) admission to the program is possible as well. The deadline for applications for the spring semester is December 1.

Advance Tuition Deposit

Students who are accepted for admission to the M.N.O. program must make a non-refundable tuition deposit of $150 at the time of acceptance to reserve a place in the entering class.

Waiver Policy

A total of six credit hours are eligible for waiver, subject to the following requirements:

Courses to be waived must have been taken from an accredited institution within five years of the date of application to the M.N.O degree program. A grade of at least a “B” must have been earned. A Mandel Center faculty member must make written approval of the waived course. Courses will not be waived based on work experience. The final decision to waive a course rests with the instructor of the course in question. A student must register for and complete at least 54 credits toward the M.N.O. degree in residence at the university in addition to courses waived. A waived course may reduce degree requirements.

Transfer Credit

Courses granted transfer credit must be approved as applicable to the M.N.O. program. They must be taken at an accredited institution, and a grade of at least B must be earned (not counted in the GPA). Transfer credit is limited to six credits.

Substitution

An additional nine credits may be approved for substitute credit. Substitute courses replace required M.N.O. courses but do not reduce the total number of credits required to complete the program. Substitute courses must be selected and approved in accordance with a clearly defined written proposal consistent with student interests/needs and the M.N.O. program mission.

Certificate Program

Applications for the CNM program are available from the Mandel Center for Nonprofit Organizations at Case Western Reserve University: (mailing address - 10900 Euclid Avenue, Cleveland, Ohio 44106-7167) (visitors' address
- Cleveland Hearing and Speech Center, 11206 Euclid Avenue (by phone at 216-368-6025 or on the web at http://www.case.edu/mandelcenter). Applicants should arrange to have the following items on file at the Mandel Center for admission consideration:
  - Completed application
  - Current résumé or vitae
  - Non-refundable $25 application fee, made payable to the Mandel Center for Nonprofit Organizations or the University
  - Official sealed transcript(s) of all academic work sent directly from each higher education institution attended
  - Two letters of recommendation
  - Personal essay as outlined in application materials

Applicants to the Certificate Program should submit the items listed above to:
Office of Admissions
Mandel Center for Nonprofit Organizations
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7167

Only completed applications will be processed.

FINANCIAL INFORMATION

Tuition

2004-2005 tuition charges for the M.N.O. degree and CNM program are $1,058 per credit or $12,700 per semester for full-time M.N.O. students taking 12 or more credits. The cost for the CNM program depends upon the number of credit hours taken. Tuition covers instructional costs and computer usage. Books and living expenses are separate student expenses. Tuition is due and payable according to the university’s tuition payment policy for each semester in which course work is undertaken.

Financial Aid

Applications for scholarship financial aid or assistance are available from the Mandel Center. Additional information about federal or other assistance may be obtained by contacting:
Financial Aid/Registration Coordinators
Weatherhead School of Management
110 Peter B. Lewis Building
Case Western Reserve University
11119 Bellflower Road
Cleveland, Ohio 44106-7235
216-368-3399 or 216-368-3821

Please Note: Initial scholarship and financial aid decisions are typically made in the spring for the following fall, so early application to the M.N.O. or CNM program is encouraged. Requests for financial assistance received after June 1 will be reviewed and considered based on availability of funds.

ACADEMIC REGULATIONS

Registration

Registration for the M.N.O. and CNM programs is done through the Weatherhead School of Management. The Director of Academic Programs and Student Services must approve all schedules prior to registration.

Refer to the Weatherhead School section of this Bulletin for information about course changes and withdrawals. For additional information about registration, contact the Mandel Center at (216) 368-8566.

Course Loads

Full-time graduate students normally register for no more than 15 or less than 9 credits per semester, and student enrollment is usually consistent with one of several recommended courses of full or part-time study.

Non-Degree Students

A maximum of two courses (6 credits) from the M.N.O. curriculum may be taken (subject to space available) by students admitted to non-degree status through the Weatherhead School of Management, providing that course prerequisite requirements are met. Contact the Director of Admissions at the Weatherhead School for further information at (216) 368-2030. (Note: Non-degree students are not eligible for federal financial aid, but may apply for private loans.)

Retention and Graduation Requirements

M.N.O. Program

The retention requirements for continued study in the M.N.O. program are:
- Minimum GPA after 15 credit hours of study: 2.5
- Minimum GPA after 23 credit hours of study: 2.7
- Minimum GPA after 30 credit hours of study: 3.0
- Minimum GPA for graduation: 3.0

A student will be placed on academic probation after any semester in which the minimum GPA is not attained. A student who has not attained the minimum GPA in a particular semester will be allowed one additional semester to attain the minimum GPA in order to continue in the M.N.O. program.

A candidate for the M.N.O. degree must file an application to graduate not later than two months before the commencement at which the degree is expected. The filing of this application is the responsibility of the M.N.O. candidate. Contact the Registrar of the Weatherhead School of Management for complete information.

Eligibility of the candidate to graduate at the time requested will be verified upon receipt of the application.

Time Limitation

All requirements for the M.N.O. degree must be completed within six years from the day of the student’s initial registration.

Certificate Program

Satisfactory completion of an approved set of five courses (15 credits), along with payment of all tuition and fees is required for graduation. Participants who complete all requirements will be awarded the Mandel Center Certificate in Nonprofit Management.
Mand Center for Nonprofit Organizations • 385

Official transcripts for course work completed may be obtained from the University Registrar's Office, 110 Yost Hall.

COURSE DESCRIPTIONS (MAND)

MAND 401. Introduction to the Nonprofit Sector (3)
An examination of the social history of nonprofit organizations in the United States, to develop an historical perspective and a sense of magnitude, scope, and functions of the nonprofit sector and its relationships with business and government. This course will explore the theoretical bases upon which social scientists have sought to understand the role of the nonprofit sector in our economy and in our political and social systems, and will explore the issues that will shape the future of the sector. Eligible for M.B.A. credit.

MAND 405. Nonprofit Ethics and Professionalism (3)
This course is an application of ethical frameworks and analysis to nonprofit organizations. Using cases and essays, the course will help nonprofit managers become better equipped to address ethical problems and dilemmas in their work in the following areas: ethics of boards, ethics and leadership, ethics and organizational culture, professional ethics, and ethics and fundraising. Eligible for M.B.A. credit.

MAND 406. Nonprofit Public Policy and Advocacy (3)
This course is an introduction to the institutions and processes that make up the political environment of nonprofit organizations in the United States. The course will examine the role of civil society in a democracy, take a general overview of American political institutions and the cultural beliefs that undergird them, and examine the important elements of the public policy process: the framing of issues, the role of political entrepreneurs and organized interests, elections, the legislative process and strategies for influencing it, and the roles of executive institutions and the courts. Emphasis will be placed on the ways that nonprofit advocates can advance their goals in the public policy process. Eligible for M.B.A. credit.

MAND 407. Earned Income for Nonprofit Organizations (3)
In this course, students will examine the entrepreneurial behavior of nonprofit sector organizations in identifying new and varied sources of income to supplement the traditional contribution base. Using cases, students will explore the nontraditional sources of income that drive the tax-exempt sector, analyze data, and make management decisions. Eligible for M.B.A. credit.

MAND 408. Philanthropic Fundraising for Nonprofit Organizations (3)
This course will provide current and future nonprofit leaders with a detailed survey of the practices, principles, and process of fundraising, enabling them to effectively create, participate in, and manage fund development programs and staff. Successful fundraising is shown to be communication-based and built upon solid relationships with defined constituencies of donors and potential donors. Eligible for M.B.A. credit.

MAND 409A. Strategic Planning for Nonprofit Organizations: Practicum I (3)
This is the first of a two-course, integrated, practicum series designed to provide "hands-on" experience in planning for, designing, and conducting strategic planning in nonprofit organizations. Students will learn to assess organizational readiness, facilitate the design of strategic planning processes, create a variety of approaches involving key stakeholders, and finalize a planning design suited to organizational culture. Eligible for M.B.A. credit.

MAND 409B. Strategic Planning for Nonprofit Organizations: Practicum II (3)
This is the second of a two-course, integrated practicum series designed to provide "hands-on" experience in planning for, designing, and conducting strategic planning in nonprofit organizations. Student teams will continue to consult with their nonprofit organizations to implement the committee deliberation phase of the planning process designed during the first practicum. Eligible for M.B.A. credit.

MAND 410. Quantitative Analysis for Nonprofit Leaders (3)
This course is designed to give students basic understanding and working knowledge of data analysis, statistical concepts, use of computers, research designs for program planning and evaluation, and quantitative techniques for problem solving. The intent is to ensure that executives and leaders are able to effectively utilize and interpret statistical data, technical reports, research findings, and evaluation studies, and employ basic quantitative methods in their own analysis of problems and policies.

MAND 411. Nonprofit Leadership Dialogs: Major Trends and Issues (1)
This course is intended to enable students to learn about major nonprofit leadership issues and trends through interaction and dialog with successful nonprofit leaders. It is also designed to provide outside nonprofit leaders with the opportunity to learn about the quality of the Mandel Center’s student body.

MAND 412. Leadership for Nonprofit Organizations (3)
This course examines leadership from nonprofit political, managerial, and sociological perspectives. Concepts of leadership will be applied to nonprofit organizations through case discussion, student experience, and class exercises. The course integrates theory-based and practice-based approaches and prepares students to participate in leader-follower dynamics in the nonprofit setting.

MAND 420. Nonprofit Organization and Management (3)
This course will focus on theories of organizations and general concepts and principles of management, governance, and leadership. Organizational design, behavior, performance, and effectiveness will be studied, and the special character and management problems of nonprofit organizations will be highlighted and analyzed. Eligible for M.B.A. credit.

MAND 422. Organizational Assessment and Program Evaluation in Nonprofit Orgs. (3)
The course is designed to introduce students to the approaches to organizational assessment and evaluation of organizational issues and problems. The class will explore a variety of ways of viewing organizations, assessing their stage of development, look at factors that influence or interfere with their forward progress, review the dimensions essential to nonprofit organizations and explore some processes useful to enable change. In addition, the course will focus on the process of creating and measuring program outcomes. Eligible for M.B.A. credit.

MAND 423. Government Funding for Nonprofit Organizations (3)
This course provides students with practical, hands-on understanding of, and experience with, government support of nonprofit 501(c)(3) organizations. Students learn about and utilize trends, tools, and techniques leading to successfully navigating the maze of government funding. The course will emphasize familiarity with sources of information, the development of effective proposal writing skills, government grant and contract management, government political processes, and an understanding of the culture of government grant review and grant making. Students will experience the advice, counsel, and wisdom of professionals involved with government grant writing review and funding. Eligible for M.B.A. credit.

MAND 424. Economics for Nonprofit Managers (3)
This course is designed to familiarize students with basic ideas of microeconomic analysis so that they may apply this reasoning to important resource-related decisions facing contemporary nonprofit organizations. This introductory course will orient the student to the role of nonprofit organizations in a market economy, familiarizing the student with basic concepts of microeconomic analysis and how they apply to resource-related decisions, and provide the student with tools and concepts for analyzing pricing, compensation, outsourcing, investment of funds, and engaging in partnerships.

MAND 425. Financial Accounting and Reporting for Nonprofit Organizations (2)
A working knowledge of accounting principles and practices as they pertain particularly to nonprofit organizations is stressed in this course. Topics include basic concepts of accounting, generation and use of accounting information, understanding and use of standard accounting reports, and the nuances of fund accounting and other subjects especially germane to nonprofit organizations. (Intensive format offered prior to and/or within regular term.)

MAND 426. Financial Management for Nonprofit Organizations (3)
This course focuses on techniques and principles of financial management including budgeting, finance and investment decision making. Topics include budget formulation, analysis and planning, present value analysis, cost-effectiveness, cash flow analysis, portfolio management, and venture planning. Special emphasis will be given to the unique problems of nonprofits in capital formation, generating earned income, managing endowments, gifts and grants, and tax planning.

MAND 427. International Non-Governmental Organizations (3)
This course examines the role of voluntary associations in the international arena and, in particular, the multiple roles of international non-governmental organizations in affecting international political and economic outcomes. The course also examines the theoretical issues surrounding NGOs and international relations, particularly the relationship between global civil society and international political outcomes. Eligible for M.B.A. credit.

MAND 430. Managing Human Resources in Nonprofit Organizations (3)
Theories and principles of managing people in organizations are addressed in this course, including...
motivation theory and human resource development strategies. Particular attention is devoted to issues critical to nonprofit organizations, such as the management of volunteers, management of professionals, working with trustees, and staff/board relationships. Eligible for M.B.A. credit.

MAND 432. Marketing for Nonprofit Organizations (3)
This course provides students with a comprehensive overview of the principles and techniques of nonprofit marketing and with an understanding of the multiple contexts in which they are applicable—marketing of products and services, marketing to potential funders, marketing of ideas and behaviors (social marketing and advocacy). The focus of the course is on managerial decision-making to achieve organizational objectives and enhance organizational viability. Eligible for M.B.A. credit.

MAND 440. Management Information Systems for Nonprofit Organizations (3)
An examination of how the management of organizations in contemporary society can be understood as the managing of systems and operations that require the processing and analysis of information. Basic concepts and models of systems analysis, management information and decision systems, and operations management will be explained and applied to the analysis and control of organizational processes and the relationship of the organization to its environment. Computer-based models may be used to analyze problems, policies, and practices of organizations in a variety of nonprofit industries.

MAND 450. Law of Nonprofit Organizations (3)
This course provides the student with a basic grounding in the laws and regulations governing nonprofit organizations. Content will include the procedures for incorporating, reporting, and maintaining tax-exempt status as a nonprofit organization, a familiarity with legal principles and research methods, and an overview of the legal, regulatory, and policy issues facing contemporary nonprofit organizations. Eligible for M.B.A. credit.

MAND 467. Community Organization and Development Strategies (3)
(See SSWM 567.) Eligible for M.B.A. credit. Cross-listed as SSWM 567.

MAND 469. Management of Community Based Development (3)
(See SSWM 569.) Eligible for M.B.A. credit. Prereq: MAND 467. Cross-listed as SSWM 569.

MAND 486. Leading and Managing Nonprofit Arts and Cultural Organizations (3)
This course addresses major issues affecting the leadership and management of arts organizations, the values and assumptions which have influenced arts organizations in the past, and current trends in society which may call those assumptions into question. Emphasis is given to issues of cultural sensitivity for leaders, managers and audiences as well as broadening the perspectives of future leaders so they may productively and creatively manage their institutions and careers. Eligible for M.B.A. credit.

MAND 489. Trusteeship: Governance of Nonprofit Organizations (3)
This elective course deals with the definition, history and concept of trusteeship, the areas of responsibilities of Boards of Trustees, the authority of Boards and the limits on its exercise, the organization of Boards and their committees, and the Board’s relationships with the Executive Director, the staff and the organization's constituencies. Eligible for M.B.A. credit.

MAND 495A. Decision Making for Nonprofit Leaders (3)
This course introduces students to decision-making strategies and techniques appropriate for use by leaders and managers of nonprofit organizations. Students working in teams will consult with local organizations, analyzing their current situation, diagnosing problems and opportunities, creatively envisioning possibilities, evaluating potential improvements, and recommending appropriate decisions. Eligible for M.B.A. credit.

MAND 501. Special Problems and Topics (1-18)
An elective which provides the opportunity for an individualized, structured course of study in an area of special interest to the student, and arranged by mutual agreement between the student and an appropriate faculty member. Prereq: Permission of instructor.
Mandel School of Applied Social Sciences

11235 Bellflower Road
Phone 216-368-2290; Fax 216-368-8670
Grover C. Gilmore, Ph.D., Dean and Professor

MISSION STATEMENT

The Mandel School provides and integrates professional social work education, research, and service to promote social justice and empowerment in communities through social work practice locally, nationally, and internationally.

A TRADITION OF SOCIAL WORK

Consistently ranked among the nation’s foremost graduate schools of social work, the Mandel School counts among its alumni many prominent educators, government officials, accomplished practitioners, researchers, and chief executives of national and regional agencies. Faculty achievements in professional organizations, research, and agency consultation further extend the school’s reputation as an active participant in the advancement of social work practice. The Mandel School believes that advanced practitioners are strategists of change, working in partnership with others to enhance the caring capacity of communities. We are committed to preparing advanced practitioners able to understand the dynamics of problematic social situations and to identify the strengths and resources in individuals, families, and communities that offer the best hope of solutions. Our school is dedicated to developing leadership in the empowerment at all systems levels and in the ongoing struggle against discrimination and oppression. The Mandel School supports innovation and excellence in the service of building healthy communities. The Mandel School offers a course of study leading to the Master of Science in Social Administration (M.S.S.A.), a social work master’s degree; an advanced program for the Doctor of Philosophy in social welfare; several joint programs; and continuing education for professionals. The Master of Science in Social Administration (M.S.S.A.) is accredited by the Council on Social Work Education. Master’s students pursue their degree through a variety of study options, including full-time study, individualized part-time programs, and specialized study options for employed social workers.

Since its founding in 1916 as one of the nation’s first university-affiliated schools of social work, the Mandel School has been an innovator in professional education. The school’s long-standing dedication to community action has brought more than 300 organizations into a field education program of unusual scope. In every type of local and regional organization, students develop skills in direct practice, research, management, fund raising and community development. Continuing interests in international social work, policy analysis and occupational social work add breadth to a curriculum designed to offer students every opportunity for individualized and interdisciplinary study.

The Mandel Center for Nonprofit Organizations offers advanced education in management and governance for leaders from every type of service organization throughout the United States. Its programs combine the perspectives of social science, law, and management for master’s students and Ph.D. fellows wishing to pursue careers in the nonprofit sector. A Mandel School education is more than preparation. It is an opportunity to join a national network of scholars and practitioners who are shaping the course of social work in communities throughout the United States.

ADMINISTRATION

Grover Cleveland Gilmore, Ph.D. (Johns Hopkins University)
Dean and Professor
Wallace J. Gingerich, Ph.D. (Washington University)
Associate Dean for Academic Affairs
Claudia J. Coulton, Ph.D. (Case Western Reserve University)
Associate Dean for Research and Training
Victor K. Groza, Ph.D. (University of Oklahoma)
Chairperson, Doctoral Program
Deborah Jacobson, Ph.D. (Tulane University)
Director, Intensive Weekend Program
Sarah Andrews, M.S.S.A. (Case Western Reserve University)
Director, Twelve-Month Advanced Standing Program
Elizabeth M. Tracy, Ph.D. (University of Washington)
Director, School Social Work Certificate Program
Zoe Breen Wood, M.S.W. (Virginia Commonwealth University)
Director, Ability Based Learning Environment (ABLE)
David Schrader, M.S.S.A., (Case Western Reserve University)
Assistant Dean for Development
Pamela R. Carson, B.S. (Kent State University)
Director, Development for Alumni and Allied Constituencies
Arthur S. Biagiotti, M.S.S.A., M.S.L.S. (Case Western Reserve University)
Director, Lillian F. and Milford J. Harris Library
Nancy L. Graf, M.S.W., LISW (Boston College)
Director, Continuing Education Program
Gerald A. Strom, M.S.W., LISW (Howard University)
Director, Field Education
Karen A. Powers M.B.A. (Case Western Reserve University)
Assistant Dean, Finance and Administration
Sandra R. Bolton, M.E.D. (Cleveland State University)
Assistant Dean, Student Services
Joan S. Horinka, M.B.A. (Case Western Reserve University)
Director, Admissions
Susan Freimark, M.A., L.P.C., (John Carroll University)
Director, Career Development and Management
Debra Fields
Registrar
Paul Kubek, M.A. (Cleveland State University)
Director, Communications
Soad Mansour, ACSW, LISW
Director, International Affairs for Social Welfare and Non-Governmental Organizations

FACULTY
Kathryn Betts Adams, Ph.D. (University of Michigan)
Instructor
Sarah Andrews, M.S.S.A. (Case Western Reserve University)
Instructor
David E. Biegel, Ph.D. (University of Maryland)
Henry L. Zucker Professor of Social Work Practice
David Crampton (University of Michigan)
Assistant Professor
Pranab Chatterjee, Ph.D. (University of Chicago)
Professor
Claudia J. Coulton, Ph.D. (Case Western Reserve University)
Lillian F. Harris Professor of Urban Research and Social Change
Susan Lajoie Eagan, Ph.D. (Harvard University)
Mandel Professor of Nonprofit Management
Kathleen J. Farkas, Ph.D. (Case Western Reserve University)
Associate Professor
Mark S. Fleisher, Ph.D. (Washington State University)
Semi J. and Ruth W. Begun Professor, and Director of the Begun Center for Violence Prevention Research and Education
Jerry E. Fioresch, Ph.D. (University of Chicago)
Assistant Professor
Wallace J. Gingerich, Ph.D. (Washington University)
Professor
Kenneth C. Green, Ph.D. (University of California)
Visiting Scholar in Computer Technology
Victor K. Groza, Ph.D. (University of Oklahoma)
Professor
Deborah Jacobson, Ph.D. (Tulane University)
Instructor
Merl C. Hokenstad, Jr., Ph.D. (Brandeis University)
Ralph S. and Dorothy P. Schmitt Professor
Lenore A. Kola, Ph.D. (Boston University)
Associate Professor
Gerald J. Mahoney, Ph.D. (Vanderbilt University)
Verna Hauk Motto Professor of Families and Communities
David B. Miller, Ph.D. (University of Pittsburgh)
Associate Professor
Dorothy C. Miller, D.S.W. (Columbia University)
Visiting Associate Professor and Executive Director of the Center for Women
Sharon E. Milligan, Ph.D. (University of Pittsburgh)
Associate Professor
Arthur J. Naparstek, Ph.D. (Brandeis University)
Grace Longwell Coyle Professor of Social Work
Regina Nixon, Ph.D. (Howard University)
Instructor
R. Susan Pearlmutter, Ph.D. (University of Kansas)
Assistant Professor
Marvin L. Rosenberg, D.S.W. (Western Reserve University)
Associate Professor
Mark I. Singer, Ph.D. (Case Western Reserve University)
Professor
Louis Stokes, J.D. (Cleveland Marshall Law School)
Senior Visiting Scholar in the Practice of Social Policy and Community Revitalization
Gerald Strom, M.S.W. (Howard University)
Instructor
Aloen Townsend, Ph.D. (University of Michigan)
Associate Professor
Elizabeth M. Tracy, Ph.D. (University of Washington)
Associate Professor
Kathleen Wells, Ph.D. (University of Colorado)
Professor
Zoe Breen Wood, M.S.W. (Virginia Commonwealth University)
Instructor
John A. Yankey, Ph.D. (University of Pittsburgh)
Leonard F. Mayo Professor
Dennis R. Young, Ph.D. (Stanford University)
Professor

ACADEMIC PROGRAMS

Master's Degree Programs

Master of Science in Social Administration

The Master of Science in Social Administration (M.S.S.A.) program prepares students for advanced social work practice in a variety of settings. The master's curriculum is designed to address the wide range of skills and functions required of a professional social worker. Mandel School students are instructed on the various theories of individual and group behavior as well as community systems theory. The application of this knowledge, along with the appropriate use of practice principles and techniques, is a major educational objective.

The curriculum is divided into two levels: foundation and advanced. The foundation curriculum (21 credit hours) includes the knowledge, values, processes, and skills essential for the general practice of social work. It consists of general courses in social work methods, human devel-
School social work is available as a special ment; and community development.

Concentrations include: aging; alcohol and other drug abuse; children, youth and families; health; mental health; management; and community development.

School social work is available as a special emphasis.

**Ability Based Learning Environment (ABLE)**

The M.S.S.A. program incorporates an ability based learning environment that enables students to develop and demonstrate mastery of eight core social work abilities. Classroom courses and field education are designed to help students develop each ability and continuously assess their learning throughout the educational experience. Mastery of the abilities is demonstrated in the field practicum and documented in a cumulative learning portfolio.

Upon entering the program, students are placed in small learning groups, each facilitated by a faculty mentor. Learning groups meet periodically throughout students’ time in the program to help them accomplish the following:

- assess their overall development in each ability;
- integrate classroom and field learning experiences;
- develop a portfolio that demonstrates mastery of each ability; and
- become life-long, self-directed learners.

Mandel School faculty place a high priority on the integration of theory with practice. To facilitate this integration, field work is done concurrent with course work. Through field education, students have the opportunity to acquire new skills and apply their classroom learning in their practice setting. The school is affiliated with over 300 agencies in the Greater Cleveland area, creating a vast network of field education as well as employment opportunities. Students are required to complete over 900 clock hours of field education. The school and the affiliated agency or field setting agree on the content and conditions of field education, including the qualifications of social workers who serve as field instructors. Field placement decisions are based on educational criteria, with student interests and career objectives taken into consideration.

**Direct Practice Concentrations:**

- Aging
- Alcohol and Other Drug Abuse
- Children, Youth and Families
- Mental Health
- Health

Health, Alcohol and Other Drug Abuse concentrations are offered only in the Full-Time format.

**Macro Practice Concentrations:**

- Management
- Community Development

Some advanced courses in the Macro are offered only in the Intensive Weekend format.

**Plan of Instruction for the M.S.S.A. Degree**

**Full-Time Programs**

**Two-Year**

The traditional full-time program is a four-semester program.

**Advanced Standing**

Up to 15 hours of advanced standing may be granted to students who have completed their bachelor's degree in social work from an institution that is accredited by CSWE in the past 7 years.

The Advanced Standing Program is available to students with a strong academic record in their BSW program. This program follows a fall, spring, summer pattern and is intended for the student who has clear professional goals and can manage an accelerated format of study. Students complete their degree in August.

Admission to the Advanced Standing Program is open to students who have a bachelor’s degree in social work (B.S.W.) from an accredited program completed within the past seven years. Grades of B or better must have been attained in all foundation social work courses.

Because of the short time frame for completing the Advanced Standing Program, dual degrees, individualized curricula, and the school social work emphasis are not available in this program.

**Senior Year in Professional Studies Program**

Undergraduate students of superior ability and achievement may be admitted to the Mandel School at the end of their junior year. A student in the Senior Year in Professional Studies Program is permitted to substitute the first year (32 semester hours) at the Mandel School for the last year of undergraduate work. The bachelor's degree will be granted by the undergraduate college when the student has completed his or her first year at the Mandel School. Students applying for this program must be interviewed by an admissions officer as part of the application process to explore the candidate's level of maturity, knowledge of social work, and readiness for professional education. Application for this program should be made prior to the second semester of the junior year. Requirements for admission to the Senior Year in Professional Studies Program are as follows: attainment of a cumulative grade point average of at least 3.25 in all courses in the student's undergraduate program; completion of three-quarters of the major and minor concentration requirements in the undergraduate program. Final acceptance into the Senior Year in Professional Studies Program is contingent upon receipt of a written statement from the dean of the applicant's undergraduate college, guaranteeing that the student will receive the baccalaureate degree from that college upon satisfactory completion of 31 semester hours at the Mandel School of Applied Social Sciences, Case Western Reserve University.

Note: This program is available to students at Case Western Reserve University,
Intensive Weekend Program

The school offers a format of concentrated weekend learning for social workers with career experience who are employed full-time. Classes meet one weekend per month (including one Friday per course) throughout the calendar year. Courses are taken one at a time. This program allows students to complete their field education requirement at their place of employment. A student can expect to earn the degree in three years. If granted advanced standing, a student may be able to complete the program in two years.

Extended Degree Program

Students may opt to complete their degree work on a part-time basis during their first year. During the second and third years, the student will complete field education requirements and carry a full-time or nearly full-time load.

Extended degree program (EDP) students select classes from the full-time weekday schedule. Employed social workers may participate in this program if they can arrange a flexible work schedule. The EDP program may be completed in three years. Students granted advanced standing may complete the program in fewer semesters. EDP students are required to register for a minimum of six credit hours per semester. A student must complete all degree requirements in a maximum of five years.

Dual and Interdisciplinary Degree Programs

(Available to full-time students only)

Dual Social Work and Law (M.S.S.A./J.D.) Program

A dual-degree program established by the Mandel School of Applied Social Sciences and the university’s School of Law makes it possible for selected full-time students to pursue an integrated program of studies and receive the M.S.S.A. and J.D. degrees. This program allows completion of both degrees within four years rather than the normal five years. Applicants for the dual-degree program must apply to and meet the admission requirements of both professional schools.

Dual Social Work and Master of Nonprofit Organizations (M.S.S.A./M.N.O.)

The dual M.S.S.A./M.N.O. (master’s degree in nonprofit organizations) is designed for individuals without previous graduate training in social work or management who have set their sights on becoming managers of social service agencies. The program is designed to bring the student to a level of professional competence in both the management of nonprofit organizations and the practice of social work. Students may pursue a direct practice, management, or community development concentration in their M.S.S.A. degree. The Mandel Center also offers a one-year certificate program in nonprofit management. This program consists of five courses that meet throughout the year on evenings and/or weekends.

Dual Social Work and Master’s in Business Administration

The M.S.S.A./M.B.A. is designed for candidates who wish to prepare for advanced social work practice in a variety of clinical settings while developing the skills to assume management responsibility in those organizations.

NON-DEGREE STUDY

Some courses may be taken on a non-degree basis with the permission of the Associate Dean for Academic Affairs. A maximum of 12 hours earned on a non-degree basis may be counted toward requirements for the master’s degree if the student is subsequently admitted as a degree candidate.

Admissions and Application Information

Admission to the master’s degree program at the Mandel School of Applied Social Sciences is granted on a selective basis determined by the quality of the total application. An applicant for admission is expected to meet the following minimum requirements:

1. A bachelor’s degree from an accredited college or university.
2. Evidence of capacity to succeed in graduate level social work education based on undergraduate work and any previous graduate work. For acceptance into the program, the minimum undergraduate grade-point average is 2.7. A Miller Analogies Test or Graduate Record Exam score at or near the fiftieth percentile may compensate for a grade point average below 2.7. In exceptional cases, applicants who lack the required academic credentials but whose other qualifications are outstanding may be admitted on a probationary basis. Students who enter on probation may not carry more than 13 credit hours in their first semester. Probationary students must achieve at least a 3.0 grade point average in their first semester of course work (minimum of six credits) to have their probationary status removed and continue in the program.
3. Undergraduate course work in the social and behavioral sciences strong enough to ensure the candidate’s ability to do creditable work at the graduate level. Courses might include history, anthropology, psychology, sociology, philosophy, communications, and social welfare.
4. Evidence of a combination of personal qualities and values that are considered essential for the professional practice of social work: strong moral character; strong analytical and verbal skills; caring and compassionate qualities; and a personal commitment to social justice, empowering individuals, and serving vulnerable and under represented groups.
5. The School may request a personal interview or additional information about an applicant if necessary.
ADMISSION PROCEDURES

The Mandel School catalog and application materials can be secured from the Office of Student Services, Mandel School of Applied Social Sciences, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7164 or by calling 1-800-863-6772.

Students are admitted in the fall semester. Applications are accepted on a rolling admissions basis, though prospective students are strongly encouraged to apply early (December/January) for admission. A $30 non-refundable application fee must be submitted at the time of application.

Advanced Standing

Advanced standing (up to 15 credit hours) may be granted to students who have earned a bachelor’s degree in social work within the past seven years from an institution accredited by the Council on Social Work Education. Students must have earned a grade of B or better in each social work foundation course for which advanced standing credit hours are given. Students granted advanced standing are not required to complete selected social work foundation courses and the first semester of field education.

Proficiency Examinations

Students without a bachelor’s degree in social work may waive the foundation courses in policy, socio-behavioral theory, and research by passing a proficiency examination. No credit hours are granted for passing the proficiency exams. Successful completion of the exam(s) exempts the student from the requirement to compete the course(s). Advanced or elective course(s) may be substituted in order to fulfill graduation requirements. There is no fee or penalty associated with taking the proficiency exams. However, each exam may be taken only once.

Transfer

Transfer credit may be given for related course work completed within the past three years. Credit hours must not have been applied toward a previous graduate degree. Up to 6 hours of credits may be transferred from a non-social work master’s level program. Students who are transferring to the Mandel School from another graduate school of social work may apply for transfer credit for up to one full year of academic work and field education. Transfer students from social work programs must submit field work evaluation(s) and official transcripts. Students must have received a grade of B or better in any course for which transfer credit is sought.

International Students

Applicants from other countries follow the regular application procedure. International students must have completed available social work training in their own countries, and have had paid experience in the social welfare field prior to entering the professional degree program. International students are required to furnish results of the Test of English as a Foreign Language (TOEFL) administered by the Educational Testing Service, Princeton, New Jersey, U.S.A. Results of this test must be forwarded to the Office of Student Services. A student from abroad whose native language is English, who has completed his or her work in a foreign university where English is the language of instruction, or who has studied at or graduated from an American institution, is exempt from this requirement. All international students must pay the health service fee and purchase the medical insurance policy. No exceptions are allowed. All international applicants must submit to the University’s Office of International Students evidence of funding sources to fully finance the cost of education, housing, and transportation.

Students holding a B.S.W. from their country of origin may be eligible for advanced standing. Applicants should contact the Council on Social Work Education (CSWE) directly and ask to have their program reviewed. Please write to CSWE, 1725 Duke Street, Suite 500, Alexandria, VA 22314-3457.

FINANCIAL INFORMATION

Tuition

In the 2004-2005 academic year, tuition for the Mandel School of Applied Social Sciences in the full-time Master’s degree program is a flat rate of $25,400, or $847 per credit hour.

A non-refundable tuition deposit of $100 is required of all master’s degree candidates at the time of acceptance. This deposit will be applied toward tuition for the degree program. Complete Academic Policies, Procedures and Financial Aid Information are available by contacting MSASS, Office of Student Services.

DOCTORAL PROGRAMS

DOCTOR OF PHILOSOPHY

The purpose of the program is the preparation of scholars, teachers, and leaders to generate new knowledge on the policies and programs of social welfare and the practice of social work. Accordingly, we emphasize the creative and evaluative skills necessary for independent inquiry. We prepare students to be knowledgeable in:

- relevant areas of the social and behavioral sciences;
- research design, statistics, and the philosophy of science;
- theory-building and theories of social welfare.

In addition to this foundation knowledge, students develop specialized expertise in policy analysis and program planning, or social work practice theory; and in one or more substantive areas of social welfare. Effort is made to provide an educational climate in which critical analysis and creative thinking flourish. The program core emphasizes philosophical and scientific approaches to theory development, the content and boundaries of theoretical social welfare, statistics and advanced research methodologies, and the social and behavioral science foundations underpinning social welfare programs and social work practice.
The area of specialization enables the student to apply social science theory, analytical approaches, and research tools to a social problem or issue in either social welfare policy or social work practice. Students are encouraged to focus on a substantive policy or practice area during the period of specialization. This facilitates the development of a dissertation proposal. Permeating the content of the entire program is a focus on the development and transmission of knowledge as a part of an educational process.

Students with a specific career interest in teaching, regardless of their area of specialization, are encouraged to take courses in social work education, learning theories, and teaching strategies as an integral part of the educational plan. Teaching mentorships can be arranged.

Students can pursue special interests through individual reading and courses. In addition, regular course offerings in other departments of the university are available to students. To the extent possible, practical experiences on faculty-conducted research projects are made available to doctoral students.

A total of 36 credit hours of course work is required, plus 18 hours of dissertation credit. A qualifying examination, given after completion of the program core, determines each student's eligibility for degree candidacy. The degree is awarded following successful completion of the dissertation.

The school reserves the right to require additional courses that may not be credited toward the doctoral requirements, if the faculty believes the student has insufficient knowledge in core areas of the curriculum, or to assist students in their intellectual and professional development.

FORMATS OF THE PH.D. PROGRAM

In response to the differential needs and interests of potential Ph.D. students, MSASS offers two formats for meeting course and degree requirements. Program requirements under both formats include taking 12 courses (36 credit hours), passing a qualifying exam, and completing a dissertation.

THE ALTERNATIVE PROGRAM STRUCTURES ARE:

The Full-Time 14-Month Program

Under this format, full-time students complete course requirements in a minimum of 14 calendar months. This intensive study plan requires total commitment to Ph.D. study during this period of time.

Full-time Ph.D. Program

First Summer
SASS 608 Philosophy of Science and Theory Building (required)
SASS 610 Theories of Human Behavior: Macro and Micro Dimensions (required)
SASS 613 Advanced Research Design (required)
Fall Semester
SASS 615 Social Statistics and Data Analysis (required)
SASS 614 Models of Qualitative Research (required)
SASS 609 Theories of Social Welfare and Social Justice (required)
January Term
SASS 624 Models of Social Work Practice or
SASS 695 Social Welfare Policy and Planning Models (one required)

Spring Semester
SASS 616 Multiple Regression and Analysis of Variance (required)
SASS 635 Methodological Issues in Qualitative Research (elective)
SASS 630* Seminar in Social Work Education (elective)
SASS 637 Independent Study June Qualifying Examination

Second Summer
SASS 625 Social Work Practice Applications or
SASS 694 Models of Service Delivery (one required)
SASS 618 Measurement Issues in Quantitative Research (required)
SASS 617 Specialization Seminar (elective)
SASS 630* Seminar in Social Work Education (elective)
SASS 637 Independent Study
Dissertation (SASS 701/18 credit hrs.)

The Summer Study Program

Course work and residency requirements for the Summer Program can be completed during three summers and two January interim periods. This format is designed to accommodate social work educators and professionals who must maintain their employment commitments, but wish to pursue Ph.D. study during the summer residence. Under both formats, all students will begin the program the first Monday in June with an intensive six-week period of study. During this time they will take three core courses. Students must devote full time to study during this six-week period. Summer program students will have a one-week to 10 day period of study in January, a second six-week period of study the following summer, a second period in January, and finally a third six-week summer period. During the fall and spring semesters of the first year, Summer Study Students take two graduate level statistic courses at a university in their own community that have been approved by the doctoral program.

Full-time students will normally complete the qualifying examination in the spring following completion of core courses. Summer-study students will complete the qualifying examination prior to their third summer of residence. It is expected that the third summer will be devoted to preparation of the dissertation prospectus, as well as completion of course requirements.

First Summer
SASS 608 Philosophy of Science and Theory Building (required)
SASS 610 Theories of Human Behavior: Macro and Micro Dimensions (required)
SASS 613 Advanced Research Design (required)

Fall-Spring
Statistics Courses (2 required)
(equivalent to SASS 615 & SASS 616) (see above)
SASS 615 Social Statistics and Data Analysis (required)
SASS 616 Multiple Regression and Analysis of Variance (required)
Test or Graduate Record Examination is required for application to the Ph.D. program. Applicants should have a score of at least 1100 on the combined Verbal and Quantitative section of the Graduate Record Examination or 60 on the Miller Analogies Test. A minimum grade point average of 3.0 for baccalaureate and master's degree study is expected.

Additional materials considered in reviewing applications include the completed application form and a written statement, with the non-refundable application fee; official transcripts of all previous undergraduate and graduate courses taken for credit; and letters of recommendation. In addition, students from other countries must submit results of the Test of English as a Foreign Language (TOEFL) with a minimum score of 600 or its equivalent. General inquiries about the advanced programs and requests for application forms should be directed to:

Mandel School of Applied Social Sciences
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7164
1-800-944-2290 ext. 2284

Completed applications should be sent to the address above.

ACADEMIC POLICIES FOR PH.D. IN SOCIAL WELFARE

Residence Requirement
To meet the official residence requirement, students must be registered for at least three courses in the Ph.D. program either in each of two consecutive semesters or two consecutive summers. A minimum of one year following successful completion of the qualifying examination and course work is generally necessary to complete the doctoral dissertation.

Faculty Advisors
Each doctoral student is assigned a faculty advisor to assist in the planning of his or her educational experience. At the appropriate time, a dissertation advisor is appointed after consultation with the student.

Qualifying Examination
The qualifying examination for doctoral candidates is taken after completion of foundation courses. The exam is intended to test the student's ability to critically analyze and integrate knowledge.

Admission to Candidacy
Students are admitted to candidacy for the Ph.D. degree upon the successful completion of the qualifying examination. To be admitted to candidacy, the candidate also must have maintained an average of 3.0 and received not more than one course grade of C or lower. To remain in the program, students must maintain a minimum of a cumulative 3.0 average and receive no more than one grade of C or lower.

Dissertation Requirements
Each candidate for the Ph.D. degree must submit a written dissertation as evidence of his or her ability to conduct independent research at an advanced level. The dissertation must present a significant contribution to knowledge in the student's field, and at least a portion of the content must be suitable for publication in a reputable professional journal or as a book or monograph.

The dissertation prospectus must be completed and accepted within two calendar years after the student has been admitted to candidacy, and the dissertation must be completed and accepted within five calendar years after admission to candidacy. It is to the student's advantage to make steady progress in his or her research and aim for early completion of the dissertation. Before a candidate leaves the school as a full-time student, he or she should have formulated the topic, been assigned a dissertation advisor, and had the dissertation prospectus approved by a faculty committee constituted for this purpose.

Once a student registers for SASS 701, Dissertation, he or she must continue to register each succeeding regular semester (fall and spring) until the dissertation is complete unless granted a leave of absence. The minimum requirement for the
dissertation is 18 hours. The minimum acceptable registration is three semester hours per semester, until 18 hours are completed.

All requirements for the Ph.D. degree must be completed within a period of five consecutive calendar years after a student is admitted to candidacy, including periods of leaves of absence. For students whose leaves of absence are for duty in the armed services, the time limitation will be extended by their period of service.

Doctoral Program Financial Aid

Financial aid is available to admitted students in the form of tuition assistance and research and training assistantships. Policies of the doctoral program regarding international students and registration are the same as those of the master’s degree program described in the MSASS bulletin. Grading policy is the same as that for the master’s degree program.

CONTINUING EDUCATION PROGRAM

Opportunities to increase practical knowledge and skills are offered to human services practitioners in a variety of workshops, institutes, and cosponsored events. Every effort is made to provide practitioners with information that addresses (1) current social issues and practical problems; (2) basic principles and concepts applicable to a wide range of services; and (3) innovative approaches to direct services, staff development, management, and planning.

Over 130 courses are offered throughout the year on campus and at selected off-campus sites. New offerings are developed in response to the demands of practice and to the needs of public and voluntary agencies at all levels. Social Work Licensure Examination Review Courses are offered three times per year.

MSASS is approved by the Ohio Counselor and Social Worker Board to provide continuing professional education to social workers and counselors. Courses offered in the MSASS Continuing Education Program usually meet license renewal requirements for these and other professionals: i.e., psychologists, nurses, nursing home administrators and chemical dependency counselors.

General inquiries should be sent to the Director, Continuing Education, Mandel School of Applied Social Sciences, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7164. Brochures describing these programs are issued regularly, and individuals are placed on a mailing list on request.

COURSE DESCRIPTIONS

ABLE 411. Ability Based Learning Environment Seminar (1)
The ABLE seminars are designed to support students in the successful completion of the School’s ability-based learning curriculum. Following an extensive ABLE orientation, students participate in four seminars designed to assist them in both understanding the ability-based approach and in becoming adept at self-assessment. Seminars meet three to five times per semester and focus on the School’s Eight Abilities. Instructors facilitate the assessment and self-assessment process in order to guide students in their attainment of the Abilities. Students compile a portfolio and compose a final integrative paper at the conclusion of the fourth seminar.

ABLE 512. Ability Based Learning Environment Seminar (1)
The ABLE seminars are designed to support students in the successful completion of the School’s ability-based learning curriculum. Following an extensive ABLE orientation, students participate in three advanced seminars designed to assist them in both understanding the ability-based approach and in becoming adept at self-assessment. Seminars meet three to five times per semester and focus on the School’s Eight Abilities. Instructors facilitate the assessment and self-assessment process in order to guide students in their attainment of the Abilities. Students compile a portfolio and compose a final integrative paper at the conclusion of the fourth seminar. Prereq: ABLE 512 and ABLE 513.

(SASS)
SASS 350. Seminars in Applied Social Sciences (1-3)
Surveys of special subject areas. Topics vary in response to faculty and student interests. Small group discussion. Prerequisite depends on content. Prereq: Permission of instructor.

SASS 390. Independent Study for Undergraduates (1-3)
Individual study in Applied Social Sciences involving specific programs of reading, research, and special projects. Requires prior approval of faculty member directing the project. Prereq: 12 hours of social science courses; approval of MSASS Associate Dean.

SASS 391. Seminar on Community Needs and Services (3)
The course is directed towards students interested in exploring the relationship between community needs and service delivery. The course will have both a classroom and experiential component. The goal of the course is to provide students an opportunity to experience first-hand the application of theoretical knowledge to community needs. Prereq: Permission of instructor.

SASS 401. Field Education I (2)
This field education experience exposes students to social work experiences at the individual, community, and administrative levels. Students spend 176 hours in this field experience. A written assignment is required that reflects the student’s understanding of the placement’s approach to working with individuals and communities, as well as a comprehensive look at the administrative and professional focus of the placement. This course is taken concurrently with SASS 495 Field Education Seminar and SSWM 400 Social Work Methods. Coreq: SASS 495 and SSWM 400.

SASS 401A. Field Education I (ABLE) (1)
This field education experience exposes students to social work experiences at the individual, community, and administrative levels. Students spend 176 hours in this field experience. A written assignment is required that reflects the student’s understanding of the placement’s approach to working with individuals and communities, as well as a comprehensive look at the administrative and professional focus of the placement. This course is taken concurrently with SASS 495 Field Education Seminar and SSWM 400 Social Work Methods. Coreq: SASS 495 and SSWM 400.

SASS 402. Field Education II (4)
This course is a continuation of SASS 401. For students with advanced standing this course is the first field education experience. Advanced standing students will have this placement in their area of concentration and will be required to complete the same written assignment required of students who take SASS 401. Students spend 300 hours in SASS 402. Prereq: SASS 401 or advanced standing.
SASS 495. Field Education Seminar (1)
This seminar prepares students for entry into field education. The course introduces students to a number of topics that are considered basic to beginning the social work field practicum.
SASS 500. Special Topics in Applied Social Sciences (1-6)
SASS 502A. Field Education II (ABLE) (3)
This course is a continuation of SASS 401A. For students with advanced standing this course is the first field education experience. Advanced standing students will have this placement in their area of concentration and will be required to complete the same written assignment required of students who take SASS 401A. Students spend 300 hours in SASS 502A. Prereq: SASS 401A or advanced standing.
SASS 503. Field Education III (4)
In the advanced field education placement in the area of the student’s concentration, students are expected to focus their experience to meet their educational learning needs. Students spend 300 hours in SASS 503. Prereq: SASS 402.
SASS 503A. Field Education III (ABLE) (3)
In this advanced field education placement in the area of the student’s concentration, students are expected to focus their experience to meet their educational learning needs. Students spend 366 hours in SASS 503A. Prereq: SASS 502A.
SASS 504. Field Education IV (3)
Continuation of SASS 503. Students spend 336 hours in SASS 504. Prereq: SASS 503.
SASS 504A. Field Education IV (ABLE) (3)
Continuation of SASS 503A. Students spend 336 hours in SASS 504A. Prereq: SASS 503A.
SASS 505. Adoption: Practice and Policy (3)
This course covers the concepts, knowledge, skills, and policies associated with contemporary adoption practice. The practice method reflects a triad perspective, meaning that adoption is examined from the viewpoints of birth parents, adoptees, and adoptive parents. For each topic area, social work roles, activities, tasks, and skills are explored along with policy issues. Exemplars and case studies are presented for illustration purposes. Consideration of triad needs at different life cycle stages are presented. The issues of ethnically competent adoption practice are emphasized throughout the course in each content area.
SASS 515. Family Caregiving (3)
The purpose of this interdisciplinary graduate-level seminar is to explore the theoretical research, policy, and practice issues related to informal caregiving of the elderly. Topics will include the historical and cultural context of family caregiving, theoretical paradigms (i.e., adult development, stress and coping), characteristics of caregivers (i.e., gender, relationship, race, ethnicity, employment status, geographical setting), characteristics of the elderly care-receiver (i.e., type of cognitive and physical impairments), ethics, physical and mental health outcomes, service delivery issues, institutionalization, and bereavement. Through readings, discussions, guest lectures, and paper presentations, students will learn about the complexities of informal caregiving of the elderly from a range of disciplinary perspectives in order to improve assessment and practice skills in a variety of settings. Students are encouraged to focus on issues relevant to their discipline, specialization, or field of practice for their seminar papers.
SASS 538. Global Aging (3)
A silent revolution is taking place as we enter the 21st century. The “globe” is greying! Population aging is a worldwide phenomenon. This rapidly changing demographic environment has important implications for social policy and the quality of life. The Global Aging Course examines the historical, economic, social, and political dimensions of the aging revolution. It then focuses on cross-national comparisons of policies and programs for older persons. Finally, global issues and action identified by the United Nations International Plan of Action on Aging are discussed.
SASS 574. Legal Issues in Social Work (3)
This course surveys the legal system as it affects social work, either direct service practice or in the development of human service policies and programs. Students are exposed to the basic trial court procedures and have the opportunity to develop necessary skills to testify. A paper is required in which the student analyzes and integrates the legal and social work issues on a proposed topic of interest.
SASS 575. Travel and Study Seminar (3)
This course acquaints the student with the socio-political factors that influence the development of social welfare systems in a selected country and the impact of these systems on the development and functioning of individuals, families, groups, or communities. The role of the emerging social work profession in social change is explored via the social welfare system. Topics focus on the health care, mental health, aging, child, and/or educational systems and are oriented towards direct practice, management, or community development.
SASS 586. Ethical Issues in Social Work Practice (3)
The main focus of the seminar is to relate ethical principles to direct practice. Through lecture, discussion, group projects, and case examples, students gain a deeper understanding of ethical issues related to confidentiality, justice, client autonomy, whistle blowing, and other areas of great importance to social work practice today.
SASS 590. Field Practice (1-12)
SASS 594. Independent Study Abroad (1-12) (Credit as arranged.)
SASS 598. Individual Reading (1-12)
Prereq: Special written permission needed. See MSASS registrar.
SASS 608. Philosophy of Science and Theory Building (3)
This is a required foundation course. The nature of theory is examined. Inductive and deductive methods for knowledge building are reviewed. Course content draws from philosophy of science as well as empirical and phenomenological research.
SASS 609. Theories of Social Welfare and Social Justice (3)
This is a foundation course required for all students. Theories of social welfare and social justice are examined. Course content draws from moral philosophy, economics, political science, cultural anthropology, sociology, history, psychology, and social welfare theory and provides students with a broad orientation to the field of theoretical social welfare.
SASS 610. Theories of Human Behavior: Macro and Micro Dimensions (3)
This course deals with labeling, socialization, ecological, structural-functional, and conflict theories as macro-level theories. This course ends with a review of cultural, social reproduction, and postmodern orientations.
SASS 613. Advanced Research Design (3)
This foundation course in research methods is required of all students. It is a prerequisite to the quantitative and qualitative courses. Research designs and methods relevant to social welfare planning, policy development, practice and administration are examined.
SASS 614. Models of Qualitative Research (3)
This required course introduces the social scientific paradigms for qualitative research and then explores varying qualitative research models, including ethnography, grounded theory and life history methods. Prereq: SASS 608, SASS 613, and SASS 618.
SASS 615. Social Statistics and Data Analysis (3)
This foundation course (or its equivalent) is required of all students. Content includes univariate, bivariate and inferential statistics, and the use of electronic data processing technology to manage and analyze data. Prereq: SASS 613.
SASS 616. Multiple Regression and Analysis of Variance (3)
This course builds on SASS 615, and either it or its equivalent is required of all students. Content focuses on using analysis of variance and multiple regression. Prereq: SASS 615.
SASS 617. Specialization Seminar (3)
This course focuses on problem definitions and research issues related to specialized populations, fields of service and practice roles. The issues selected as the focus are based on faculty and student interests. Prereq: SASS 614 or SASS 618.
SASS 618. Measurement Issues in Quantitative Research (3)
This course covers the operationalization of social science concepts and development of methods for their measurement. Issues covered include index and scale construction, validity, reliability, questionnaire design, factor analysis, measurement error, and missing data. Prereq: SASS 615 and SASS 616 are recommended.
SASS 624. Models of Social Work Practice (3)
This is the first of two required courses for students specializing in direct practice. It critically analyzes the theory based knowledge underlying contemporary practice. The course is designed to examine the development of practice theory, to develop a framework for the analysis of theory and to assist students in applying theory in building a conceptual model for a social issue they define.
SASS 625. Social Work Practice Applications (3)
This is the second of two courses aimed at the analysis and development of models of direct practice. Student works on the construction of an approach to practice related to his or her interests. Prereq: SASS 624.
SASS 630. Seminar on Social Work Education (3)
This seminar examines the structure and content of social work education within the context of higher education in American society. Emphasis is placed on curriculum design and course development. The course also is designed to help students develop a strategic approach to teaching based on learning theory. Finally, attention is given to current issues and future directions for social work education.
SASS 632. Research Project (3)
This course provides students with the opportunity to work with specific faculty engaged in research studies either on an individual or group basis. Prereq: SASS 614 and SASS 615.
SASS 635. Methodological Issues in Qualitative Research (3)
This course builds on SASS 614, Models of Qualitative Research. It focuses on the application of specific qualitative data-collection methods, data-analytic approaches, and strategies for representing findings from qualitative investigations. Prereq: SASS 614.

SASS 637. Individual Reading (1-18)
This is an individual reading course permitting students to select areas of interest and pursue these interests with specific faculty. (This also is the course number to register for dissertation credits before passing the qualifying examination.)

SASS 642. Teaching Practicum (1-6)
Students interested in experiential learning within social work education can arrange a teaching assistantship within the M.S.S.A. curriculum.

SASS 646. International Social Welfare (3)
This elective course focuses on social welfare programs and services in selected industrialized countries, with particular attention given to comparison of income maintenance and social service programs. Frameworks for cross-national analysis are examined and various national programs are evaluated in the context of these frameworks.

SASS 694. Models of Service Delivery (3)
This course is required of all planning and policy development students. Content includes analysis of large data set to answer key policy questions. Prereq: SASS 695.

SASS 695. Welfare Policy and Planning Models (3)
This seminar focuses on the analysis of social welfare policy. Tools of policy analysis and frameworks for policy analysis are examined and critiqued. Policy alternatives are considered from an analytical and comparative perspective. Attention also is given to policy development and implementation with emphasis on program planning and evaluation.

SASS 701. Dissertation Ph.D. (1-18)
This course is intended for students who have passed the qualifying examination and are actively working on their dissertation.

SASS 703. Dissertation Fellowship (1-8)

(SPPP)

SPPP 470. Social Policy (3)
This course provides basic perspectives on social policies related to poverty, health, aging, mental health, substance abuse, and discrimination. An analytical framework is used to systematically identify, define, and analyze social problems and policies. The course also introduces the student to social planning and service delivery.

SPPP 500. Special Topics in Social Work Policy (3)
This seminar course is intended for students who are interested in exploring advanced topics in social policy.

SPPP 502. Alcohol and Other Drug Abuse Policy and Service Delivery (3)
This course explores selected current alcohol and other drug abuse (AODA) problems using a problem analysis framework. Emphasis is placed on current and past AODA problem definitions as they affect policy and program development. Conceptualization of the problems resulting from AODA patterns of use and abuse, causation theories, the impact of cultural and social diversity as well as discrimination upon all client systems, and the role of local and national institutions which advocate for this population group are reviewed. Prereq: SPPP 470.

SPPP 510. Mental Health Policy and Service Delivery (3)
This course is designed for students preparing for careers as social workers in the mental health field with an understanding of mental health policy and service delivery at the federal, state, and local levels. Through readings, lectures, discussion, and written assignments, the course will aid students in developing a macro-level perspective of mental health policies and programs. Prereq: SPPP 470.

SPPP 511. Issues in Health Policy and Service Delivery (3)
This course examines health care policy issues and options, and highlights the development of health care policy in the U.S., the influence of health policy development, and the role of social work. It also examines the problems, policy, and program issues in the subsidy, financing, reorganization, and regulatory capacity of health policy. National, state, and local issues will be stressed. The course is for students in the health concentration but also welcomes students from other areas. Prereq: SPPP 470.

SPPP 512. Legislative and Political Process (3)
This course focuses on how to deal effectively with legislators, their staff, and legislative systems. The roles of money and information in legislative and political systems are examined. The process through which a bill moves to become law is explored, including critical points of intervention in that process. Lobbying legislators, including presentation of testimony and use of coalitions, is featured. Prereq: SPPP 470.

SPPP 513. Aging Policy and Service Delivery (3)
This course reviews current income, health, and social service policies for older Americans. It also investigates patterns and levels of care for the elderly. Trends and issues in policies and programs for seniors are analyzed in the context of the dimensions and differential characteristics of the aging population in the country. Some cross-national comparisons of services for the elderly are included in this analysis. Prereq: SPPP 470.

SPPP 520. Homelessness Policy and Service Delivery (3)
This course provides an understanding of homelessness and its incidence and prevalence, its origins, both historical and social, its consequences, and policy-based strategies for its prevention. The course investigates the impact of homelessness on single individuals, families with children, minorities, and vulnerable populations such as the mentally ill and alcoholics. Students, organized into a task force, examine a range of professional and community-based responses to the problem. The task force method enables students to assess the effects of public policy on homeless people, critique the effectiveness and adequacy of local shelter and service programs, and propose community-based strategies to prevent, stop, and better homelessness. Prereq: SPPP 470.

SPPP 525. AIDS Seminar (3)
This course is designed to provide an understanding of HIV/AIDS. The nature and prevalence of the disease, including its impact upon vulnerable populations such as children and youth, women, gay and lesbian populations, people of color, prisoners, IV drug users, and street people are examined. The course focuses on public policies, programs, and service delivery for HIV/AIDS at local, state, and national levels. Topics include the policy-making role of advocacy groups, the function of AIDS service organizations, and the design of educational and preventive programs. Prereq: SPPP 470.

SPPP 529. Child and Family Policy and Service Delivery (3)
This course focuses on major federal legislation impacting children, youth, and families, examined in the context of community based social work policy/practice. It builds upon the foundation course in social welfare policy and enables students to use an advocacy approach to provide policy-informed services and to participate in policy and implementation and change. Prereq: SPPP 470.

(SRCRH)

SRCRH 426. Introduction to Social Research (3)
This course provides an overview of the basic concepts used in the conduct of scientific inquiry and the tools of research methodology. It introduces students to the issues involved in the design, implementation, analysis and utilization of social research. Students are encouraged to focus on a practice-related research problem in their individual or group research projects, as well as to focus on research issues relevant to their specialization, field of practice, or field practicum setting. Students are alerted to the risks of cultural bias in research throughout the course through examples and scientific readings.

SRCRH 530. Practice Evaluation (3)
This advanced course prepares direct practice students to examine their own practice with individuals, families, and groups. Attention is given to basic principles of measurement and selection of appropriate measurement instruments for use in direct practice settings.

The course is intended to provide students with the technical skills necessary to investigate the components of social work practice and contribute to an empirically validated social work knowledge base. The student is asked to determine the efficacy of his/her practice intervention in field placement by using a suitable design and method. A hands-on project is required using clinical experience from field practice. Prereq: SRCRH 426 and SASS 401A.

SRCRH 532. Needs Assessment and Program Evaluation (3)
This course is designed to introduce students to the design, implementation, management, analysis, and utilization of program evaluation research. The major rationales for this course are: 1) the strong need for accountability in social service delivery, 2) the need to maintain current on developments in service interventions, and 3) the need to defend human service programs on the basis of effectiveness and efficiency. Students will develop their understanding and use of skills in the interpretation and conduct of different types of program evaluation, including needs assessment, monitoring/process evaluations, and outcome/impact assessments. Students will learn to determine needs of client populations, whether program objectives are being achieved, whether programs are achieving outcomes, and whether program performance is efficient. Prereq: SRCRH 426 or equivalent. Coreq: Advanced field placement. SSBT 534.

SRCRH 536. Individual Research Practicum (3)
With instructor and research sequence chair approval, an individual program of supervised research experience may be undertaken. This course allows the student to tailor a program of applied research to a specific practice issue or program. Prereq: SRCRH 426.
In this course, students will focus on the segment of human development throughout the life cycle. Psychosocial theory, learning theories, and social role theory constitute the theoretical base for this foundation course. Developmentally determined objectives and tasks for every life stage are examined in the context of biological, genetic, psychological, familial, and sociocultural factors. Special emphasis is placed on the impact of gender, health, and minority status, and on community institutions of human development. This course supports the foundation social work methods course by introducing substantive content on human development as a framework for assessment, prevention, and intervention with psychosocial problems. Curricularly related to the advanced sociobehavioral courses on human development and developmental dysfunction, this course provides a basic understanding of normal human development, which can serve as a contextual framework for developmental deviations from the norm.

SSBT 500. Special Topics in Sociobehavioral Theory (1-3)
This seminar is intended for students who are interested in exploring advanced topics of current interest in sociobehavioral theory.

SSBT 501. Advanced Child and Adolescent Development and Dysfunction (3)
This course traces the development and dysfunction of individuals from conception through adolescence. It stresses transactions between the individual and his/her environment including schools, peers, community, and family. Special attention is given to the influences of poverty, gender, and ethnicity on development and dysfunction. A variety of etiologic perspectives are addressed in explaining the major maladaptive conditions of children and adolescents. Prereq: SSBT 440.

SSBT 502. Infant and Toddler Development (3)
In this course, students will focus on that segment of the human life span called infancy and toddlerhood, a period of development from conception to age three years. Students will be introduced to the major theories of development and will integrate theory and research as they relate to children's physical and motor development, perception, intelligence, language and communication development, and social and emotional development. The impact of the family and sociocultural contexts that affect development will be discussed. Discussion, case studies, and observations will be used to facilitate learning. Prereq: SSBT 440.

SSBT 508. Advanced Adult Development and Dysfunction (3)
This course examines broad perspectives on adult development and specific dysfunctions in adulthood. Several developmental theories are reviewed. The prevalent and serious emotional problems experienced by adults in our society are presented, with particular attention given to the social contexts in which these problems occur. Examples of such problems include marital dysfunction, family violence, maladaptive approaches to parenting, alcoholism and other addictions, depression, and suicide. The effects of poverty, gender, and minority status on development and dysfunction are addressed. Prereq: SSBT 440.

SSBT 520. Family System Theories (3)
This course covers development of the family over the life span, with an emphasis on normal family stages and tasks. Life cycle stages include marriage, parenting young children, families with adolescents, launching children and moving on, and families in later life. Divorce, remarriage, and forming a step-family are considered. The course covers a range of family forms based on culture and socioeconomic as well as changes in the family life cycle over time. Families coping with various life stressors, such as alcoholism or drug addiction, children with chronic illness or developmental disabilities, care of elderly family members, and living in impoverished conditions also are discussed. Prereq: SSBT 440.

SSBT 527. The Theory and Practice of Leadership (3)
This course assists students preparing for management and leadership roles in social service organizations to understand theories of leadership and translate them into effective leadership practices. The class explores leadership definitions, tasks and responsibilities, and the development of leadership capabilities. Students also examine their personal values, beliefs, skills, and understanding of ethical principles underlying leadership. Prereq: SSBT 440.

SSBT 534. Organizational Theory (3)
This course enables students to understand the organizational conditions, processes and structures and the nature of human service organizations. The course covers various theoretical perspectives on organizations, including the issues of goals, power, leadership, effectiveness, efficiency, performance, clients and staffing. Special attention is given to the ways in which nonprofit human service organizations are similar to and different from other types of organizations. Prereq: SSBT 440.

SSBT 535. Human Sexuality (3)
The course addresses sexuality as an integral part of human functioning and human relationships throughout the life cycle. The formation of sexual identity is addressed, including gender identity, sexual orientation, and sexual intention. The physiological and psychological aspects of sexual behavior are covered, including the effects of aging, chronic illness, and sexually transmitted diseases. The course concludes with practical applications for social work, including an overview of assessment and treatment of sexual dysfunction. Prereq: SSBT 440.

SSBT 540. Theories of Groups, Organizations, Communities, and Social Class (3)
The course provides a foundation of knowledge about the theory, development, and behavior of groups, organizations, and communities. Emphasis is placed on understanding the manifestation of discrimination and oppression and their impact on the affected populations. Social work's response to discrimination and oppression within the profession and in society at large will also be examined.

SSWM 400. Social Work Methods (3)
The foundation methods course is based on a generalist social work practice perspective incorporating a problem-solving methodology applicable to client systems including individuals, families, small groups, organizations, and communities. Emphasis is placed on developing skills with respect to relationship formation and engagement; data collection and assessment; goal setting and contracting; designing and implementing appropriate interventions; assuming appropriate practice roles; evaluation; and termination. Explicit attention is given to issues of human diversity and their impact on work with clients at all points in the social work process. The course is undergirded by relevant sociobehavioral and practice theories that emphasize the reciprocal nature of person-environment interaction and community-based practice.

SSWM 500. Special Topics in Social Work Methods (1-3)
This seminar course is intended for students who are interested in exploring advanced topics of current interest in methods. Prereq: SSWM 400.

SSWM 517. Family System Interventions (3)
This course covers the knowledge, concepts, and skills associated with working families. The practice method
will reflect a family systems approach, integrating theories and approaches within a systemic perspective. It will build practice skills in assessing, interviewing, and intervening with families and emphasize a strengths-based perspective on intervention with families. Considerations of family issues at different developmental stages will be presented. The issue of ethically competent and community-based social work practice with families will be stressed throughout the course for each content area. Prereq: SSWM 400 and SSBT 520.

SSWM 518. Death and Dying (3)

This course focuses on the concept of death and related topics from a social work perspective. Such topics include the role of death in American culture; the dying process and its institutions; assessment and intervention strategies; life span and family life considerations; and end-of-life decisions. The course provides both theoretical and experiential exposure to the dying process as it relates to self, the dying person, and the bereaved. Students will gain insight into serving the terminally ill, those who need assistance with mourning and grief, and clients dealing with difficult life-and-death decisions regarding loved ones. Prereq: SSWM 400.

SSWM 519. School Social Work Seminar (3)

This course prepares students to be certified school social workers. The course addresses major issues in American schools; a theoretical framework for school social work services; design, deliverance, and evaluation of school social work services; legal and ethical issues; and the roles and intervention strategies of school social workers. It covers student and family problems and areas of need such as disability, truancy, divorce, teen pregnancy, youth depression and suicide, substance abuse, violence, and dropping out of school. This course is required for those participating in a planned program of study leading to state certification as a school social worker. If space permits, other students may enroll if they have or have had school social work experience. Prereq: SSWM 400.

SSWM 530. Managing Organizational Change (3)

This course provides a conceptual and practical understanding of planned change in human service organizations considering both organizational resources and achieving outcomes for clients. Skills and strategies for identifying needs for change, preparing and managing a change process, and institutionalizing change are critically examined. Prereq: SSWM 400 and SSBT 540.

SSWM 531. Strategic Alliances (3)

This course provides organizational leaders with the concepts and practices critical to the development of interorganizational alliances, from affiliations to mergers and consolidations. Various strategies are examined and existing community-based national and international linkages are explored. Prereq: SSWM 400 and SSBT 540.

SSWM 541. Attracting Government, Foundation, and Corporate Support (3)

This course reviews the trends, types of support available, sources of information, processes for accessing, criteria for decision-making, and the “politics” of grant, contract, in-kind, or other support. Preparation of winning proposals constitutes a special focus. Nonprofit organizations’ accountability, stewardship, and recognition responsibilities or activities are explored. Prereq: SSWM 400, SSWM 544, and SSWM 545.

SSWM 544. Budgeting and Financial Management in Social Service Organizations (3)

Social service managers must be both responsible and accountable for the management of resources that enhance the provision of effective and efficient services to clients. In this course, students obtain an understanding of the skills, tools, and strategies needed to plan for the financial stability of their organizations. Students use a critical thinking perspective to examine budgetary and financial choices. They are able to understand the impact of power and politics in budget and financial processes. In addition, they are able to recognize ethical dilemmas that are often inherent in financial decision-making. Students demonstrate their understanding of program budgeting, financial reporting, and monitoring as well as other resource management concerns that affect human service managers and organizations. Prereq: SSWM 400.

SSWM 545. Social Program Design (3)

Students develop skills and techniques for forming social agencies and designing social service programs. The course addresses the demands of multiple constituencies (clients, other agencies, legislators, the legal system, etc.) and competing values (the ability to be flexible versus the need for control and to work both inside the organization and outside its boundaries). It presents an approach that focuses on establishing outcome-based goals and interventions. Prereq: SSWM 400.

SSWM 546. International Social Work (3)

This is an advanced seminar designed for students interested in the international dimensions of the social work profession and social work practice. The seminar focuses on commonalities and differences in the roles and functions of social workers in different nations. It also gives attention to social work as a global profession and social work practice on an international level. Prereq: SSWM 400.

SSWM 563. Social Work Intervent in Co-occurring Mental and Substance Abuse Disor (3)

This advanced methods course provides a basic orientation to substance use disorders in persons with mental illness (SAMH). A biopsychosocial framework will be used to explore the etiology, the maintenance, and the recovery of both mental and substance use disorders. The historical background of practitioner, programmatic, and institutional barriers that impede the development and application of clinical skills to dually diagnosed individuals will be explored. Emphasis will be placed on strategies for the implementation of services to deal with individuals with co-occurring problems and their families using the evidence-based New Hampshire-Dartmouth Psychiatric Research Center Integrated Treatment (IT) Model. Current assessment techniques and treatment of special populations including, but not limited to: women, minorities, and adolescents will be discussed. Prereq: SSWM 400.

SSWM 564. Interventions in Alcohol and Other Drug Abuse (3)

This course provides a biopsychosocial approach to prevention, assessment, and treatment of alcohol and other drug abuse problems. This course introduces the student to the etiology and treatment of alcohol and other drug abuse in the context of social work practice. The historical background of alcohol and other drug treatment interventions, self-help groups, and conceptual models of addiction are presented. Students explore their own attitudes and values toward AODA problems and how these affect treatment outcomes as well as the development of programs. Emphasis is placed on current screening and assessment techniques and prevention and treatment issues in social work practice with alcohol and other drug abuse. Prereq: SSWM 400.

SSWM 565. Community-Based Practice with Children and Families (3)

This course covers knowledge, concepts, and tools associated with contemporary child welfare practice. The practice method reflects a family centered or family based approach, meaning that the welfare of children cannot be considered separately from the families of which they are a part. For each topic area, major social work roles, activities, tasks, and skills are explored along with problems and issues in implementation. Program exemplars and case studies are presented for illustration purposes and practical application of the skills and techniques presented. Child welfare services that promote safety, permanency, and child well-being are presented. Consideration of family needs at different developmental stages of the child and family life cycle are also presented. The issue of culturally competent community based social work practice is stressed throughout the course for each content area. While this is primarily a methods course, program delivery and policy issues are discussed as they relate to the socio-political and organizational contexts of practice. Prereq: SSWM 400.

SSWM 567. Community Organization and Development Strategies (3)

This course demonstrates the application of social science theory to the issues of economic and neighborhood development. It illustrates how social workers can refine their roles, skills, and understanding of techniques in community organization, and presents strategies for economic and housing development. Prereq: SSWM 400 and SSBT 540. Cross-listed as MAND 469.

SSWM 569. Management of Community Based Development (3)

This course examines the fundamentals of building and managing an effective community development organization. Students will develop an understanding of community development with a focus on housing, economic development, and community building. Community building integrates family development, education and health, housing, and economic development. The use of technology as a tool in community development is covered. Prereq: SSWM 400, SSWM 544, SSWM 545, and SSWM 567. Cross-listed as MAND 469.

SSWM 571. Case Management (3)

This course addresses case management as an interdisciplinary human service intervention and examines the social, policy, programmatic, and practice factors that shape the delivery of case management services. A variety of models of case management are covered, along with their respective implications for social work practice. Multiple perspectives of consumers of case management services are addressed. Prereq: SSWM 400.

SSWM 573. Home-Based Family Interventions (3)

This course provides students with an in-depth, comprehensive understanding of family preservation services and practice. Home-Based Family Interventions encompasses the values, attitudes, beliefs, knowledge base, and skills necessary for the beginning home-based worker. The course reviews the theories that guide family-centered services, examines models of family preservation services across various service systems, reviews current research on home-based services, and teaches skills or competencies necessary for home-based family work. A variety of teaching methods is used to learn, observe, and practice new skills. Prereq: SSWM 400.
SSWM 574. Integrative Seminar in Alcohol and Other Abuse (3)
This course builds upon the material presented in the methods course (SSWM 564) in alcohol and other drug abuse. It is intended as an elective course for students who are interested in developing their clinical skills in AODA and in enhancing their abilities to conduct an empirically-based practice with AODA clients. Course objectives include integrating clinical and research knowledge about AODA; strengthening the student's clinical skills in AODA practice; focusing on the complexity of comorbidity issues of AODA practice including, but not limited to, mental health problems, sexual victimization, and domestic and family violence; and recognizing policies and practices relevant to cultural diversity, gender differences and discrimination in social work practice with AODA problems. Prereq: SSWM 400 and SSWM 564.

SSWM 575. Social Work With People Who Have Chronic Mental Illnesses (3)
This course focuses on people who have severe mental illnesses. Students learn primary and tertiary community-based treatment and rehabilitative approaches, services, and programs. In helping people achieve recovery, students learn the theory and practice skills that underscore the four major approaches to community-based service delivery: the assertive case management model; strengths case management model, psychosocial rehabilitation model, and the recovery model. Within each model, specific attention is placed on practice similarities and differences, especially interviewing, assessment, and intervention. Within these practice skills, students learn how to identify social justice and empowerment values that are supported or undermined. Advocacy is highlighted as a central social work value and practice skill that cuts across community-based practice models. Finally, lectures, readings, and discussions examine how gender, ethnicity, and social class produce various experiences of mental illness and various social work interventions. Prereq: SSWM 400.

SSWM 579. Cognitive Behavioral Interventions (3)
This course acquaints students with the theoretical, conceptual, and skill bases of several cognitive-behavioral approaches to practice. Topics include assessment, use of tasks and homework, coping skills, cognitive restructuring, and problem solving approaches to practice. The course draws upon students' field and work experiences to illustrate the application of the concepts and skills under discussion. Prereq: SSWM 400.

SSWM 580. Mental Health Practice with Children and Adolescents (3)
This course will focus on developing specialized knowledge and social work techniques related to professional social work in such settings as hospitals, child guidance agencies, family service agencies, mental health centers, and residential treatment centers. Concentration will be on assessment of normal and pathological social functioning as related to age-appropriate development, adaptations of psychotherapeutic principles to social work interventions, maximizing individual, family and environmental strengths in each situation as guidelines for offering help. Prereq: SSWM 400 and SSBT 501.

SSWM 581. Social Work with Older Populations (3)
This course in gerontological social work provides advanced content in working with elderly people and their families in the community and in residential settings. Using a biopsychosocial approach, the course explores various issues of later life including, but not limited to, retirement, social roles, depression, social networks, and grief. Specific attention is paid to assessment and diagnosis, goal setting, and rationale for selection of treatment approach. Prereq: SSWM 400.

SSWM 582. Social Work in Child Abuse and Family Violence (3)
This course addresses the etiology, investigation, and treatment of child abuse including sexual abuse and the roles of child welfare, health, and mental health agencies. Particular attention is given to direct work with children and adults who have experienced abuse, and to interventions in instances of family violence. Prereq: SSWM 400 and SSBT 501.

SSWM 583. Mental Health Practice with Adults (3)
This course builds on the content from required foundation social work methods, policy, and advanced sociobehavioral theory courses. It complements the content of advanced methods courses, including Social Work with People Who Have Chronic Mental Illness (SSWM 575), Social Work in Child Abuse and Family Violence (SSWM 582), and Interventions in Alcohol and Other Drug Abuse (SSWM 564). This course explores currently prevailing theoretical perspectives to mental health practice with adults, including cognitive theory, behavior theory, crisis theory, and structural theory informing ego psychology. Specific focus of attention is on the newly evolving object relations theoretical frameworks to practice. Risk status—including the effects of poverty, gender, culture, discrimination, and oppression—is considered in the treatment process and in the utilization of mental health services to adults. The empirical and value base of interventions is examined. Prereq: SSWM 400 and SSBT 508.

SSWM 584. Social Work with Couples (3)
This course provides an overview of assessment and intervention methods for working with couples around issues of marriage, divorce, and remarriage. Alternate couple forms are discussed. The course emphasizes systems and social learning approaches, communication and negotiation in problem solving and its relevance to assessment, treatment structure, and techniques. Special attention will be given to problem areas such as commitment, sexual dysfunction, chemical dependency, and destructive communication patterns. Prereq: SSWM 400.

SSWM 585. Social Work with Groups (3)
A theoretical formulation of the social group work method as a problem solving process is addressed. Exercises are presented in the use of diagnostic skills to determine individual needs and problems for which groups may be helpful, the worker's role in facilitating group functioning through his/her use of various program media. Attention is given to the significance of goals, agency environment, and policy for direct work with groups. Prereq: SSWM 400.

SSWM 586. Race and Class: Implications for Social Work Practice (3)
This course provides students with the opportunity to integrate concentration content within a perspective focusing on social work practice within the context of race and class. Specific attention will be focused on the development of a practice model that takes into account the impact of race and class on social functioning. Students will explore the effects of race and class on critical life areas such as education, housing, access to health care services, and the involvement with the justice system. Prereq: SSWM 400.

SSWM 589. Social Work Interventions in Chronic Illness (3)
This course is an interest-focused seminar, which consists of the instructor's didactic presentations and students' individual presentations. The instructor addresses the unique features of practice in healthcare settings within a community-based context perspective. Various social work interventions appropriate for use in healthcare are explored. Additional content focuses on developmentally determined issues for chronically ill children, adolescents, young adults, middle-aged adults, and older adults, including sensitivity to issues of diversity in practice populations. Students select one chronic illness for intensive study. The chronic illness must be an organically-based disease process, not a mental illness or an addiction. Prereq: SSWM 400.
The School of Dental Medicine is a professional school offering a curriculum leading to the Doctor of Dental Medicine degree (D.M.D.). Advanced Education Programs in the dental specialties are also available. The School of Dental Medicine also offers a program of continuing education courses in conjunction with the Greater Cleveland Dental Society for dental practitioners and auxiliaries including dental laboratory technicians.

The School of Dental Medicine was organized June 21, 1892, as the Dental Department of Western Reserve University. For the first 25 years of its existence, the school was located in downtown Cleveland. In 1917, the School of Dental Medicine became an integral part of the University. In 1925, the school was located in downtown Cleveland. In 1917, the School of Dental Medicine became an integral part of the University. For the first 25 years of its existence, the school was located in downtown Cleveland. In 1925, the school was located in downtown Cleveland. In 2003 the name of the school officially changed from the School of Dental Medicine to the School of Dental Medicine and the degree offered changed from Doctor of Dental Surgery to Doctor of Dental Medicine.

The School of Dental Medicine is a member of the American Association of Dental Schools and all of the programs of the School of Dental Medicine are accredited by the Commission of Dental Accreditation. Since its organization, it has conferred degrees on approximately 4,700 graduates.

**ADMINISTRATION**

Jerold S. Goldberg, D.D.S. (Case Western Reserve University)

Dean of the School of Dental Medicine; Professor of Oral and Maxillofacial Surgery

Ronald L. Occhionero, D.D.S. (Case Western Reserve University)

Associate Dean for Administration; Professor of General Practice Dentistry and Chair of the Department

FACULTY

Marsha A. Pyle, D.D.S. (Case Western Reserve University), M.Ed. (Cleveland State University)

Associate Dean for Education; Associate Professor of Oral Diagnosis and Radiology

Stanley A. Hirsch, D.D.S. (Case Western Reserve University), M.S. (Indiana University)

Associate Dean for Graduate Studies; Associate Professor of Oral Pathology and Acting Chair of the Department

Danny R. Sawyer, D.D.S., Ph.D. (Medical College of Virginia)

Assistant Dean for Didactic Education; Professor of Oral Diagnosis and Radiology

Robert F. Hirsch, D.D.S. (Case Western Reserve University)

Assistant Dean for Clinical Education; Associate Professor of General Practice Dentistry

Bonnie Marks, B.A. (Case Western Reserve University)

Acting Director of Development and Alumni Affairs

Philip C. Aftoora, B.S. (University of Dayton), M.A. (Case Western Reserve University)

Director of Student Services

David A. Dalsky, B.A., M.Ed. (Kent State University)

Director of Admissions

John W. Smolik, M.B.A. (Baldwin Wallace College)

Director, Finance and Operations

Cecil S. Ash, D.D.S (Dalhousie University), M.S. (University of Manitoba)

Assistant Professor of Oral & Maxillofacial Surgery

Hussein M. Assaf, D.D.S. (The Ohio State University)

Assistant Professor of Restorative Dentistry

Sally T. Baden, D.D.S., M.S. (Case Western Reserve University)

Associate Professor of Oral Diagnosis and Radiology

Sahar A. Bajoury, B.D.S., M.D.S. (Cairo University)

Assistant Professor of Restorative Dentistry

Dennis C. Beesoon, D.D.S., M.S. (Case Western Reserve University); Assistant Professor of Orthodontics

Nabil F. Bissada, B.D.S. (University of Cairo, Egypt), D.D.S. (Case Western Reserve University), M.S.D. (University of Minnesota)

Professor of Periodontics and Chair of the Department

Jon P. Bradrick, D.D.S. (University of Iowa)

Associate Professor of Oral and Maxillofacial Surgery

Seth B. Canion, D.D.S. (Howard University)

Associate Professor of Pediatric Dentistry and Chair of the Department

Louis P. Castellarin, D.D.S. (Marquette University)

Associate Professor of Restorative Dentistry and Chair of the Department

Sami M. Chogle, D.D.S. (Dharwad University, India), M.S.D. (Case Western Reserve University)

Assistant Professor of Endodontics

Francis M. Curd, D.D.S. (Case Western Reserve University)

Assistant Professor of General Practice Dentistry

Fady F. Faddoul, D.D.S., M.S.D. (Case Western Reserve University)

Associate Professor of Restorative Dentistry

Anthony J. Ficara, D.D.S. (Farleigh Dickinson University), M.S. (George Washington University)

Associate Professor of Periodontics
Dentistry

Xavierian University)

Santiago Moncayo, D.D.S. (Pontifical
Assistant Professor of Endodontics

Western Reserve University)

André K. Mickel, D.D.S., M.S.D. (Case
Associate Professor of Restorative Dentistry

Reserve University)

Charles J. Love, D.D.S. (Case Western
Associate Professor of Oral Diagnosis and

Reserve University)

Radiology

Jerold S. Goldberg, D.D.S. (Case Western
Professor of Oral and Maxillofacial Surgery; 

Reserve University)

Dean

Angela R. Graves, D.D.S. (Meharry
Medical College), M.S. (Columbia
University)

Assistant Professor of Restorative Dentistry

Yping W. Han, Ph.D. (University of Illinois)

Assistant Professor of Periodontics

Mark G. Hans, D.D.S., M.S. (Case
Western Reserve University)

Associate Professor of Orthodontics and Chair of the Department

Robert F. Hirsch, D.D.S. (Case Western
Reserve University)

Associate Professor of General Practice Dentistry; Assistant Dean for Clinical Education

Stanley A. Hirsch, D.D.S. (Case Western
Reserve University), M.S. (Indiana University)

Associate Professor of Oral Pathology and Acting Chair of the Department; Associate Dean for Graduate Studies

T. Roma Jasinevicius, D.D.S. (Case Western
Reserve University)

Assistant Professor of Restorative Dentistry

Jefferson J. Jones, D.D.S. (University of Pittsburgh)

Associate Professor of Endodontics and Chair of the Department

James A. Lalumandier, D.D.S. (Georgetown
University), M.P.H. (University of North Carolina)

Associate Professor of Community Dentistry and Chair of the Department

Michael A. Landers, D.D.S. (Case Western
Reserve University)

Associate Professor of Oral Diagnosis and Radiology

Charles J. Love, D.D.S. (Case Western
Reserve University)

Assistant Professor of Restorative Dentistry

André K. Mickel, D.D.S., M.S.D. (Case
Western Reserve University)

Assistant Professor of Endodontics

Santiago Moncayo, D.D.S. (Pontifical
Xavierian University)

Assistant Professor of General Practice Dentistry

Suchitra S. Nelson, Ph.D. (Case Western Reserve University)

Assistant Professor of Community Dentistry

Ronald L. Occhionero, D.D.S. (Case Western Reserve University)

Professor of General Practice Dentistry and Chair of the Department; Associate Dean for Administration

Juan Martin Palomo, D.D.S. (Ponta Grossa State University, Brazil), M.S.D. (Case Western Reserve University)

Assistant Professor of Orthodontics

Michael P. Powers, D.D.S. (University of Iowa), M.S. (University of Michigan)

Associate Professor of Oral and Maxillofacial Surgery and Chair of the Department

Marsha A. Pyle, D.D.S. (Case Western Reserve University), M.Ed. (Cleveland State University)

Associate Professor of Oral Diagnosis and Radiology; Associate Dean for Education

Faisal A. Quereshy, D.D.S. (State University of New York), M.D. (Case Western Reserve University)

Assistant Professor of Oral & Maxillofacial Surgery

Danny R. Sawyer, D.D.S., Ph.D. (Medical College of Virginia)

Professor of Oral Diagnosis and Radiology and Chair of the Department; Assistant Dean for Didactic Education

Gary R. Schween, D.D.S. (Case Western Reserve University)

Assistant Professor of Oral & Maxillofacial Surgery

Manish Valiathan, B.D.S. (College of Dental Surgery, Manipal, India), M.S.D. (Case Western Reserve University)

Assistant Professor of Orthodontics

Russell Wang, D.D.S. (University of Toronto) M.S.D. (Indiana University)

Associate Professor of Restorative Dentistry

Aaron Weinberg, D.M.D., Ph.D. (The Hebrew University, Israel)

Associate Professor of Periodontics

Tim S. Whittingham, Ph.D. (University of Wisconsin), M.B.A. (Case Western Reserve University)

Associate Professor of Oral Diagnosis and Radiology

Stephen Wotman, D.D.S. (University of Pennsylvania)

Professor of Community Dentistry

Kristin Z. Victoroff, D.D.S. (Dalhousie University)

Assistant Professor of Community Dentistry

FACILITIES

Physical Resources

The entire Health Sciences Center has been designed so that students can travel from the School of Dental Medicine to the School of Medicine, the School of Nursing, the Health Sciences Library, the Health Sciences Dining Room, and any component of University Hospitals without having to go outside.

The Dental School building was designed to provide a modern teaching facility. The Multimedia Laboratories are designed and equipped so that the basic sciences (except for anatomy), technique and simulated clinical experience can be carried on by the student in his or her individual area. The 50,000 square foot dental clinic floor consists of two major clinical areas and five specialty clinics. The major clinics are made up of individual cubicles, fully equipped as private operatories. Each student clinician is assigned to one of the individual operatories for the academic year.

Drawing from a local population of more than one million, the clinics provide a broad spectrum of care to the population, affording the student substantial clinical experience. The school cooperates with various organizations of the city in caring for their clients, an arrangement that provides additional clinical experience for students.

Libraries

The Cleveland Health Sciences Library (CHSL) was formed in 1966 by an agreement between the Cleveland Medical Library Association (CMLA) and Western Reserve University. CHSL operates in two locations: the Allen Memorial Medical Library and the Health Center Library (HCL). The total collection currently numbers 380,000 volumes. More than 1,700 journals are received.
The Allen collection, strongly clinical, serves private and institutional members of the Cleveland Medical Library Association as well as faculty and students of Case Western Reserve University.

The Health Center Library collection of basic science materials is primarily for faculty and students of the schools of dentistry, medicine, and nursing and the department of biology.

The Dittrick Museum of Medical History, located on the third floor of the Allen Library, contains nearly 20,000 objects related to the history of medicine, dentistry, and pharmacy, with special emphasis on Cleveland and the Western Reserve. The museum also contains a medical archives collection and a rare book room.

Reference staff in both libraries help and instruct patrons in the use of the library and its bibliographic resources. Items not available on campus may be obtained through interlibrary loan. Other services provided are quick telephone reference, citation verification, computerized or manual bibliographic searches, and access to the internet. The library staff can provide on-line searching of more than 100 data bases.

Hospital Affiliations

The School of Dental Medicine has working relationships with many hospitals and health clinics in the Greater Cleveland community. Students have the opportunity to function as dentists and observe hospital routine and operating room techniques in these hospitals. Many members of the faculty hold staff appointments in these extramural health facilities.

University Hospitals is a 974-bed tertiary care facility located across the street from the School of Dental Medicine. Graduate departments in Oral & Maxillofacial Surgery and Pediatric Dentistry are based at this facility. A variety of educational and research opportunities exist in relation to this affiliation.

The Veterans Administration Medical Center is a modern 780-bed hospital in the University Circle area. The hospital provides dental services for both outpatient and inpatient veterans.

The Free Clinic

The Free Medical Clinic of Greater Cleveland, at 12201 Euclid Avenue, is a nonprofit community service organization that presently offers medical, dental, podiatric, and legal services, as well as family planning and psychological counseling programs for adults and children; provides a patient advocacy program and speakers for community education and training at other health agencies; and operates a hotline seven evenings a week.

Dental students may volunteer their services to any of the programs at the clinic. However, most participate in delivering dental care to the indigent; this also increases students’ skills in emergency and comprehensive patient care.

THE PROFESSION OF DENTISTRY

The mission of dentistry is the protection and improvement of the health of individuals and society with a concentration on oral health. Professional activities encompass a wide variety of endeavors including the clinical care of individuals, the prevention of disease, the discovery of new knowledge, and the development of procedures and policies that protect and improve health, especially for those populations at risk for disease.

Because oral health is an important concern of society, the role of the dentist continues to be essential and rewarding. Men and women who are interested in scientific studies directly related to the welfare of people should find a strong appeal in dentistry as a life work. It offers an unusual opportunity for public service, community respect, and the use of originality, compassion, and substantial skill and independent judgment on a daily basis.

MISSION STATEMENT

The mission of the Case Western Reserve University School of Dental Medicine is to efficiently provide contemporary programs in oral health education, patient care, research and scholarship, and service that are attractive to our constituents. We will accomplish this in an environment which fosters collegiality and professionalism, and that enables a diverse group of students to become competent practitioners of dentistry.

DENTAL EDUCATION PROGRAM

The students who enter the School of Dental Medicine are very carefully selected and already have had many opportunities for intellectual and social development. The years in dental school should permit the continued maturation of the individual and should emphasize the basic knowledge and skills which are common to all dentists. Graduates should continue their dental education during their professional careers and add to the basic concepts taught in dental school by studying the literature and by attending continuing education courses. While in dental school, the student develops an attitude of professionalism and a sense of responsibility toward the patient’s welfare, which will provide optimal dental care.

The Committee on Dental Education studies, reviews, and evaluates the school’s educational goals and objectives, subject matter, grading systems, and clinical and laboratory experiences.

CONTINUING EDUCATION

The School of Dental Medicine, in conjunction with the Greater Cleveland Dental Society, offers a program of continuing dental education to practicing dentists and auxiliary personnel.

Guest lecturers, including faculty, who have distinguished themselves in one of the many specialty areas of dentistry present courses on an annual basis.

The continuing education courses encompass the expanding horizons of dentistry, covering such subjects as endosseous implants, periodontics, oral medicine, endodontics, dental materials, esthetic dentistry, restorative and prosthetic dentistry, occlusion, practice management,
and orthodontics, as well as expanded functions for dental auxiliaries.

These courses are designed to keep the practitioner abreast of current procedures and enrich the participant’s knowledge of the newest and most accepted advances in all subjects of dentistry. Courses may include subject matter of an experimental and/or controversial nature. This material is offered to the profession for educational and informational purposes in a spirit of academic freedom. Participants are given the opportunity to weigh the validity and usefulness of this material according to their own professional experience and judgment.

Case Western Reserve School of Dental Medicine continuing education courses are eligible for fellowship credit through the American Dental Association, Graduate Education Recognition Program (Continuing Education Recognition Program.)

LICENSE TO PRACTICE DENTISTRY IN OHIO

Currently the license to practice dentistry is granted by the Ohio State Dental Board after successful completion of appropriate examinations.

The candidate must be 21 years of age, show evidence of good moral character, and affirm that he or she understands the Ohio Dental Law.

Specific information about licensure in Ohio and other states should be obtained from the individual state boards of dentistry.

ADMISSION

Admission to the D.M.D. Program

The Case Western Reserve University School of Dental Medicine is a participant in the American Association of Dental Schools Application Service (AADSAS). An application request card may be secured from either AADSAS, 1625 Massachusetts Avenue, N.W., Suite 101, Washington, D.C. 20036, or from the School of Dental Medicine. It is advantageous to initiate the application procedure as early as possible. You may choose to submit your application electronically or download and print the application via the application service home page www.ADEA.org.

Application may be initiated as early as June of the year before intended registration. Applications may be forwarded before the completion of prerequisite course work and the Dental Admission Test. At the time the application is forwarded to AADSAS, the application fee of $45 (see financial information) should be forwarded to the School of Dental Medicine. The applicant should request the Council on Dental Education, American Dental Association, to forward a Dental Admissions Test transcript to the School of Dental Medicine. When the application is complete, it will be reviewed by the Admissions Committee. If additional material is required, it will be requested after review of the application. The committee reviews applications continuously throughout the year.

Dental Admissions Test

All applicants are required to take the Dental Admissions Test, which is conducted by the Council on Dental Education of the American Dental Association, in electronic format at Sylvan Learning Centers. The School of Dental Medicine recommends that the test be taken no later than April of the year before the expected date of application. The scoring of the Dental Admissions Test is on a range of 1 to 30, with the mean score being 16; each integer represents one half of one standard deviation.

Personal Interviews

Each accepted applicant to the School of Dental Medicine has been interviewed by the Admissions Committee before acceptance. Since it is physically impossible for the committee to interview every applicant, interviews are held only at the invitation of the committee. The Admissions Committee begins conducting formal interviews in August for entrance the following August. Early applications are encouraged and given priority, but the deadline is February 1.

Academic Requirements

Matriculation at the School of Dental Medicine requires a minimum of 60 semester hours or its equivalent of collegiate courses exclusive of physical education and military training. Most applicants have completed three or more years of work toward a bachelor’s degree by the time they enter dental school.

Primary consideration is given to applicants with a superior grade point average in both overall course work and prerequisite pre-dental courses. All applicants are expected to have demonstrated competence in the basic prerequisite courses. Students likely to be given first priority are those who have achieved superior grades in the basic sciences and who have taken an adequate sampling of courses in the social sciences and humanities to give them a broad background. Candidates with major areas of concentration in fields other than the basic sciences are given equal consideration with those who have majored in the basic sciences.

In order to permit maximum flexibility in the selection of candidates, the school has established a limited number of specific prerequisite courses. These include a minimum of 12 semester hours of chemistry (of which 6 semester hours should be in organic chemistry), 6 semester hours in biology, 6 semester hours in physics, and 6 semester hours in English. All prerequisite science courses must include laboratory instruction. These minimal requirements permit superior applicants to pursue a variety of subjects in their areas of academic interest. Students who have difficulty in the prerequisite science courses are encouraged to pursue additional work in the sciences.

Pre-dental electives suggested by the Admissions Committee include comparative anatomy, cell biology, genetics, biochemistry, microbiology, and physiology. These courses are helpful in providing a foundation for the basic science courses.
to be taken in dental school. However, advanced science courses should not be taken to the exclusion of courses in the humanities and social sciences, which are likely to enhance the applicant’s social and verbal skills and facilitate effective dealings with patients.

Advanced science courses most commonly taken during the undergraduate years by dental students include anatomy, biochemistry, calculus, cell biology, genetics, microbiology, and physiology.

Letters of Recommendation

The applicant should arrange to have letters of recommendation sent to AADSAS at the time the completed application is forwarded to AADSAS. These should be from the Pre-Dental Advisory Committee at the applicant’s college. If no Pre-Dental Advisory Committee exists, letters from two instructors in the basic sciences are acceptable. Additional letters may be requested by the Admissions Committee.

Deposit of Acceptance

In accordance with the guidelines of the American Association of Dental Schools, applicants will not be advised of acceptance before December 1 of the year preceding their enrollment. Acceptances on or after that date are provisional and are contingent on the applicant’s maintenance of an acceptable level of achievement throughout the remainder of the college program. Upon notification of acceptance, the applicant is required to make a deposit of $1,000, due 45 days from the date of acceptance. All deposits apply toward tuition and are non-refundable and nontransferable.

After January 1, the payment of the deposit is required no later than 30 days after notification of acceptance. By July 15, the balance of tuition for the first semester of the first year must be paid.

Advanced Standing

A graduate of a foreign dental school may be considered for advanced standing at this school. Acceptance is based on the review of credentials, personal interview, bench testing, and English language testing as applicable. Transfers for students attending other dental schools can be arranged only if schedules and course content at the other school are similar to those of the Case Western Reserve University School of Dental Medicine.

The transferring student or foreign-trained dentist must submit a written request to the Committee on Admissions of the School of Dental Medicine indicating a desire for transfer or be considered for advanced standing. Upon receipt, an application will be sent. In addition to the completed application form, the applicant must submit all undergraduate and dental school transcripts, Dental Admissions Test scores, Dental National Board scores, a letter from the dean of the school of current attendance stating that the applicant is in good standing, or in the case of a foreign graduate, a letter from the dean of the school attended stating that the student was graduated and at what rank, and other information deemed appropriate by the committee. The fee for application to advanced standing is $55 and must accompany the submitted application.

If the committee decides that a transfer or advanced placement is feasible, the applicant will be required to pass a laboratory “bench test” examination in the clinical sciences. All travel and lodging costs are borne by the applicant. An additional fee is charged for those who are required to take a “bench test” and is due at the time of the test.

Grading Policy

The responsibility for assigning grades rests exclusively with the course director, who must announce the general method of grading at the beginning of the course. Course grades are reported to the registrar of the school at the end of the course or when a final grade has been determined if prior to the scheduled completion time for the course. Incomplete or conditional grades can be changed only by the course director in accordance with university policy.

The following grading system is used at the School of Dental Medicine for students entering the Doctor of Dental Medicine program:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>4.00</td>
</tr>
<tr>
<td>A</td>
<td>3.66</td>
</tr>
<tr>
<td>A-</td>
<td>3.33</td>
</tr>
<tr>
<td>B+</td>
<td>3.00</td>
</tr>
<tr>
<td>B</td>
<td>2.66</td>
</tr>
<tr>
<td>B-</td>
<td>2.33</td>
</tr>
<tr>
<td>C+</td>
<td>2.00</td>
</tr>
<tr>
<td>C</td>
<td>1.66</td>
</tr>
<tr>
<td>C-</td>
<td>1.33</td>
</tr>
<tr>
<td>D+</td>
<td>1.00</td>
</tr>
<tr>
<td>D</td>
<td>0.66</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Grades not Averaged

IN: Incomplete and not averaged when received.

P: Passed and not averaged for pass/fail course.
Grade point averages are calculated by multiplying the number equivalent of the letter grade by the number of credit hours for the course. The semester grade point average is computed by dividing the total number of grade points earned during a given semester by the sum of the credit hours for all courses in which the student received letter grades of A, A-, B+, B, B-, C+, C, C-, D+, D, D-, F, I, or NP. The student is expected to achieve a grade point average of at least 2.0. Students may not be promoted with one or more failing or incomplete grades unless they have entered a remedial program to remove those grades by a deadline set by the course director or committee. In the usual case, the remediation must be completed no later than the end of the next regular semester or summer clinic session, whichever is sooner. Students cannot be graduated with any failing or incomplete grades and must have a minimum overall cumulative 2.0 grade point average.

Each student’s academic performance is reviewed by the Committee on Student Standing and Promotion as soon as possible after the conclusion of each semester and summer clinic session. Additional review may occur after each eight week period or when grade reports are submitted. The committee sets standards of academic performance for promotion and standing, probationary requirements and remedial actions, and recommends candidates for graduation. The committee, at its option, may place a student on academic review, academic probation, clinical probation, clinical review, clinical probation, require repeat of an academic period, or require a student to withdraw.

The committee will notify each student in writing of their status at least twice each academic year; following the end of each semester and more frequently if necessary. Academic review serves to warn the student that some improvement is required and clinical probation for one succeeding semester. A student with two or more semesters of probation may become ineligible for federally-sponsored financial aid.

The general guidelines used by the Committee on Student Standing and Promotion are that each student must attain a grade point average of at least 2.0 for didactic courses and for technique/clinical courses by the end of the first semester, and each semester thereafter. Students may not be promoted with one or more failing or incomplete grades unless they have entered a remedial program to remove those grades by a deadline set by the course director or committee. In the usual case, the remediation must be completed no later than the end of the next regular semester or summer clinic session, whichever is sooner. Students cannot be graduated with any failing or incomplete grades and must have a minimum overall cumulative 2.0 grade point average. Each student's academic performance is reviewed by the Committee on Student Standing and Promotion as soon as possible after the conclusion of each semester and summer clinic session. Additional review may occur after each eight week period or when grade reports are submitted. The committee sets standards of academic performance for promotion and standing, probationary requirements and remedial actions, and recommends candidates for graduation. The committee, at its option, may place a student on academic review, academic probation, clinical warning, clinical review, academic probation, require repeat of an academic period, or require a student to withdraw.

The committee will notify each student in writing of their status at least twice each academic year; following the end of each semester and more frequently if necessary. The committee takes reasonable care to accurately evaluate each student and inform them of their status by letter in a timely manner. If a letter cannot be hand delivered, it will be mailed to the student’s official address. The committee reserves the right to reissue letters of standing or promotion at any time it deems necessary. It is the responsibility of the student to fulfill all academic, pre-clinical, and clinical requirements, and to abide by all official policies and protocols outlined in the student services and clinical policy manuals of the School of Dental Medicine. For each semester of enrollment, the student is expected to achieve a grade point average of at least 2.0 for didactic courses and 2.0 for clinical technique and/or clinical courses. Students who fail to meet these general guidelines may be placed on:

1. Academic review: The student has failed to achieve an acceptable level of performance in a limited number of courses and/or has not achieved a grade point average of at least 2.0. Academic review serves to warn the student that some improvement is required and future promotion may be withheld in the absence of demonstrated improvement. Academic review may, but not necessarily, precede academic probation or dismissal.

2. Academic probation: The student has failed to achieve an acceptable level of performance in a number of courses and/or has earned a grade point average deemed unacceptable by the committee. In being placed on academic probation, the student may continue in the program for the next semester, during which time the student must demonstrate an acceptable level of performance or be required to withdraw or repeat an academic period or year. In unusual circumstances, students may be continued on academic probation for one or more succeeding semesters. A student with two or more semesters of probation may become ineligible for federally-sponsored financial aid.

3. Clinical review: The student fails short of the minimum expectations for clinical performance, including demonstration of clinical skills and knowledge, patient management, conformity with infection control policies and procedures, attendance and clinical productivity. Clinical review serves to warn the student that some improvement is required and future promotion may be withheld in the absence of demonstrated improvement. Clinical review may, but not necessarily, precede clinical probation or dismissal.

4. Clinical probation: The student has failed notably to achieve an acceptable level of clinical performance in one or more of the following areas: clinical skills, clinical knowledge and appropriate application of that knowledge, patient management, conformity with infection control policies and procedures, attendance and clinical productivity. In being placed on clinical probation, the student may continue in the program for the next semester, during which time the student must demonstrate an acceptable level of clinical performance or be required to withdraw or repeat an academic period or year. In unusual circumstances, students may be continued on clinical probation for one succeeding semester.

A student may appeal an action of the Committee on Student Standing and Promotion. The appeal must be in writing, state the basis of the appeal, and be filed within 14 days of the issuance of the notification letter sent to the student informing them of committee action. The written appeal should be directed to
the chairperson of the committee. The student may request or be invited to appear before the committee at the hearing of the appeal. The committee will inform the student in writing of the results of the hearing of the appeal. The student is advised to consult with the chairperson, the director of student services, or the associate dean for academic affairs for further information prior to filing the appeal so that the process can be fully explained and the student’s rights protected. The school reserves the right to require a student to withdraw from the school for any reason it deems sufficient. Academic or clinical failure, moral delinquency, gross misconduct, or failure to meet the specific conditions of probation or review is sufficient reason for requiring withdrawal from the school.

Terms and Course Length

The school year consists of 34 weeks of five days each, exclusive of vacations, and is divided into two semesters of two terms each. The final week of each semester is reserved for examinations. There are mandatory summer clinic and class sessions for all students at the end of the second and third years. A fee is charged for these summer sessions.

Attendance

Students enrolled at the School of Dental Medicine are expected to pursue their course of study according to a systematic plan as determined by the Faculty. It is the policy of the School that student attendance for clinic and clinic duty assignments is mandatory. Attendance requirements for lectures, laboratories and seminars are at the discretion of the course director. The course director is free to determine the extent to which absences affect the final grade. The student should realize that lack of regular attendance is extremely disruptive of academic progress and every attempt to attend all classes is strongly encouraged. The student should also be aware that the Committee on Student Standing and Promotion will consider faculty notation of poor attendance in its deliberations.

The Office of Student Services serves as a clearinghouse to notify faculty and staff of a student’s absence. Students who are not able to attend classes, laboratories or clinic are to call 216-368-6136 and advise the office of the period and expected duration of an absence and the reason that you will not be able to attend classes. The office will notify appropriate faculty and staff.

Note that the above action does not represent an approved absence. The clearinghouse function provided by the Student Service Office is a notification service. Individual faculty may express their own policy concerning absence as stated in the course syllabus.

There are situations where an approved absence that excuses the individual from classes et. al. are appropriate. An approved absence requires the approval and signature of the Director of Student Services.

Absence from Examinations

The student is expected to be present at all examinations or provide, when possible, advance notice to the Office of Student Services when absence from an examination is anticipated. If a student fails to provide advanced notice, the student must provide an appropriate excuse. Failing to provide an acceptable excuse, the student will meet with the Director of Student Services and the course director to discuss the absence. Following such consultation, the student will be informed of the consequences. The course director may permit the student to be re-tested (with or without penalty), be assigned a grade of zero for the examination, or receive a failing grade for the course.

Leave of Absence

A student may request a Leave of Absence for personal reasons or reasons of health when anticipated or actual absence is in excess of three weeks. Such request must be submitted in writing to the Director of Student Services who will forward the request to the Committee on Student Standing and Promotion. The request must be submitted by letter and state the reason for the request, the length of leave requested and the date of return. The Committee will ordinarily grant such requests if the student is currently enrolled and has been in regular attendance prior to the time or circumstances that necessitated the request. The request may be submitted by a parent, spouse or authorized agent of the student if the student is unable to file the request. The maximum length of leave is one year. Students must resume registration at the expiration of the leave unless formally granted an extension. Re-entry into the dental program is determined by the Committee on Student Standing and Promotion and may not necessarily be at the same level attained at the time the leave was granted. The Committee also reserves the right to place a student on Leave of Absence when it has determined that the circumstances warrant that action, even in the absence of a formal request.

Degrees Conferred

The degree Doctor of Dental Medicine (D.M.D.) is awarded to students successfully completing the four-year professional program offered by the school. The Master of Science in Dentistry (M.S.D.) degree is awarded to graduate students who successfully complete a graduate program of advanced study. Degrees are granted by the university on the recommendation of the faculty subject to the satisfactory completion of all curricular requirements and the discharge of all financial obligations to the university. The recommendation for a degree is discretionary with the faculty, and there is no contract stated or implied, between the university and the student that a degree will be conferred at any stated time, or at all.

Withdrawals and Refunds

To officially withdraw from the School of Dental Medicine, a written notice must be submitted to the dean for approval. Failure to attend class or merely giving notice to an instructor will not be regarded as an official notice of withdrawal. A student who withdraws after the start of a semester must pay a portion of the usual tuition. The student is
charged in accordance with the university policy on withdrawals. If the withdrawal occurs during the time that the student is enrolled in summer clinic, the student is charged at a rate of 12.5% per week of usual fee for summer clinic.

The university will refund any tuition paid for a semester by any student in good standing who is inducted, or called to active duty, by the Armed Forces of the United States prior to completing that semester, and who does not receive credit for the work completed during that semester.

Appropriate Attire

All students are expected to dress appropriately. The dental student is obliged to follow the dress code developed by the Dental Student Council and approved by the faculty. Graduate students and residents are expected to dress in a manner acceptable to their department.

Personal Property Insurance

Students are responsible for their personal property while on campus. The university assumes no responsibility for loss of or damage to a student’s personal property, and the university insurance program does not cover such losses. Many families have homeowner or renter insurance policies which provide coverage for such perils as fire, water and theft. If this coverage does not exist, the student may wish to consider a separate one.

Student Services

The Dental School’s Office of Student Services acts as a resource for individual dental students, and for classes as a whole, providing services and administering programs that supplement the regular curriculum and enrich the quality of student life. Programs under the direction of this office include:

Student Activities

The School of Dental Medicine encourages its students to avail themselves of cultural opportunities within the university and the community.

Each class has its own student organization which is governed by the students, with advice from the dental school’s Office of Student Services and other teaching staff when such advice is requested.

The Student Council is an organization representing the entire student body whose purpose is to advance the interests of the students of the School of Dental Medicine and the university. Students of the School of Dental Medicine share in university athletics, participating in inter-class, interdepartmental, and intercollege contests in various activities.

The School of Dental Medicine has chapters of three of the national dental student fraternities: Alpha Omega, Delta Sigma Delta, and Psi Omega. Students of all classes are eligible for student membership in the American Dental Association.

American Student Dental Association

The American Student Dental Association (ASDA) is a student organization of approximately 20,000 individual predoctoral and postdoctoral members organized into chapters, one at each of the U.S. dental schools. The ASDA is committed to the following:

1. Developing and training future leaders of the dental profession
2. Improving the quality of dental education
3. Disseminating information of value to dental students
4. Promoting the social, moral, and ethical obligations of the profession
5. Ensuring due process for all dental students
6. Representing dental students before legislative bodies and organizations
7. Providing opportunities for students and recent graduates to deliver health care to people in areas of need

The local chapter at Case Western Reserve University, representing more than 90 percent of the dental students, provides benefits that include:

1. Five professional publications
2. Reprints of national dental board examinations
3. Insurance at low group rates (disability/major medical, equipment, professional liability, term life insurance)
4. Reduced ADA dues upon graduation.

Freshman Orientation

Incoming students are introduced to the school, the university, and the Cleveland area in a three-day program presented by the Office of Student Services, faculty members, and upper-class students.

Faculty Mentors

All students are assigned to faculty mentors during freshman orientation. The advisors are volunteers from the faculty who offer the students guidance and fellowship during their educational program.

Student Monitoring

The Director of Student Services monitors student grades on a regular basis and works individually with students. Students are assisted in defining problems, identifying available resources, and choosing specific steps to be taken toward improvement.

Tutoring

The Office of Student Services provides tutoring for students who need to improve their academic performance. The tutors are usually upperclassmen or graduate students. Students may seek tutoring on their own or be recommended for tutoring by course instructors. Tutors emphasize study techniques, time allotment, problem solving, and communication in addition to comprehension of content.

HONORS, PRIZES, AND AWARDS

Recognition, both honorary and monetary, is given to students who achieve excellence in different facets of their dental education. A complete description of each award is available in the Office of the Dean.
Scholastic Achievement
Alpha Omega Fraternity Award for Scholarship
Omicron Kappa Upsilon
Callahan Prize
American Academy of Oral Medicine
American Association of Women Dentists Award

General Dentistry
American College of Dentists, Ohio Section
International College of Dentists
Pierre Fauchard Academy Award

Community Dentistry
Robert Dean Feder Award
Comprehensive Dental Care
Ohio Academy of General Dentistry

Endodontics
American Association of Endodontists
Doctor Paul P. Sherwood/Hrutkay Award

Operative Dentistry
Academy of Operative Dentistry

Oral Diagnosis, Radiology, and Treatment Planning
American Academy of Radiology
American Academy of Oral Medicine

Oral Pathology
American Academy of Oral and Maxillofacial Pathology

Oral and Maxillofacial Surgery
American Association of Oral and Maxillofacial Surgeons
American Dental Society of Anesthesiology, Incorporated

Orthodontics
American Society of Orthodontists
Pediatric Dentistry
American Society of Dentistry for Children
Academy of Dentistry for the Handicapped

Periodontics
American Academy of Periodontology

Prosthodontics
Dentsply International Merit Award in Prosthodontics

Practice Management
Richard A. Collier Prize

Research and Scientific Papers
Alpha Omega Prize
Block Drug Award

STUDENT AFFAIRS
The University Office of Student Affairs serves as an ombudsman focusing attention on the rights and responsibilities of students within the university community. In addition, it serves as a central source of information about university policies and procedures that affect student life and extracurricular programs and services. Students may contact the University Office of Student Affairs for resolution of specific problems and for referral to other university offices or campus agencies.

ACADEMIC PROGRAMS

Doctor of Dental Medicine Degree Curriculum
The Doctor of Dental Medicine curriculum is a sequence of learning experiences designed to prepare the student to serve as an effective general dental practitioner. The present curriculum is a “diagonal” structure designed to give the student a broad foundation through initial instruction in the basic sciences and an introduction of limited clinical experiences during the early period of education. As the student progresses through the educational program, clinical experience increases to facilitate integration of basic science information with clinical science training.

Methods of Instruction
The traditional methodology of lecture, seminars, laboratory, and clinical teaching is augmented by the use of teaching aids developed at the School of Dental Medicine and elsewhere. Among these aids are:
1. Television monitors for live and taped presentations
2. Slides with accompanying text (audio and visual)
3. Programmed texts and exercises
4. Sequential models
5. Computerized presentations
6. Multimedia/simulation laboratory
7. Case presentation

Instructional techniques utilized are intended to encourage students to be active participants in their education wherever possible, and are facilitated by small group conferences, seminars, and demonstrations. These small group settings promote personal and informal communication between students and instructors. In addition, the resources of the libraries offer the opportunity to satisfy personal interests and professional aspirations.

Combined Degree Programs
By arrangement with the College of Arts and Sciences of Case Western Reserve University and other cooperating institutions of higher education, an in absentia privilege is accorded undergraduates in their senior year whereby the first year of professional study may be substituted for the last year of liberal arts education. The student may be granted a baccalaureate degree by the liberal arts college upon completion of the first year in the School of Dental Medicine. Arrangements for this in absentia privilege must be made by the student with the liberal arts college before entering the School of Dental Medicine. This option must be exercised at completion of the first year of study in the School of Dental Medicine unless permission is granted by the undergraduate college and dental school by prior arrangement.

Joint Degree Programs
Students enrolled full time in the School of Dental Medicine desiring to enter a joint degree program must apply and be admitted to a non-dental degree program of another school of the university.
through the usual process followed for admission at that school. If accepted, the student must notify the associate dean for academic affairs in writing at least four weeks prior to the start of the semester they wish to initiate non-dental course work in the joint degree program. A dental student must be in the top one-half of the class to be eligible to enter a joint degree program and may not begin earlier than the second semester of the first year.

If the student appears eligible for the initiation of a joint degree program, a dental faculty member will be assigned as an Advisor to the student. The faculty Advisor will be responsible for routine matters such as assisting in registration (e.g. add slips) in addition to the advisory function. Students should be assigned, or request, an Advisor on the faculty of the second school in which non-dental course work is taken.

Eligible students must meet with the advisors and program coordinators of both schools. Following this meeting, the student will be provided with a written agreement and guidelines specifying the program which will have priority in all future considerations, a curriculum plan and projected timetable for the completion of course work, and other conditions or stipulations in effect that will govern the student’s tenure in both programs. The student will acknowledge the agreement with their signature.

First year students are limited to one course (3 credit hours) in the first semester (spring) of a joint program. Upper level students (years two through four) in good standing (defined as top one-half for this purpose) may enroll for up to two courses (six credit hours) in each of the fall or spring semesters. Course work undertaken in the non-dental program should not ordinarily be scheduled during the regular school hours at the School of Dental Medicine unless approval is granted by the associate dean for academic affairs. Course work taken as a part of the non-dental program cannot be used to meet the requirements of the dental program.

Tuition charges for course work taken in the non-dental program are the responsibility of the School of Dental Medicine to the extent outlined in the agreement and to a maximum of six credit hours per semester (fall and spring semesters only) if the student fulfills all eligibility requirements, is enrolled full time and in good standing at the School of Dental Medicine, and is current in the payment of tuition to the School of Dental Medicine. Tuition charges for non-dental courses taken during the summer semester are the responsibility of the student. Enrollment in a joint degree program does not constitute a guarantee that a degree will be granted for either program at any given time or at all.

Permission to continue in the joint program may be withdrawn by either school for a variety of reasons including, but not limited to, poor or failing grades or grade point averages, incompleteness or tardiness in completing program requirements, delinquency in payment of tuition, non-academic or academic probation, suspension or dismissal.

Problems that might arise will be resolved on a case-by-case basis by the associate dean for academic affairs and the faculty advisors in consultation with the student. The student may appeal any unfavorable decision to the Committee on Student Standing and Promotion for final resolution.

Special Programs for Undergraduates

The College of Arts and Sciences and the School of Dental Medicine jointly offer two programs for exceptionally able and well qualified high school seniors who plan to pursue careers in dentistry. Students admitted to these programs will be provided with advisors from both the College of Arts and Sciences and the School of Dental Medicine. Prior to enrollment in the School of Dental Medicine, all students are required to achieve an acceptable performance on the Dental Admission Test given by the American Dental Association. Students in the Six-Year Dental Program should take the test no later than April of the second year and must achieve an average of 15 or higher on both “Academic” and “PAT” portions of the test.

Six-Year Dental Program

The Six-Year Dental Program is designed to enable the especially mature student who is determined to pursue a career in dentistry to accelerate his or her undergraduate and professional education.

The first two years of the program are spent in the College of Arts and Sciences. Students are required to follow a specific curriculum. In order to secure the place reserved for them in the first class year at the School of Dental Medicine, students must earn a cumulative average of 3.0 or higher for all course work attempted and must achieve grades of “B” or higher for all required courses in biology, chemistry, and physics.

After successful performance in the pre-dental part of the program and on the Dental Admission Test, students in the Six-Year program move into the first year of dental school. The D.M.D. is awarded upon completion of the six-year program.

Up to 10 students can be admitted to the Six-Year Dental Program each year.

Pre-Professional Scholars Program in Dentistry

The Pre-Professional Scholars Program in Dentistry is designed for those who desire careers in dentistry but wish to broaden and enrich themselves with a full undergraduate program before embarking on study in a professional school. Such students matriculate in the College of Arts and Sciences with a conditional commitment for admission to the School of Dental Medicine to be honored upon completion of the bachelor’s degree.

Students are free to develop and follow a course of study that reflects their educational interests and needs rather than concentrating solely on activities that enhance their chances for admission to professional study. Participants will be expected to take the courses required of pre-dental students and to maintain a
grade point average of 3.0 or higher both for their work in the sciences and overall.

Expanded Function Dental Auxiliary Program

The School of Dental Medicine offers a non-degree certificate course in expanded dental functions to dental auxiliaries with requisite training and experience. This continuing education program prepares the student to take an examination administered by the Ohio Commission on Dental Testing for Advanced Qualified Personnel.

The Expanded Function Dental Auxiliary course is a part-time program and includes didactic, pre-clinical laboratory, and clinical training. It is affiliated with several hospitals and health agencies in the Cleveland metropolitan area, where a portion of the clinical training takes place. Students are selected for admission on the basis of their performance on an entrance examination administered by the program faculty.

Basic Science Programs

The most direct route toward a career in research is through the Doctor of Philosophy degree programs offered by the departments that are basic to health education: anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. Inquiries about these non-dental school programs should be addressed to the Dean of Graduate Studies, whose catalogue provides specific information about these programs. Fellowships may be available to qualified students to assist them during their period of study and research leading to an advanced degree.

The curricula of the School of Dental Medicine are designed to provide general education in dentistry or in areas of clinical specialization. However, recognizing the need within dentistry for individuals qualified for teaching and research, the School of Dental Medicine may provide the use of its facilities and faculty as part of a cooperative program in the training of such individuals.

ADMISSION TO ADVANCED EDUCATION PROGRAMS

Programs Offered

The School of Dental Medicine, in cooperation with other institutions, offers programs of study in advanced education in general dentistry, endodontics, pediatric dentistry, periodontics, orthodontics, and oral and maxillofacial surgery. Entry requirements vary and are determined by the program director and faculty of each program who select applicants for admission. Program length, stipends offered and program requirements vary by program. Requests for application materials should be directed to the Office of Graduate Studies of the School of Dental Medicine or printed from the internet at http://www.cwru.edu/dental/casewebsite/

All advanced education programs are accredited by the Commission on Dental Accreditation of the American Dental Association and are board-eligible programs for the respective specialty boards. The programs in endodontics, orthodontics, and periodontics are master’s degree programs with a certificate granted upon completion of the degree requirements. The programs in advanced education in general dentistry and pediatric dentistry are certificate-only programs. The program in oral and maxillofacial surgery is a joint program with the School of Medicine leading to the M.D. degree and certificate in oral and maxillofacial surgery. A certificate-only program in oral and maxillofacial surgery may be available at the discretion of the department.

Entry Requirements

All programs are highly structured and require a commitment to full-time study. Time for employment is limited; enrolled students are not permitted to engage in outside dental practice without the approval of their program director.

In order to be considered for admission, the applicant must submit several items; a completed application form (PASS or MATCH applications are accepted for some programs), all requested supporting documents such as transcripts, letters of recommendation, etc., and an application fee by the deadline published for each program. Incomplete or late applications will not be considered unless all other qualified applicants have been offered admission and a vacancy remains.

The selection of individuals for entry into a program of study is made by the program director (faculty) from the pool of applicants. The general criteria of the most qualified applicants for admission are as follows:

The applicant must be a graduate of a dental school accredited by the American or Canadian Dental Association or have been graduated from an institution considered by the School of Dental Medicine as one of acceptable academic caliber. (Applicants who are currently enrolled as dental students must submit a final transcript and verification of graduation from a dental school prior to entry if selected.)

The applicant must have earned a 3.0 (B) average or its equivalent and/or been graduated in the highest one-third of their graduating dental class.

The applicant must have passed Part I of the National Dental Board and should have an average score of at least 85 and have taken or applied for Part II (to be completed with a score of 85 or higher prior to entry if selected). If the applicant is a graduate of a foreign dental school and has not taken the National Dental Board, recent GRE examination results may be substituted (general test and one subject test in biochemistry, biology or chemistry). GRE scores should be at the fiftieth percentile or higher.

The applicant should have a documented interest in their field of study and must meet additional criteria set by the department to which they are applying. Applicants graduated from a non-English speaking dental school, and for whom English is not their first language, must take the TOEFL test with a minimum score of 550 (paper-based score) or 213 (computer-based score).
These criteria are considered minimums, and a higher level of performance (where applicable) enhances the likelihood of acceptance. Applicants who paid an application fee but were not accepted, can be considered, at no additional fee, for entry the following year. In order for the application to be considered for the following year, a request for reactivation of the application must be made in writing and received by the deadline for applications for the following year. Those not selected for the second year must submit a new application and pay the applicable fee for further consideration.

Applicants selected for programs in advanced education in general dentistry, oral and maxillofacial surgery, or pediatric dentistry must be eligible for licensure or intern certificate issued by the State of Ohio, and must be a graduate of a dental school accredited by the Commission on Dental Accreditation. International applicants are accepted into the programs offered by the Departments of Endodontics, Orthodontics, and Periodontics.

ADMISSION OF STUDENTS FROM OTHER COUNTRIES

See “Students from Other Countries” in the Student Affairs section of this Bulletin.

M.S.D. DEGREE AND RESIDENCY PROGRAMS

Registration

Advanced education programs operate on a 12-month basis, from July 1 of one year to June 30 of the next. The year is divided into two six-month semesters (Fall, July 1 to December 31; Spring, January 1 to June 30). The act of registration includes submission of a course schedule approved by the department, the payment of semester tuition and the completion of the simplified registration form. Each semester, registration must be completed as scheduled. Registration for each semester is handled through the Dental School Registrar. Students enrolled in fall and spring semesters may arrange to pay bills for tuition and fees in two installments. At least half of the total bill must be paid at registration, the remainder must be paid in accordance with university policy. Fees may be charged for late registration or late payment. Students who fail to register within 30 days after the published dates will be considered to have withdrawn from the program. In the School of Dental Medicine, students who are not registered are not considered students of record, lose the protection of the university in matters of liability, and, therefore, may not treat patients. They can no longer attend class or receive grades and will have to formally reestablish their matriculation. In any circumstance, all lost course and/or clinical time will be added to the end of the program’s original completion date.

Under unusual circumstances, special arrangements for registration may be made with permission of the department chairperson and the Associate Dean for Graduate Studies. Social Security numbers are used for all records and documents and must be provided at the time of registration. Foreign students will be issued a number for this purpose if they have not obtained a Social Security number prior to registration. New students and new residents who do not register as specified and who have failed to provide satisfactory reasons for the delay in advance forfeit their right to admission. Vacancies which arise from such circumstances are filled from a list of alternate candidates at the discretion of the department.

Grading

The responsibility for assigning grades rests exclusively with the course director, who must announce the general method of grading at the beginning of the course. Course grades are reported to the Registrar of the School at the end of the course or when a final grade has been determined if prior to the scheduled completion time for the course. Incomplete or conditional grades can be changed only by the course director (see grading policies of the university). The following grading system is used at the School of Dental Medicine for advanced education courses:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
</tr>
<tr>
<td>A-</td>
<td>Satisfactory (Thesis or Research)</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
</tr>
<tr>
<td>B+</td>
<td>Satisfactory (Thesis or Research)</td>
</tr>
<tr>
<td>C</td>
<td>Average</td>
</tr>
<tr>
<td>C+</td>
<td>Successful Audit</td>
</tr>
<tr>
<td>D</td>
<td>Unsatisfactory (Thesis or Research)</td>
</tr>
<tr>
<td>D+</td>
<td>Successful Audit</td>
</tr>
<tr>
<td>F</td>
<td>Unsatisfactory</td>
</tr>
<tr>
<td>IN</td>
<td>Incomplete</td>
</tr>
<tr>
<td>NP</td>
<td>Not Passing (Pass/Fail Course)</td>
</tr>
<tr>
<td>WP</td>
<td>Withdrew class</td>
</tr>
<tr>
<td>W</td>
<td>Withdrew all classes</td>
</tr>
</tbody>
</table>

Transfer Credit

Transfer of credit from another university is limited to six semester hours of graduate-level courses. Such transfer requires approval from the student’s advisor, the departmental chairperson, and the Office of Graduate Studies. Courses must have been taken within five years prior or subsequent to matriculation in the graduate program at Case Western Reserve University, and only those with grades of “B” or better are transferable. No credit for thesis may be transferred from another university.

Graduate credit is not awarded for 100 or 200 level courses or their equivalents.

Thesis Advisory Committee

Each master’s degree candidate is advised to consult with their program director as to when, and how, to form a thesis committee. The department chair, in consultation with the program director, chooses a faculty member to serve as the primary thesis advisor. This advisor also serves as the chair of the thesis committee. The primary thesis advisor will help identify other members of the faculty (at least two) to serve as secondary advisors and as members of the thesis committee. At least two members of the thesis committee must be from the department in which the student is enrolled, and one must be
from another department. Additional membership is not restricted and may include persons from outside the university who have qualifications acceptable to the department chair. Members of the thesis committee continue in their capacity until the student graduates or leaves the program of study. The thesis committee will be responsible for guiding the student in the development of a thesis protocol. Once a protocol is acceptable, the thesis committee members advise the student on the conduct of the research and writing of the thesis document. Ultimately, the committee members will evaluate the student's oral defense and final thesis document.

Research Project

For master's degree programs, each student must carry out an original and meaningful research project acceptable to the department chairperson and the advisory committee. A written thesis, similarly acceptable, is to be prepared and must conform to the standard format determined by the Office of Graduate Studies of the School of Dental Medicine. The thesis must be submitted before the prescribed deadline. An oral examination (defense) of the thesis is required. This examination is administered by the student's advisory committee before a standard date set by the Office of Graduate Studies of the School of Dental Medicine. Unanimous agreement of the committee is required to pass the thesis examination. A student must be registered for thesis credit or continuing graduate work during the semester in which the thesis examination is conducted. The thesis defense is ordinarily open to all members of the university faculty, student body, and guests.

Extra Courses

Individual students enrolled in an advanced education program, whether or not a master's degree is involved, may be required to take courses beyond the general requirements set forth by the department in order to complete the program. In such instances, the student must be notified in writing by the department chairperson, with a copy filed in the Office of Graduate Studies of the School of Dental Medicine.

Time Limits

Each student is expected to maintain continuous registration and all requirements must be completed within five consecutive calendar years immediately following matriculation as an advanced education student, including approved periods of leave of absence. A student who fails to complete the requirements within five years must be formally readmitted with full standing in order to continue study, subject to terms of readmission, future time limits, and revised requirements for the award of the degree. Prior status in the program is no guarantee of readmission and should not be assumed.

Leave of Absence

A student may request a leave of absence for personal reasons or reasons of health when anticipated or actual absence is in excess of three weeks. A written request for a leave of absence must include the reason for the request and the length of time requested. A leave of absence cannot exceed one calendar year. It must be submitted to the program director and to the Associate Dean for Graduate Studies of the School of Dental Medicine. The program director will forward the request with his/her response to the Committee on Graduate Studies. In order to be eligible for such requests, the student must be currently enrolled and in regular attendance prior to the time or circumstances that necessitated the request. At the expiration of the leave, the student must resume registration unless formally granted an extension. A leave of absence does not extend the maximum time permitted for the completion of degree requirements. A student who fails to obtain an approved leave, or who fails to resume registration at the time expected, may be separated from the program. During the period of leave, it is expected that the student will not avail himself or herself of the teaching and research resources of the School of Dental Medicine or the university. At the end of an approved leave, reentry into the program is reviewed by the program director in concert with the Committee on Graduate Studies and may not be at the same level attained at the time the leave was granted. Programs with a high patient case component may require that the clinical portion of the program be repeated in its entirety. Finally, the committee also reserves the right to place a student on leave of absence where it has been determined that the circumstances warrant, even in the absence of a formal request.

Maintenance of Good Standing

A minimum cumulative grade point average of 2.75 is required for good standing in a graduate program for all courses taken for graduate credit (excluding those graded Satisfactory/Unsatisfactory or Pass/No Pass).

The Associate Dean for Graduate Studies reviews student performance and may recommend a course of action to the Committee on Graduate Studies. The committee may require remedial work, place a student on academic review or probation, set conditions for continuation in the student's course of study or program, and may require withdrawal for failure to meet the academic standards set by the department or school. A student who receives a grade deemed unsatisfactory in any course is placed on probation and must remove himself or herself from probation within a time period specified by the committee. It is expected that removal from probation will ordinarily require repetition of the course with an acceptable grade or the successful completion of work deemed equivalent by the student's advisory committee and the departmental chairperson.

In this regard, a student may be separated from the university for any one of the following reasons:

1. Failure to correct probationary status within the specified time period.
2. Failure to achieve a minimum grade point average of 2.50 or above upon completion of 12 semester hours or a grade point average of 2.75 or higher upon completion of 21 semester hours of graduate study.
3. Failure to complete all requirements for the master’s degree within five consecutive calendar years from the term of matriculation, unless granted an extension of a maximum of one year upon recommendation of the advisor and chairperson and approved by the Associate Dean for Graduate Studies.

In calculating the grade point average, all courses for which quality points are given are counted, including courses which may be required to be repeated. In addition, on the recommendation of the student’s department, and with due process, the School of Dental Medicine may suspend or separate a student from the university for failure to maintain appropriate standards of conduct and integrity in discharging their responsibilities. Academic failure, moral delinquency, gross misconduct, or failure to meet the specific conditions of probation or academic review is sufficient reason for requiring withdrawal from the school.

Graduation

The minimum requirements for the master’s degree in the School of Dental Medicine are 54 semester hours of coursework, including six or more semester hours of thesis/equivalent registration, and the submission of an accepted thesis. Individual departments may require additional semester hours of specific coursework and/or thesis. Not less than 48 semester hours may be at the 500 level or higher.

A candidate for a Master of Science in Dentistry degree must make application for the degree to the Office of Graduate Studies of the School of Dental Medicine no later than three months before the commencement at which the degree is expected.

Candidates must meet all deadlines for completion of degree requirements set forth in the calendar issued by the Office of Graduate Studies for the School of Dental Medicine. All thesis students must be registered during the semester in which the degree is awarded (also see “Delayed Graduation”).

The awarding of the degree is dependent upon the satisfactory completion of all requirements, and the recommendations of department chairperson, Committee on Graduate Studies, and Faculty of the School of Dental Medicine. The student must complete all requirements for both the master’s degree and certificate in order to receive either.

Degrees will not be awarded to candidates with delinquent financial accounts that include, but are not limited to, tuition payments, fees, and library fines.

Delayed Graduation

A candidate who has successfully defended his or her thesis but who fails to meet the deadline for thesis submission for graduation in one semester, will be permitted to receive his or her degree at the next scheduled graduation, without further registration or payment of tuition if the completed thesis is submitted within fourteen days of the date originally scheduled for graduation. If all requirements are not met within this grace period, the candidate must register for the subsequent semester.

COURSE DESCRIPTIONS

DENTISTRY (DENC, DEND, EDNF, DENT)

DENC Courses

DENC 122. Preventive Periodontics (1)
Companion clinical component to DEND 121. Clinical application of methods for the prevention and maintenance of periodontal health in patients. The importance of patient education, motivation, and cooperation in present methods of prevention and plaque control.

DENC 124. Outreach Preventive Dentistry (2.5)
Clinical component of DEND 123.

DENC 162. Dental Anatomy (1)
Companion preclinical component to DEND 162. Laboratory exercises and assignments include drawings, waxups, tooth identification, and use of semi-adjustable articulator.

DENC 163. Masticatory Dynamics (1.5)
(See DENC 162.)

DENC 172. Basic Procedures in Fixed Prosthodontics (2)
Laboratory component of DEND 172.

DENC 222. Periodontics (1)
Companion clinical component for DEND 222. Students observe and assist at periodontal surgical procedures on moderately advanced periodontal diseases. Treatment includes root planing, curettage, occlusal adjustment, minor tooth movement and case maintenance.

DENC 229. Radiology Rotation (1)

DENC 248. Endodontics (5)
Companion laboratory component to DEND 248. Complete endodontic treatment performed by each student on extracted teeth using gutta percha.

DENC 262. Basic Procedure Operative (1)
Laboratory component of DEND 262.

DENC 265. Basic Procedure Operative (1)
Laboratory component of DEND 265.

DENC 267. Partial Denture Design Lab (1.5)
Theories of removable partial denture construction which enable the student to perform exercises that are associated with the techniques used to achieve a successful result. Students will be evaluated by various testing methods.

DENC 268. BP Competency Lab (1.5)

DENC 269. Prosthodontic Technology (2)
Companion preclinical component to DEND 269. Each student constructs a complete set of dentures using laboratory manikins as patient. Although DENC 269 was conceived as a technique course, one of its principal objectives is to prepare the student for the clinical aspect of dental education.

DENC 274. Basic Procedure Fixed Prosthodontics II (1)
Laboratory component of DEND 274.

DENC 277. Pediatric Dentistry Lab (1)
This course introduces, demonstrates, and provides exercises in basic pediatric dentistry restorative techniques for anterior and posterior teeth, pulp therapy for vital pulps, single and multiple tooth space maintenance, and management of trauma to the permanent anterior dentition.

DENC 282. Orthodontics (1)
Companion laboratory component to DEND 282. Application and fabrication of various orthodontic appliances.

DENC 322. Surgical Periodontics (1.5)
Companion clinical component to DEND 321. Clinical treatment in conjunction with residents and faculty.

DENC 328. Oral Diagnosis and Treatment Planning (1)
Treatment planning based on the correlation of fundamentals taught in diagnosis, preventive dentistry and restorative dentistry. Clinical experience in the application of didactic training consists of four components: assignments in the admitting and radiology service where students carry out examinations of the newly admitted patients and evaluate their problems and needs; radiology seminars where the technique and interpretation of the radiographs taken by the students are discussed; assignments to the emergency service; and clinical conferences with a staff member.

DENC 348. Endodontics Clinic (1.5)
Companion clinical component to DEND 348. Clinical application of endodontic techniques.

DENC 363. Operative Dentistry II (1)
Companion clinical component to DEND 363 and DEND 364. Clinical application of the basic principles of operative and cosmetic dentistry. Prereq: Completion of BPRD.

DENC 364. Operative Dentistry II (1)
(See DENC 363.) Prereq: Completion of DENC 363.
DENC 373. Fixed Prosthodontics Clinic I (1)  Companion clinical component of DEND 374.  Clinical experiences in fixed prosthodontics. Prereq: Completion of BPRD.

DENC 374. Fixed Prosthodontics Clinic II (1)  (See DENC 373.)  Prereq: DENC 373.

DENC 378. Pediatric Dentistry Clinic (1.5)  Companion clinical component of DEND 378.

DENC 389. General Practice Dentistry (3)  Comprehensive dental care. Each student is assigned for clinical training to a preceptor group led by a practicing general dentist. The preceptor guides the students in diagnosis, treatment planning, and actual patient treatment with consultation in various specialties as required. Experiences in the provision of emergency dental care. The preceptor directs the total dental health care of the patients of each of his students. Biweekly seminars are provided for each preceptor group. Special topics, student cases, techniques, and journal articles are discussed.

DENC 390. General Practice Dentistry (3)  Clinical application of the principles of general practice dentistry.

DENC 392. General Dentistry Clinical Qualifying (5)  This course consists of the successful completion of the recall clinical qualifying exam and two diagnosis and treatment planning clinical qualifying exams. It is also necessary for the student to successfully fulfill the recall needs of their assigned clinic patients in order to pass this course.

DENC 397. Quality Assurance (1)  This course entails quality assurance issues including, but not limited to: providing students with the working knowledge of dental record keeping, as it relates to diagnosis and treatment of pathology; recognition and management of medical illness and disabilities; treatment planning; documentation of pre-existing conditions, current and past treatment; established laboratory protocols; evaluation of reasons for remakes and re-dos; post-treatment evaluation of care. Prereq: DEND 394.

DENC 422. Periodontics (5)  Clinical application of surgical and nonsurgical techniques used in the treatment of moderate periodontal disease. Students exposed to more advanced cases through clinical demonstrations by instructors. Students encouraged to gain additional experience and become more confident in the management of periodontal patients.

DENC 428. Oral Diagnosis and Radiology (5)  Clinical experience in the admitting and radiology service.


DENC 464. Operative Dentistry (1.5)  Clinical application of the principles of operative dentistry.

DENC 468. Prosthodontics (1.5)  Clinical application of the principles of prosthodontic dentistry.

DENC 474. Fixed Prosthodontics (1.5)  Treatment of patients requiring simple and advanced fixed prostheses as an integrated part of total patient care.

DENC 478. Pediatric Dentistry (1)  Emphasizes comprehensive oral health care of the well child to provide experience in examining, diagnosing, treatment planning, and completing treatment of a selected number of children. Preventive aspects of pediatric dentistry emphasized. Additional voluntary experiences in clinical practice of pediatric dentistry available.

DENC 482. Clinical Orthodontics (1)  Clinical application of the principles of orthodontics.

DENC 489. General Practice Dentistry (5)  Comprehensive dental care. Each student is assigned for clinical training to a preceptor group led by a practicing general dentist. The preceptor guides students in diagnosis, treatment planning, and actual patient treatment with consultation in various specialties as required. Experiences in the provision of emergency dental care. The preceptor directs the total dental health care of the patients of each of his students. Biweekly seminars are provided for each preceptor group. Special topics, student cases, techniques, and journal articles are discussed.

DENC 490. General Practice Dentistry (5)  (See DENC 489.)

DENC 492. General Dentistry Clinical Competency (5)  This course consists of the successful completion of the recall, emergency, diagnosis and treatment planning, and patient outcomes clinical competencies. It is also necessary for the student to successfully fulfill the recall needs of their assigned clinic patients in order to pass this course. Prereq: Completion of Basic Core Program.

DENC 498. Quality Assurance (1)  This course reinforces quality assurance skills and knowledge provided in the prerequisite course including, but not limited to: providing students with the working knowledge of dental record keeping, as it relates to diagnosis and treatment of pathology; recognition and management of medical illness and disabilities; treatment planning; documentation of pre-existing conditions, current and past treatment; established laboratory protocols; evaluation of reasons for remakes and re-dos; post-treatment evaluation of care. Prereq: DEND 394.

DEND Courses


DEND 104. Neurobiology (3)  An integrated approach to the anatomy and physiology of the human nervous system. Analyzes neuronal phenomena at both cellular and systems levels. Focus on the principles of organization of those components related to the neurology of the jaws.

DEND 106. Oral Histology (3)  Development of teeth and supporting tissues. Histology and ultrastructure cytology of the oral region with emphasis on the calcified tissues.


DEND 108. Physiology (4.5)  This course investigates the functions of human organ systems in the healthy state and leads to an understanding of the workings of the human body. Muscle, bone, gastrointestinal, cardiovascular, renal, respiratory and endocrine systems are covered.

DEND 110. Special Topics in Dentistry (5-4)  Directed study under faculty supervision and with special permission of the Associate Dean for Academic Affairs.

DEND 114. Professional Development (1)  This didactic course focuses on the professional development of the student dentist. Basic principles of professionalism and ethics are introduced. A model of patient-centered communication is presented and students begin to develop effective dentist-patient communication skills. Students consider and understand the variety of factors that can influence patients’ oral health beliefs and behaviors. A model of behavior change and principles of patient education are presented. Specific behavior management issues are considered.

DEND 116. Introduction to Microbiology and Immunology (3)  Introduction to the basic concepts, characteristics, and techniques used in the study of the clinically and orally significant microbial groups: viruses, bacteria, and fungi. The structure, metabolism, genetics, and control of each microbial group will be described. Also, the introduction of the molecular, cellular, and organismal mechanisms responsible for the human immune response system. Basic concepts of infection control in the clinical setting will be reviewed.

DEND 119. Critical Thinking in Research (1)  Students initiate evaluation of experimental design and apply analytical statistics to the critical reading of dental literature.


DEND 123. Outreach Preventive Dentistry (3)  This course covers the basic didactic and clinical curriculum necessary for first-year dental students to be able to place dental sealants on elementary/middle school children as part of a school-based sealant program. Etiology of dental caries, preventing dental disease, behavioral management theories, and sealant techniques will be explored.

DEND 158. Introduction to Dental Materials (1.5)  The primary goal is to introduce basic material science concepts needed to evaluate, compare and select materials for a specific application. Knowledge of properties, indications and limitations of different clinical and laboratory materials will be presented. The effect of
DEND 162. Dental Anatomy (3)
Descriptive anatomy of masticatory structures with emphasis on deciduous and permanent teeth and the temporomandibular-mandibular movements, and the fundamental concepts of the functional relationships between the dentition and the temporomandibular joint. Lectures on comparative anatomy and variations in tooth morphology.

DEND 163. Masticatory Dynamics (2)
(See DEND 162.)

DEND 172. Basic Procedures in Fixed Prosthodontics (2)
To introduce and familiarize the dental student to basic principles related to fixed prosthodontics. The introduction will emphasize principles of engineering and preparation designs, full coverage retainers for both metal and ceramic restorations.

DEND 182. Facial Growth and Development (1)
Introduction to the normal growth and development of the human face from embryology to adult.

DEND 211. General Pathology (5)
General principles of pathology; etiology; retrograde changes; inflammation and repair; bacterial, viral, and mycotic infections, and disturbances of growth presented as an introduction to a more detailed consideration of oral pathology. The pathology of the organ systems.

DEND 214. Oral Pathology (4)
Diseases and abnormalities of the teeth and adjacent hard and soft tissues. Includes periodontal, pulpal, and periapical diseases as well as cysts, tumors, developmental anomalies, and oral aspects of systemic disease.

DEND 215. Medical Microbiology and Immunology (5)
Fundamental concepts of bacteriology, virology, and immunology, and their interrelationships in systemic and oral disease processes.

DEND 222. Periodontics (1)
A comprehensive course in periodontology including etiology, diagnosis, radiographic, interpretations and prognosis.

DEND 225. Physical Evaluation (1)
Involves the exploration of patient database building. The scope and methods for data collection, physical examination appropriate to dental care, data recording and data interpretation are discussed in order to be able to assess the patient’s ability to receive dental care safely. The recognition of signs and symptoms of medical and dental disease and the implications for patient well-being are discussed. Systematic evaluation of the patient’s physical examination, medical history, and dental history are integrated so that differential diagnoses may be developed.

DEND 228. Treatment Planning I (1)
This course provides lecture presentations to help prepare the student to develop skills in patient diagnosis and treatment planning. The lectures will guide the students through the thought processes necessary in the development of workable treatment plans. The emphasis will be on exposing the students to the approach used in our clinic of providing the patients with options of optimal, alternative and emergency diagnostic or recall treatment plans using decisional analysis.

DEND 229. Principles of Radiography (1)
Initial course consisting of lecture and laboratory covering basic principles of radiography. Included are: instructions on taking intraoral radiographs, radiation physics involved in x-ray generation and the parts and function of the x-ray unit, radiation biology of x-ray interaction with tissue, head and neck anatomy and pathology with regards to radiographic interpretation. Each student will have a clinic rotation.

DEND 230. Advanced Principles of Radiography (1)
This is a continuation of DEND 229. This course will explore alternative intraoral radiographic techniques, extraoral radiography techniques, their uses and limitations. Included is a discussion of radiation safety in the dental office and film processing. Each student will have an opportunity to gain “hands-on” experience in patient alignment for a panoramic radiograph and alternative tools for taking quality films. Each student will have a clinic rotation.

DEND 243. Pharmacology (4)
This course introduces students to the principles of pharmacology and to the mechanisms of drug action in the context of common disease states.

DEND 248. Endodontics (1)
Introduction to methods and materials necessary for successful root canal therapy.

DEND 251. Applied Anatomy of the Head and Neck (5)
Review of head and neck anatomy with clinical correlations.

DEND 252. Oral Surgery - Pain Control (1)
Anatomy pertaining to local anesthesia. Drugs used in local anesthesia and technique of administration. Management of complications. Slides and clinical demonstrations.

DEND 257. Dental Materials (1)
This course provides the basic information required to facilitate the optimal selection, handling, placement, and care of materials used in dentistry.

DEND 262. Basic Procedure Operative (2)
This course, together with DEND/DENC 265, covers the criteria, techniques, and practice of preparing “ideal/standard” operative preparations and placement of operative restorations. The emphasis is on posterior amalgam preparations and restorations, as well as an introduction to cast gold inlay and onlays. Students will be introduced to basic cariology and radiology as it relates to operative dentistry. In addition, the composition and properties of amalgam, liners and bases, investment material, and gold will be reviewed. Students will work on typodont and extracted teeth.

DEND 265. Basic Procedure Esthetics (1)
This course provides formal lecture presentations and laboratory exercises to introduce the students to basic operative procedures for direct composite resin restorations.

DEND 267. Partial Denture Design (4)
Recognition of clinical situations that require partial denture therapy are developed. Introduction to the terms used in removable partial prosthodontics. Partially edentulous cases diagnosed, designed, surveyed, contoured for path of insertion, prepared for rest seat areas, and finally tripped for further orientation by each student on his or her own casts. Thus the design, surveying, and clinical applications for removable partial service are presented in order to maintain optimum oral health conditions and to provide a sound basis for the prosthesis.

DEND 268. BP Competency (2)
DEND 269. Prosthodontic Technology (2)
A lecture—demonstration—laboratory approach to complete denture prosthesis construction. Emphasis on certain fundamental biological considerations of the edentulous patient, such as the oral membranes, muscles, bones, and phonetics and how they relate to the technical aspects of denture constructions.

DEND 274. Basic Procedure Fixed Prosthodontics II (3)
This course builds upon those core elements covered in DEND/DENC 172. Emphasis on principles of engineering for fixed partial dentures, preparation and design of fixed partial dentures, considerations for the restoration of endodontically involved teeth, and definitive and provisional fixed partial denture restorations. Introduces dental material topics related to fabrication of a fixed partial denture restoration, including: chemomechanical soft tissue retraction, die spacers, investments, casting and casting alloys, ceramics, soldering, provisional materials, prefabricated and custom post and core systems.

DEND 282. Orthodontics (1)
Presents principles of orthodontics including relevant areas of applied growth and development, diagnosis methods, biomechanics, and techniques. Histological and physiological changes due to orthodontic tooth movement and biomechanical and laboratory techniques related to the fabrication and use of suitable orthodontic appliances. Biomechanical principles, and the materials science and biologic background necessary for proper clinical management of these appliances.

DEND 284. Dentofacial Morphology (1)
Provides the dental student with an introduction to the assessment of dynamic faces and the relatively static dentition. The course details the etiologies and characteristics of various malocclusions including developmental disharmonies observed during the growth and development of a child. Primary emphasis is laid on empowering the student in the diagnoses of malocclusions employing study casts, intra and extra-oral photographs and cephalograms.

DEND 291. Dental Auxiliary Management (5)
Lectures in the principles of auxiliary management. Overview of organization management, communication skills, duty delegation, and organization of work. Information is provided about the dental allied health fields, duties, responsibilities, training, and testing.

DEND 301. National Board I Review (.5)
This didactic course is comprised of 5 sessions (1.5 hours per session), and an on-line database of board-like questions. The purpose of the course is to provide the matriculating third-year students with a review of material applicable to National Boards Part 1. Included are questions for the following subjects: Gross Anatomy, Histology, Microbiology, Pathology, Physiology, Biochemistry, Dental Anatomy, and Occlusion. Prereq: Matriculating third year.
DEND 315. Practice Management I (1)
This course is designed to develop practical knowledge and skills in dental practice management. It is organized around initial topics that will lay the foundation for adequate planning for practice success after graduation. The subsequent courses build upon this foundation knowledge so that students will have a general perspective of where to begin their strategies for success in the future. This course discusses topics that include analysis of practice configurations, choosing the appropriate consultants, basic tools for fiscal management and evaluation, and identifying opportunities that match the student’s life goals.

DEND 320. Issues and Trends (1)
Major issues and trends that affect oral health and the mission of dentistry in the United States. Behavioral knowledge and skills essential to the oral health practitioner’s ability to deliver effective patient-centered care.

DEND 321. Surgical Periodontics (1)
Case analysis and treatment planning for various conditions of periodontal disease. Case presentation to patients. Basic surgical technique and advanced types of periodontal surgery demonstrated. Occlusal analysis and occlusal adjustment considered.

DEND 326. Oral Rehabilitation (1)
The didactic curriculum provides a series of lectures that emphasize the importance of evaluation of the entire stomatognathic system for treatment planning. Causal relationships influenced by misdirected forces and hyperfunction are discussed.

DEND 328. Treatment Planning II (1)
This course will initially deal with the predoctoral clinic process of collecting data and information following the protocols which are utilized in our clinic. The process of educating the patient from a medical and patient management viewpoint will be discussed and practiced by the students with written assignments. A “flow chart” approach will be utilized to deal with clinical departmental patient issues to aid the student in developing treatment plans.

DEND 329. Oral Diagnosis and Radiology (2)
This course is designed to develop practical knowledge and skills in dental practice management. As the student prepares for clinical practice, topics surrounding negotiation of working contracts, insurance contract evaluation, policies, compliance, and marketing are among some of the most important issues to be familiar with. Skills acquired in the preceding course are applied to the student’s “practice” (panel of patients) for evaluation of practice productivity and growth.

DEND 332. Geriatric Dentistry (1)
The didactic curriculum provides a general background on the changing demographics of our population as well as knowledge about the medical, social, psychological, and dental problems many older Americans face today. Dental problems common to the elderly, approaches to treatment planning and the provision of care for this unique group in traditional and non-traditional settings are explored.

DEND 333. Management of Medical Emergencies (1)
Patient evaluation, diagnosis and treatment of life-threatening emergencies that may arise in the course of dental treatment. Includes instruction in basic life support and cardiopulmonary resuscitation.

DEND 340. Clinical Pharmacology (2)
This course is designed to review common pharmacologic agents encountered in the general population. Emphasis is placed on the prescription, action, and interaction of dental pharmacologic agents as well as the implication of medical prescriptions on dental therapy. The course culminates in the evaluation of case studies and problem solving in drug therapy.

DEND 348. Endodotics (1)
Recognition of endodontic pulpal health and the changes that occur in the transition from health to disease. The didactic component focuses on scientific basis for recognition of degenerative states of the dental pulp and the philosophy of endodontic therapy. The clinical component focuses on the treatment of diseased, pulpally-involved teeth of actual patients. It provides practical instruction on how to render endodontic therapy under the direct supervision of qualified endodontic personnel.

DEND 351. Oral Surgery II (1)

DEND 352. Dental Management of Medical Disease (1)
Hospital procedures and protocol and the management of surgical complications and emergencies. General principles of surgery as applied to selected topics.

DEND 354. Oral Surgery IV (1)

DEND 355. Introduction to Conscious Sedation (.5)
Physiopharmacology of nitrous oxide use. Indications, contraindications, and complications.

DEND 360. Implant Dentistry (1)
Didactic and laboratory instruction introduce the concepts used in dental implantation, including the diagnostic and patient evaluative techniques to determine if implant therapies are appropriate. The student is exposed to the scientific basis of implant tissue reactions, implant system selection and the restorative and surgical protocols of therapy. Lecture/slideshow format with student interaction. Student participates in a laboratory program that simulates performance of a successful implant restoration. Completion and proficiency of this material is prerequisite for the restoration of an implant restoration on a clinical patient.

DEND 363. Operative Dentistry (1)
Expands beyond the basic concepts learned in BPRD to include new advances in materials and in techniques, plus the indications and contraindications for their use, as supported by recent research and literature. Problem solving in clinical practice will be emphasized.

DEND 364. Aesthetic Dentistry (1)
Lectures and demonstrations. The indications, contraindications, limitations, and use of modern techniques and materials in aesthetic dentistry.

DEND 368. Prosthodontics (2)
Develops basic principles previously taught for clinical application. Instruction to immediate denture, partial denture, and over denture prostheses. Lectures and audio-visual demonstrations relating to cleft palate, TMJ disturbances, and cosmetic prosthesis of the face.

DEND 371. Occlusion Seminar (2)
An introduction to gnathological principles: terminology, procedures and instrumentation. Correlation of history and clinical symptoms with treatment modalities emphasized. Use of bite planes, centric relation registration, and diagnostic waxup on mounted casts.

DEND 374. Fixed Prosthodontics (1.5)
Diagnosis and treatment planning in fixed prosthodontics and construction of simple crowns and bridges. Lecture series concerning the discussions and demonstration of elementary and advanced methods of restoring occlusion, esthetics, and speech using fixed prosthesis.

DEND 378. Pediatric Dentistry (2)

DEND 379. Nutrition for Dentistry (1)
General nutrition concepts are presented in addition to aspects pertinent to the practice of dentistry.

DEND 394. Dental Patient Management/Risk Management (1)
Principles of patient management and risk management are reviewed. The primary focus is directed toward the skills associated with communication. A variety of examples of malpractice are reviewed and discussed. Other areas of risk are discussed such as infection and occupational hazards related to EPA and OSHA standards.

DEND 411. Clinical Oral Pathology (1)
Clinical features of oral lesions as a basis for differential diagnosis. Clinical slides representing a variety of diseases. Students are encouraged to participate in classroom discussions.

DEND 415. Practice Management II (2)
Students deal with entrepreneurship applications and experiences specific to dentistry and are introduced to the process of formulating a business plan. Personal finance and investment strategies are covered in this course, particularly as they pertain to developing a business plan for the students’ careers. Each student constructs a business plan specific to the goals and situation of that student.

DEND 416. Practice Management III (1.5)
This course is designed to develop practical knowledge and skills in dental practice management. As the student prepares for clinical practice, topics surrounding negotiation of working contracts, insurance contract evaluation, policies, compliance, and marketing are among some of the most important issues to be familiar with. Skills acquired in the preceding course are applied to the student’s “practice” (panel of patients) for evaluation of practice productivity and growth.

DEND 420. Jurisprudence and Professional Ethical Responsibility (.5)
Ethical and legal issues, civil and criminal law, contracts, malpractice and current ethical and legal dilemmas encountered in practice.

DEND 421. Periodontal Medicine and Case Presentation (1)
Further application of the knowledge and skills learned in prior periodontal courses. Focus is on how selective periodontal treatment can be integrated into a treatment plan considering the parameters presented by a special situation. Some examples are treatment related to endodontics, prosthodontics, geriatrics, esthetics, orthodontics, and implantology. Prereq: DEND 121, DENT 122, DENT 222, DENT 222, DENT 321, and DENT 322.

DEND 426. Oral Diagnosis Seminar (1)
Case-based review of oral diagnosis, radiology, and medicine.

DEND 427. National Boards Part II Preparation (1)
Multidisciplinary approach designed to prepare students for the National Dental Board Examination, Part II.
DEN 428. Regional Board Preparation (1.5) Procedures, standards, and expectations of regional board examinations are reviewed in order to better prepare students.

DEN 445. Pharmacology Board Review (1) Drugs useful in dentistry with special emphasis on their clinical application.


DEN 482. Orthodontics (1) Instruction through lectures and audio-visual programs enabling the student to gain judgment, knowledge, and skills to select and treat uncomplicated tooth irregularities in children and adults. Advanced topics in comprehensive orthodontics, such as surgical orthodontics and cleft-palate treatment.

DEN 488. Case Presentations (2.5) Selected cases presented by students and instructors emphasizing diagnosis, treatment planning, and complete patient care. Topics of special interest covering the concepts of total patient care and recent advances in dental treatment presented by guest lecturers and faculty.

DEN Courses

DEN 422. Comprehensive Periodontics (3) This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have approval of their Chairperson and the Dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dentistry in order to assure competency in the periodontic procedures associated with general dentistry.

DEN 428. Comprehensive Oral Medicine (3) This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their Chairperson and the Dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dentistry in order to assure competency in the endodontic procedures associated with general dentistry.

DEN 448. Comprehensive Endodontics (3) This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their Chairperson and the Dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dentistry in order to assure competency in the endodontic procedures associated with general dentistry.

DEN 455. Comprehensive Oral Surgery (3) This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their Chairperson and the Dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dentistry in order to assure competency in the endodontic procedures associated with general dentistry.

DENT Courses

DENT 310. Summer Clinic (0-5) Attendance is mandatory in the dental clinic between the spring semester of the second year and the fall semester of the third year. Students begin performing restorative preparations on patients and become acquainted with all aspects of clinical practice and operation.

DENT 501. Biological Aspects of the Stomatologic System (2) This course is a review of biochemistry, molecular and cellular biology, histology, and oral anatomy and an expansion of oral biological topics that underlie the disciplines of endodontics, orthodontics, periodontics, and pediatric dentistry.

DENT 502. Correlative Medical Science (2) Case-based discussion of selected systemic disease commonly encountered by the dentist.

DENT 503. Facial Growth and Development (1) Emphasis on the qualitative, quantitative, and integrative changes during postnatal craniofacial growth and development.

DENT 504. Advanced Facial Growth (1) Student participation in seminar evaluation series dealing with problems and controversies apparent in the literature in regard to theories of growth, development, and aging. Emphasis on the craniofacial literature but not exclusively.

DENT 505. Dentofacial Anomalies (1) This course is designed to provide the student with the practical experience regarding the multidisciplinary aspects of diagnosis and treatment of patients with craniofacial anomalies. Observation of team sessions and active participation in patient examinations, diagnosis, and treatment planning.

DENT 506. Concepts of Occlusion (Orthodontics) (1) Course given in a continuing education format dealing with the spectrum of gnathology. Subjects include the physiology of occlusion, record-taking and mounting of cases, laboratory and clinical exercises in occlusal equilibration, splint construction, set-ups, positioner construction, and the examination, diagnosis, and treatment of various TMJ disorder. Instruction is carried out by the use of lectures and laboratory and clinical exercises.

DENT 509. Advanced Dental Studies (1-10) A course for non-degree-seeking students who wish to pursue special post-doctoral studies in the School of Dentistry. Arrangement made through the department and the Associate Dean for Graduate Studies.

DENT 510. Epidemiology and Biostatistics (3) A detailed presentation of epidemiological and biostatistical techniques designed to acquaint the student with a broad spectrum of scientific approaches and to prepare for a research project. Topics include design of observational and experimental studies, common biostatistical techniques encountered in the dental literature such as t-test, ANOVA, chi-square, correlation and regression, and assessing the validity of diagnostic tests. Instruction includes lectures, critique of selected literature and computer analysis of data.

DENT 512. Advanced Oral Pathology (3) Lectures and seminars on the clinical and histopathologic characteristics of many of the common oral diseases. Special emphasis on developing a logical approach to clinical and histopathologic diagnosis. Each participant is required to study a set of microscopic slides. Participation is expected for in-class discussion of the clinical and histopathologic material presented.

DENT 513. Anatomy of the Head and Neck (3) This course deals with the structural, functional, and clinical relationships of the many organs and organ systems which comprise the head, neck, and pharyngeal regions of the human body.
DENT 514. Research Methods: Preparation (1.5)
The goal of this course is to facilitate a formal statement of the student's research idea as preparation for working with a thesis committee or undertaking independent research. Prereq: D.D.S. or equivalent.

DENT 515. Interdisciplinary Seminar (1)
This course is meant to frequent the first-year graduate student/resident with ongoing research at the School of Dentistry as well as collaborative research being conducted with other Case faculty members at other sites on campus. Presentations also include completed Master's thesis work by graduating residents from their respective programs, when possible. Clinical presentations of an interdisciplinary nature are also presented by members of the clinical departments, with an emphasis on applied research whenever possible.

DENT 516. Microbiology, Immunology, and Immune Systems (1)
This course reviews bacterial structure and classification, provides insight into oral bacterial pathogenesis. Principles of antibiotic use and mechanisms of resistance are reviewed. Microbial diagnostic methodologies are discussed. Integration of periodontics, endodontics, and pediatric dentistry are stressed as it relates to the inflammatory process in the human host.

DENT 518. Behavior Considerations in Oral Health (5)
This 8-contact-hour course focuses on the behavioral knowledge and skills the oral health practitioner must possess in order to deliver effective, patient-centered care. Specifically, the course is designed to enhance graduate students’ existing knowledge and skills in relation to dentist-patient communication, management of diverse patient populations, and patient education and facilitation of health behavior change.

DENT 522. Orthodontic Diagnosis Seminar (1)
Registration in each of six semesters is required for students in the orthodontics program. Series of weekly lectures and seminars covering the science of orthodontic diagnosis. Initial two courses consist of lectures on the techniques of diagnosis, various diagnostic aids, and case planning. The following three courses consist of seminars where the students perform diagnosis, plan treatment and critique cases from the department. The final semester is used for long-term follow-up clinic.

DENT 523. Clinical Specialty Seminar I - Orthodontics (2)
This course is a companion to clinical training in orthodontics and involves faculty and student evaluation of past and present literature. Sessions are used to evaluate current timely literature, and lectures and seminars complement the clinical experiences with topics including patient management, treatment of various aged populations and malocclusions, orthopedic appliances, treatment of patients with special needs, and various aspects of fixed and removable mechanotherapy. First in a series of four courses.

DENT 524. Clinical Specialty Seminar II - Orthodontics (2)
Second in a series of four courses. (See DENT 523.)

DENT 527. Clinical Specialty Seminar III - Orthodontics (2)
Third in a series of four courses. (See DENT 523.)

DENT 528. Clinical Specialty Seminar IV - Orthodontics (2)
Fourth in a series of four courses. (See DENT 523.)

DENT 529. Endodontology I (3)
Scientific rationale for endodontic practice. Endodontic anatomy, physiology, pathology, and microbiology. All treatments and techniques studied and substantiated by current and classical research. First in a series of four courses.

DENT 530. Endodontology II (3)
Second in a series of four courses. (See DENT 529.)

DENT 531. Endodontology III (3)
Third in a series of four courses. (See DENT 529.)

DENT 532. Endodontology IV (3)
Fourth in a series of four courses. (See DENT 529.)

DENT 539. Endodontic Literature Review I (3)
Provides scientific basis for present and future treatment. Instructs students in critically evaluating literature. Provides format for lifelong self-education. Specific journal assignments summarized, evaluated, and presented for group discussion weekly. First in a series of four courses.

DENT 540. Endodontic Literature Review II (3)
Second in a series of four courses. (See DENT 539.)

DENT 541. Endodontic Literature Review III (3)
Third in a series of four courses. (See DENT 539.)

DENT 542. Endodontic Literature Review IV (3)
Fourth in a series of four courses. (See DENT 539.)

DENT 549. Clinical Pharmacology I (1)
This course is designed to enable residents to obtain an understanding of the pharmacology of the most commonly prescribed medications; pharmacotherapeutic concepts in relationship to disease pathophysiology; rational drug therapy in the treatment of disease; drug-drug interactions and drug-disease interactions; adverse drug events. Residents will be expected to apply information on disease pathophysiology and pharmacotherapy to clinical cases. The ultimate goal is to provide relevant information to assist clinicians in practice.

DENT 550. Clinical Pharmacology (1)
This course is designed to enable residents to obtain an understanding of the pharmacology of the most commonly prescribed medications; pharmacotherapeutic concepts in relationship to disease pathophysiology; rational drug therapy in the treatment of disease; drug-drug interactions and drug-disease interactions; adverse drug events. Residents will be expected to apply information on disease pathophysiology and pharmacotherapy to clinical cases. The ultimate goal is to provide relevant information to assist clinicians in practice.

DENT 551. Clinical Endodontic Specialty I (3)
Students present case histories as they encounter them in clinic. Cases discussed in detail and critically evaluated by colleagues and graduate endodontic faculty. Past endodontic literature discussed in detail as each student presents a topic assigned by faculty. Problems in clinic discussed. Several guest endodontists present various techniques and perform them. First in a series of four courses.

DENT 552. Clinical Endodontic Specialty II (3)
Second in a series of four courses. (See DENT 551.)

DENT 553. Clinical Endodontic Specialty III (3)
Third in a series of four courses. (See DENT 551.)

DENT 554. Clinical Endodontic Specialty IV (3)
Fourth in a series of four courses. (See DENT 551.)

DENT 555. Management of Medical Emergencies (1)
This course covers the diagnosis and management of common medical emergencies, with special emphasis on patient evaluation and history taking to prevent such emergencies in the dental office. Viniupuncture technique and the use of emergency equipment are demonstrated. Also included is a basic course in cardio-pulmonary resuscitation, with practical demonstrations and examinations that lead to certifications in basic CPR.

DENT 557. Periodontal Conference I (1)
Presentation of treated patients with advanced periodontal disease. Discussion of the clinical findings, etiology, diagnosis, and treatment plan. Critical review of the different surgical procedures used in therapy and evaluation of postoperative results. First in a series of four courses.

DENT 558. Periodontal Conference II (1)
Second in a series of four courses. (See DENT 557.)

DENT 559. Periodontal Conference III (1)
Third in a series of four courses. (See DENT 557.)

DENT 560. Periodontal Conference IV (1)
Fourth in a series of four courses. (See DENT 557.)

DENT 565. Practice Management I (Ortho) (1)
Seminar and demonstration course designed to prepare the student for all phases of the “business” of orthodontics as well as the responsibility of being a “professional.” Management of the department clinic, private practice management, office visits, and the business community, and ethics through the use of guest speakers on jurisprudence, personal and professional insurance, estate planning, risk management, informed consent, banking, office design, organized dentistry and investments. First in a series of four courses.

DENT 566. Practice Management II (Ortho) (1)
Second in a series of four courses. (See DENT 565.)

DENT 567. Practice Management III (Ortho) (1)
Third in a series of four courses. (See DENT 565.)

DENT 568. Practice Management IV (Ortho) (1)
Fourth in a series of four courses. (See DENT 565.)

DENT 569. Orthodontic Literature Review I (1)
The course will focus on contemporary and classic literature selected to cover a wide range of orthodontic topics. The selected literature includes the reading list suggested by the American Board of Orthodontics in preparation for the Part II of the ABO examination. Students will be required to discuss the articles and answer questions pertaining to the reviewed material.

DENT 570. Orthodontic Literature Review II (1)
The course will focus on contemporary and classic literature selected to cover a wide range of orthodontic topics. The selected literature includes the reading list suggested by the American Board of Orthodontics in preparation for the Part II of the ABO examination. Students will be required to discuss the articles and answer questions pertaining to the reviewed material.

DENT 572. Pre-Clinical Principles in Orthodontics (1)
This course is comprised of a series of seminars presented by orthodontic faculty covering topics that will prepare the first orthodontic resident for the initial phases of clinical training.

DENT 573. Advanced Specialty Principles: Clinical II (2)
Full fixed orthodontic appliance treatment of patients in an educational setting. First in a series of four courses.

DENT 574. Advanced Specialty Principles: Clinical II (2)
Second in a series of four courses. (See DENT 573.)

DENT 575. Advanced Specialty Principles: Clinical III (2)
Third in a series of four courses. (See DENT 573.)
DENT 576. Advanced Specialty Principles: Clinical IV (1)
Fourth in a series of four courses. (See DENT 573.)

DENT 577. Clinical Periodontics I (3)
Clinical practice of periodontics supplemented by case evaluation and treatment planning. A comprehensive study of normal and diseased periodontal tissues including etiology and diagnosis. Current modes of therapy-rationale technique, and prognosis. First in a series of four courses.

DENT 578. Clinical Periodontics II (3)
Second in a series of four courses. (See DENT 577.)

DENT 580. Orthodontics-Oral Surgery Conference (1)
A seminar series involving a multidisciplinary approach to the treatment of patients with severe craniofacial deformities. Begins in the fall of each year (continuing for four semesters) with a series of lectures, followed by assignment of patients supervised jointly by the departments of orthodontics and oral surgery. Meetings held bimonthly to review patient progress, plan treatment, and present cases for discussion. Each student involved in all phases of treatment: presurgical orthodontics, the surgical procedure, finishing orthodontics, and retention.

DENT 581. Clinical Periodontics III (3)
Third in a series of four courses. (See DENT 577.)

DENT 582. Clinical Periodontics IV (3)
Fourth in a series of four courses. (See DENT 577.)

DENT 583. Orthodontic Diagnostic Seminar I (1)
Series of lectures and seminars covering the science of orthodontic diagnosis. Course consists of lectures on techniques of diagnosis, treatment planning, and critique of cases from the department or from faculty private practices. Content also includes long-term follow-up of post retention cases. First in a series of three courses.

DENT 584. Orthodontic Diagnostic Seminar II (1)
Second in a series of three courses. (See DENT 583.)

DENT 585. Orthodontic Diagnostic Seminar III (1)
Third in a series of three courses. (See DENT 583.)

DENT 586. Limited Tooth Movement for the Dental Specialist (1)
A review of the rationale for orthodontic treatment in periodontally diseased patients and in pre-restorative dentitions. Lectures, audio-visual programs, and technique sessions. Diagnosis, treatment planning, and various methods of tooth movement.

DENT 587. Periodontal Prosthesis (1)
This course examines and defines the periodontal prosthetic interrelationships beginning with treatment planning and continuing with discussing the utilization of the combined treatment modalities. It focuses on provisionalization, furcation treatment, occlusion, aesthetics, removable appliances, and special advanced treatment problems.

DENT 588. Hospital Rotation (2)
Students are assigned full time to anesthesia service and perform such duties as directed by anesthesiology staff: preoperative evaluation of patients, indications and contraindications for specific methods of anesthesia, relationship of medical problems to anesthesia risks, assisting in preparation of patients for anesthesia, intubation and anesthesia management, assisting in the management of complications, and post-anesthetic recovery management including monitoring of vital signs, blood gases, EKG, etc., and participation in post-anesthesia rounds and conferences.

DENT 595. Advanced Periodontal Seminar I (1.5)
Series of seminars covering clinical, histological, and physiological aspects of the periodontium in health and disease, etiology, diagnosis, prognosis, prevention, and treatment of periodontal disease, as well as the relationship of periodontics to other phases of dentistry. First in a series of four courses.

DENT 596. Advanced Periodontal Seminar II (1.5)
Second in a series of four courses. (See DENT 595.)

DENT 597. Advanced Periodontal Seminar III (1.5)
Third in a series of four courses. (See DENT 595.)

DENT 598. Advanced Periodontal Seminar IV (1.5)
Fourth in a series of four courses. (See DENT 595.)

DENT 651. Thesis M.S.D. (1-9)
Subsections for each program area of study: endodontics, orthodontics, or periodontics.

DENT 661. Conscious IV Sedation I (2)
Didactic portion covers physical evaluation, physiology, pharmacology, emergencies, and techniques. Cardiac monitoring, basic life support, and advanced cardiac life support.

DENT 662. Conscious IV Sedation II (1)
(See DENT 661.) Supervised clinical experience in conscious IV sedation.

DENT 663. Implant Dentistry I Periodontics (1)
Designed to enhance the understanding of current concepts and their role in the multidisciplinary treatment of the patient.

DENT 664. Implant Dentistry II Periodontics (1)
(See DENT 663.) Clinical demonstration, participation, and case presentation in implant dentistry.

DENT 682. Cephalometrics (1)
A lecture and laboratory course in cephalometric roentgenography leading to a thorough understanding of craniofacial radiographic techniques. Use of x-rays and radiation hygiene, and technical and interpretive proficiency.

DENT 683. Imaging and IT in the Orthodontic Office (1)
This course is designed to give some basic computer knowledge and prepare the resident for the use of computers in the orthodontic office. Prereq: DENT 682.

DENT 684. Radiology and Cephalometrics (1)
Fundamentally related to cephalometric radiography, skeletal morphology, and cephalogram interpretations of historic analyses via the Kroghman-Sassouni Sylabus. Also, clinical evaluations of hard and soft tissue relationships of the airway and skeletal maturation are presented. The use of Bolton Standards in craniofacial analysis is stressed.

DENT 685. Literature Review in Periodontics I (1)
Comprehensive discussion of selected articles related to clinical periodontology and basic sciences of significance to periodontal research and therapy.

DENT 686. Literature Review in Periodontics II (1)
(See DENT 685.)

DENT 687. Literature Review in Periodontics III (1)
Third in a series of four courses. See DENT 685.

DENT 688. Literature Review in Periodontics IV (1)
Fourth in a series of four courses. See DENT 685.
Founded in 1892, the School of Law is a charter member of the Association of American Law Schools and of the national law honorary society, the Order of the Coif. It was among the first law schools accredited by the American Bar Association.

The school has a student body of about 700 and a full-time faculty of about 49. In the school’s early years, most students came from Ohio and remained in Ohio after graduation. Today, students come from all parts of the country, and there are Case law graduates in virtually every state (and in several foreign countries) and certainly in every major U.S. city. An active and aggressive Career Services Office works with students, graduates, and prospective employers from all over the nation to maximize job opportunities.

ADMINISTRATION

Gerald Korngold, J.D. (University of Pennsylvania)
Dean
Hiram E. Chodosh, J.D. (Yale University)
Associate Dean for Academic Affairs
Sonia M. Winner, J.D. (University of Dayton)
Associate Dean for Development and Public Affairs
Barbara Andelman, J.D. (Ohio State University)
Associate Dean for Student Services, Enrollment Planning, and Special Projects
Susan Renee Seliga, J.D. (Cleveland State University)
Assistant Dean for Career Services
Pat Kost, M.B.A. (Cleveland State University)
Assistant Dean for Finance and Administration
Jonathan H. Adler, J.D. (George Mason University)
Associate Director of the Center for Business Law and Regulation
Kathleen M. Carrick, M.L.S. (University of Pittsburgh), J.D. (Cleveland State University)
Director of the Law Library
Peter B. Friedman, J.D. (University of Michigan)
Director of Moot Court and Mock Trial Programs
Leon Gabinet, J.D. (University of Chicago)
Executive Director of the Graduate Program in Taxation
Thomas I. Hausman, J.D. (Ohio State University), LL.M. (New York University)
Administrative Director of the Graduate Program in Taxation
Lewis R. Katz, J.D. (Indiana University)
Director of the LL.M. in United States and Global Legal Studies
Henry T. King, Jr., LL.B. (Yale University)
U.S. Director of the Canada-United States Law Institute
Raymond Shih Ray Ku, J.D. (New York University)
Associate Director of the Center for Law, Technology, and the Arts
Robert P. Lawry, Diploma in Law (Oxford University), J.D. (University of Pennsylvania)
Director of the Center for Professional Ethics
Wilbur C. Leatherberry, J.D. (Case Western Reserve University)
Director of Skills Courses and Externship Program
Jacqueline D. Lipton, Ph.D. (Griffith University), LL.B. (University of Melbourne), LL.M. (Cambridge University), LL.M. (Monash University)
Associate Director of the Frederick K. Cox International Law Center
Judith P. Lipton, M.S.S.W. (University of Wisconsin), J.D. (University of Connecticut)
Co-Director of the Milton A. Kramer Law Clinic Center
Kenneth R. Margolis, J.D. (Case Western Reserve University)
Director of the CaseArc Integrated Lawyering Skills Program and Co-Director of the Milton A. Kramer Law Clinic Center
Maxwell J. Mehlman, J.D. (Yale University)
Director of the Law-Medicine Center
Andrew P. Morriss, J.D., M.Pub.Aff. (University of Texas), Ph.D. (Massachusetts Institute of Technology)
Director of the Center for Business Law and Regulation
Craig Allen Nard, J.D. (Capital University), J.S.D., LL.M. (Columbia University)
Director of the Center for Law, Technology, and the Arts
Michael P. Scharf, J.D. (Duke University)
Director of the Frederick K. Cox International Law Center
Calvin William Sharpe, J.D. (Northwestern University), M.A. (Chicago Theological Seminary)
Director of the Center for the Interdisciplinary Study of Conflict and Dispute Resolution
Alyson Suter Alber, J.D. (University of Virginia)
Director of Career Services
Megan Allen, M.L.I.S. (Kent State University)
Electronic Services and Training Librarian
Keith Barton, J.D. (Case Western Reserve University)
Director of Information and Technology
Rafael Brown, J.D. (Case Western Reserve University)
Assistant Director of Student Support for the LL.M. in United States and Global Legal Studies
Cheryl Smith Cheatham, M.S.L.S. (Case Western Reserve University)
Head of Educational Media and Reference Librarian
Tron Compton-Engle, M.S.W. (Syracuse University)
Help Desk Manager
Anne-Marie E. Connors, M.A. (Saint Louis University)
Director of Regional Development, Alumni Relations, and Special Gifts
Shannon E. Curley, M.F.A. (University of Maryland)
Director of Regional Development and Annual Giving
Deborah S. Dennison, M.L.S. (Kent State University)
Head of Bibliographic Access

Andrew Dorchak, M.L.S. (Kent State University)
Head of Reference Services and Government Resources Manager

Mweni U. Ekpo, J.D. (Indiana University-Bloomington)
Assistant Director of Admissions and Student Services

Michelle C. Frygier, M.A. (Case Western Reserve University)
Director of Publications and Communications

Alice Hunt
Director of Facilities and Administration

D.R. Jones, J.D. (Mercer University), M.L.S. (University of Washington)
Deputy Director of the Law Library

Judith A. Kaul, M.S.L.S. (Case Western Reserve University)
Electronic Research Services Manager and Reference Librarian

Patricia M. Kim, J.D. (Ohio State University)
Director of Student Services

Elizabeth Klusas, J.D. (Indiana University-Purdue University, Indianapolis)
Director of Employer Development

Constance M. Kopec, M.A. (Cleveland State University)
Director of Donor Relations and Operations

Cheryl M. Lauderdale, B.A. (Notre Dame College)
Assistant Director of Special Events and Development

Christopher Lucak, M.A. (Kent State University)
Director of Admissions

Robert Myers, J.D. (Cleveland State University), M.L.S. (Kent State University)
Head of Serials and Collection Access Librarian

Jessica Ollis, M.N.O. (Case Western Reserve University)
Budget and Acquisitions Officer

Lisa Peters, J.D. (Georgetown University), M.L.S. (Rutgers University)
Head of Access Services

Sara Jean Petite, M.L.S. (Kent State University)
Government Resource Manager and Bibliographic Access Librarian

Sarah McFarlane Polly, J.D. (Ohio State University)
Director for Career Counseling

Carl Roloff, B.S. (Capella University)
Webmaster

Jay A. Ruffner, B.S. (Case Western Reserve University)
Director of Academic Services

Adria J. Sankovic, M.A. (Case Western Reserve University)
Assistant Director for the LL.M. in United States and Global Legal Studies

Melissa A. Santee, B.A. (University of Toledo)
Director of Development, Individual Giving, and Public Affairs

Alice Simon, M.A. (University of Baltimore)
Manager of Academic Centers and Law Journals

Carole Zalokar, A.A. (Lakeland Community College)
Assistant Registrar

FACULTY

Gerald Korngold, J.D. (University of Pennsylvania)
Dean and Everett D. and Eugenia S. McCurdy Professor of Law

Jonathan H. Adler, J.D. (George Mason University)
Associate Professor of Law and Associate Director of the Center for Business Law and Regulation

Olufunmilayo B. Arewa, J.D. (Harvard Law School), A.M. (University of Michigan), M.A., Ph.D. (University of California, Berkeley)
Assistant Professor of Law

Arthur D. Austin II, J.D. (Tulane University)
Edgar A. Hahn Professor of Law in Jurisprudence

Jessica Wilen Berg, J.D. (Cornell University)
Associate Professor of Law and Biomedical Ethics

Craig M. Boise, J.D. (University of Chicago), LL.M. (New York University)
Assistant Professor of Law

David J. Carney, J.D. (University of Michigan)
Instructor of Law, Research, Analysis, and Writing

Kathleen M. Carrick, M.L.S. (University of Pittsburgh), J.D. (Cleveland State University)
Associate Professor of Law and Director of the Law Library

William M. Carter Jr., J.D. (Case Western Reserve University)
Associate Professor of Law

Timothy Casey, J.D. (University of California Hastings College of Law), LL.M. (Columbia University)
Associate Professor of Law, Milton A. Kramer Law Clinic Center

Laura Brown Chisolm, J.D. (Case Western Reserve University)
Professor of Law

Hiram E. Chodosh, J.D. (Yale University)
Associate Dean for Academic Affairs and Professor of Law

Ronald J. Coffey, LL.B. (University of Cincinnati), LL.M. (Harvard University)
Professor of Law

George W. Dent, Jr., J.D. (Columbia University), LL.M. (New York University)
Schott—van den Eynden Professor of Business Organizations Law

Jeffrey D. Dillman, J.D. (University of California, Berkeley)
Associate Professor of Law, Milton A. Kramer Law Clinic Center

Melvyn R. Dutschke, J.D. (Northwestern University)
Professor of Law

Jonathan L. Entin, J.D. (Northwestern University)
Professor of Law and Political Science

Peter B. Friedman, J.D. (University of Michigan)
Instructor and Director of Moot Court and Mock Trial Programs

Leon Gabinet, J.D. (University of Chicago)
Professor and Executive Director of the Graduate Tax Program

Peter M. Gerhart, J.D. (Columbia University)
Professor of Law

Paul C. Giannelli, J.D. (University of Virginia), M.S.F.S. (George Washington University), LL.M. (University of Virginia)
Albert J. Weatherhead III and Richard W. Weatherhead Professor of Law
Jonathan Gordon, J.D. (Columbia University)
Instructor of Law, Research, Analysis, and Writing

Thomas I. Hausman, J.D. (Ohio State University), LL.M. (New York University)
Adjunct Professor of Law and Administrative Director of the Graduate Tax Program

Katherine Hessler, J.D. (College of William & Mary), LL.M. (Georgetown University Law Center)
Professor of Law, Milton A. Kramer Law Clinic Center

B. Jessie Hill, J.D. (Harvard Law School)
Assistant Professor of Law

Sharona Hoffman, J.D. (Harvard University), LL.M. (University of Houston)
Associate Professor of Law

Erik M. Jensen, M.A. (University of Chicago), J.D. (Cornell University)
David L. Brennan Professor of Law

D.R. Jones, J.D. (Mercer University), M.L.S. (University of Washington)
Adjunct Instructor of Law and Deputy Director of the Law Library

Lewis R. Katz, J.D. (Indiana University)
John C. Hutchins Professor of Law and Director of the LL.M. in United States and Global Legal Studies

Henry T. King, Jr., LL.B. (Yale University)
Professor of Law and U.S. Director of the Canada-United States Law Institute

Juliet P. Kostritsky, J.D. (University of Wisconsin)
John Homer Kapp Professor of Law

Raymond Shih Ray Ku, J.D. (New York University)
Professor of Law and Associate Director of the Center for Law, Technology, and the Arts

Robert P. Lawry, Diploma in Law (Oxford University), J.D. (University of Pennsylvania)
Professor of Law and Director of the Center for Professional Ethics

Wilbur C. Leatherberry, J.D. (Case Western Reserve University)
Professor of Law and Director of Skills Courses and Externship Program

Jacqueline D. Lipton, Ph.D. (Griffith University), LL.B. (University of Melbourne), LL.M. (Cambridge University), LL.M. (Monash University)
Associate Professor of Law and Associate Director of the Frederick K. Cox International Law Center

Judith P. Lipton, M.S.S.W. (University of Wisconsin), J.D. (University of Connecticut)
Professor of Law and Co-Director of the Milton A. Kramer Law Clinic Center

Kenneth R. Margolis, J.D. (Case Western Reserve University)
Professor of Law, Director of the Case Arc Integrated Lawyering Skills Program and Co-Director of the Milton A. Kramer Law Clinic Center

James W. McElhaney, LL.B. (Duke University)
Baker & Hostetler Distinguished Scholar in Trial Practice

Louise W. McKinney, J.D. (Case Western Reserve University)
Professor of Law, Milton A. Kramer Law Clinic Center

Kevin C. McMunigal, J.D. (University of California, Berkeley)
Judge Ben C. Green Professor of Law

Maxwell J. Mehman, J.D. (Yale University)
Arthur E. Petersilge Professor of Law, Professor of Biomedical Ethics, and Director of the Law-Medicine Center

Kathryn Sords Mercer, M.S.S.W., J.D., Ph.D. (Case Western Reserve University)
Instructor of Law, Research, Analysis, and Writing

Andrew P. Morriss, J.D., M.Pub.Aff. (University of Texas), Ph.D. (Massachusetts Institute of Technology)
Galen J. Roush Professor of Business Law and Regulation and Director of the Center for Business Law and Regulation

Dale A. Nance, M.A. (University of California, Berkeley), J.D. (Stanford University)
Professor of Law

Craig Allen Nard, J.D. (Capital University), J.S.D., LL.M. (Columbia University)
Professor of Law and Director of the Center for Law, Technology, and the Arts

Spencer Neth, J.D., LL.M. (Harvard University)
Professor of Law

Matthew J. Rossman, J.D. (New York University)
Associate Professor of Law, Milton A. Kramer Law Clinic Center

Michael P. Scharf, J.D. (Duke University)
Professor of Law and Director of the Frederick K. Cox International Law Center

Morris G. Shanker, M.B.A., J.D. (University of Michigan)
Professor of Law

Calvin William Sharpe, J.D. (Northwestern University), M.A. (Chicago Theological Seminary)
John Deaver Drinko—Baker & Hostetler Professor of Law and Director of the Center for the Interdisciplinary Study of Conflict and Dispute Resolution

Ann Southworth, J.D. (Stanford University)
Professor of Law

Robert N. Strassfeld, M.A. (University of Rochester), J.D. (University of Virginia)
Professor of Law

Secondary Faculty
Brian Gran, Ph.D. (Northwestern University)
Assistant Professor of Sociology and Law
Paul A. Laux, Ph.D. (Vanderbilt University), M.B.A. (Xavier University)
Associate Professor of Banking and Finance and Law
Kenneth F. Ledford, J.D. (University of North Carolina), M.A., Ph.D. (The Johns Hopkins University)
Associate Professor of History and Law
Emery G. Lee III, J.D. (Case Western Reserve University)
Assistant Professor of Political Science and Law
Theodore L. Steinberg, Ph.D. (Brandeis University)
Professor of History and Law
Martha A. Woodmansee, M.A., Ph.D. (Stanford University)
Professor of English and Law

Adjunct Faculty
For a complete list of adjunct faculty for the Case School of Law, contact the Office of Academic Affairs at the law school.

ADMISSION
This section relates to the J.D. programs; see below for information regarding admission to LL.M. program. For complete information about admission policies and procedures, and about the law program generally, see the law school's website and the current admissions bulletin, which the
school’s Office of Admissions will mail on request.

Admission Procedures

Since the School of Law receives many more applications than there are places in the first-year class, the admissions process is selective. Each application receives full file review. When we review files, our principal question is this: Is a candidate ready to meet the intellectual challenges of our program? The admissions committee evaluates each applicant’s credentials, looking carefully at the candidate’s undergraduate grade-point average and LSAT score as well as other, non-quantitative factors, such as level and difficulty of undergraduate course work, writing ability, and work experience. The school receives applications as early as September for admission in the following fall. Beginning in January, the admissions office takes action on the applications; as decisions are made, applicants are notified. Most decisions are made between January 1 and May 1. At that point the class is filled, and the office starts a waiting list of candidates. As vacancies occur up to the date of registration, candidates are drawn from the list.

Admission Requirements

Admission to Regular Standing

In order to apply as a candidate for the Juris Doctor (J.D.) degree, a student must have a bachelor’s degree from an accredited institution. Every applicant must have taken the Law School Admission Test (LSAT) and must have registered with the Law School Data Assembly Service (LSDAS) before the application deadline.

Admission to Advanced Standing

Students currently enrolled in accredited law schools may apply for admission with advanced standing. They must complete four semesters in residence at Case to receive the J.D. degree.

Admission as a Visitor

We accept students enrolled at other law schools who wish to take courses at Case for credit toward their own school’s degree requirements. Such students must submit with their application a letter from their dean indicating that they are in good standing and that the other law school will accept the academic credits from the Case School of Law.

FINANCIAL INFORMATION

See “Financial Information” section of this bulletin.

ACADEMIC PROGRAMS

Juris Doctor (J.D.) Degree

The School of Law offers the Juris Doctor (J.D.) degree as well as dual degree programs (see below). The J.D. degree requires successful completion of 88 credit hours. The first-year program for the J.D. degree consists mainly of the required basic courses. In addition, in the spring semester students select a 3-credit elective course; the menu of first-year “perspectives” courses varies from year to year.

The centerpiece of our revised curriculum is the Case Arc Integrated Lawyering Skills Program, an innovative program stretching across the three years of law school. Designed to coordinate experientially-based instruction in fundamental lawyering skills—such as interviewing, counseling, fact-gathering, legal research, writing, oral advocacy and negotiation—with more traditional classroom methods for teaching legal analysis, it creates powerful synergies between our rigorous, classical education in legal theory and our instruction in lawyering, enhancing both areas. The Case Arc program begins with four courses, taken consecutively in each semester of a student’s first and second years. In the first semester, students learn skills such as interviewing, fact-gathering, counseling, and objective legal writing and analysis in the context of an existing course such as criminal law. In the spring semester of their first year, students add persuasive legal writing, negotiation and oral advocacy in the context of, for example, constitutional law. In subsequent semesters, students learn higher-level negotiation and business planning skills to prepare them for dispute resolution processes and transactional lawyering.

Fall Semester Required Courses

- LAWS 132, Torts (4)
- LAWS 123, Contracts (4)
- LAWS 103, Constitutional Law I (4)
- LAWS 801, CORE Lawyering Skills I

Spring Semester Required Courses

- LAWS 104, Civil Procedure (4)
- LAWS 131, Criminal Law (4)
- LAWS 144, Property (4)
- LAWS 802, CORE Lawyering Skills II

In the second year, every student must take LAWS 375, Professional Responsibility (3) and the remaining Case Arc CORE requirements. Otherwise, the curriculum is elective after the first year. As a requirement for graduation, every student must complete a substantial research paper.

Concentrations

For complete information about the voluntary Concentration program, see the law school’s website or contact the Registrar’s Office at the School of Law.

Voluntary Concentrations:

- Business Organizations
- Criminal Law
- Litigation
- Health law
- International Law
- Law, Technology, and the Arts
- Public Law – Public and Regulatory Institutions track
- Individual Rights and Social Reform track

Interdisciplinary Programs

For complete information about dual degree programs, see the law school’s website or contact the Registrar’s Office at the School of Law.

J.D/M.B.A.

A dual degree program between the School of Law and the Weatherhead School of Management allows students to earn two degrees in four years. Students spend the first year in one school and the second year in the other. Once the required courses are behind them, they
spend the third and fourth years taking electives at both schools. Five areas of law-management specialization have been approved by the two schools: international business, health systems management, corporate finance, banking and investment, and labor and industrial relations.

J.D./M.A. (Bioethics)
The School of Law and the Center for Biomedical Ethics make it possible for a student to earn two degrees in seven semesters, or in six semesters plus two summer sessions. Typically a student begins with a year of law study.

J.D./M.A. (Legal History)
Enrolling in both the law school and the School of Graduate Studies, a student can study law and legal history and earn the two degrees in seven regular semesters or six semesters plus two summers.

J.D./M.S.S.A. (Social Work)
Together, the School of Law and the Mandel School of Applied Social Sciences offer a four-year program in law and social work. Students take the basic required courses in both schools and then have considerable flexibility in pursuing their particular interests and preparing themselves for different careers. Besides their time in the classroom, students gain practical experience in internships.

J.D./M.N.O. (Nonprofit Management)
A 4-year program combining the J.D. with a master's degree in nonprofit organizations is offered in cooperation with the university’s Mandel Center for Nonprofit Organizations. Housed in the Mandel School of Applied Social Sciences, which has long been noted as a training ground for administrators of nonprofits, the center is co-sponsored by Mandel School of Applied Social Sciences, the School of Law, and the Weatherhead School of Management.

J.D./M.D. (Medicine)
The School of Law and the School of Medicine offer a dual degree program that allows a student to complete both degrees in six years. A student who begins at the law school spends two years studying law, then four years studying medicine. Alternatively, a student may spend the first two years and the last two years at the medical school, and the two middle years at the law school.

J.D./M.P.H. (Public Health)
The M.P.H. degree will generally add a year of additional course work to the J.D. degree, creating a four-year program. Law students enrolled in the dual J.D./M.P.H. degree program may earn up to 12 credits toward the J.D. in graduate level M.P.H. courses. The law school offers several health law courses that meet the M.P.H. elective requirements.

J.D./C.N.M. (Certificate in Nonprofit Management)
The CNM is a non-degree professional certification that provides knowledge in critical areas of management methodology and the operational environment of the nonprofit sector.

Graduate School Option
Students in the School of Law may take up to nine hours of courses in the other graduate and professional schools at Case and have such courses counted for credit toward the J.D. degree.

LL.M. in United States and Global Legal Studies
The LL.M. in United States and Global Legal Studies is designed for graduates of foreign law schools who wish to spend an intensive year immersed in American legal education. LL.M. candidates take most courses with American J.D. candidates and have seminars with American lawyers. Degree requirements include 24 course credits (including LAWS 570, Foreign Graduate Seminar). Students from civil law countries must take LAWS 595, American Contract Law, and students whose command of English is deficient will be required to take an English language course. LAWS 263, Doing Business in the U.S., is an elective available only to LL.M. students.

Each student’s courses will be determined by the program director in consultation with the student and will be based on the student’s prior legal education and interests. After completion of the degree requirements, students may elect to spend a summer internship with a law firm or corporate legal department in the United States or apply for admission to the J.D. program with advanced standing. Further information and admission materials may be requested from Professor Lewis R. Katz, Director of the LL.M. in United States and Global Legal Studies program or Ms. Adria J. Sankovic, Assistant Director of the LL.M. in United States and Global Legal Studies program.

THE LAW LIBRARY
The law library’s holdings include more than 390,000 books and volume-equivalents, complete collections of federal and state law, law reviews, current law services, an extensive British and Commonwealth collection, and special collections in taxation, labor law, foreign investments, international law, and environmental law. The law library is building strong collections in law and medicine, intellectual property, and law of the European Union. It is a selective depository for both U.S. and Canadian government documents. The law school itself has computer facilities on every floor of the library, providing access to more than 700 electronic services and library catalogs, 75 CD-ROM applications, and a wide range of software services. The university boasts a fast and powerful network and wireless access, and the University Network links the law school to more than 12,800 campuses. The law library is a member of OhioLINK, which is a consortium of Ohio’s college and university libraries and the State Library of Ohio. OhioLINK offers access to more than 31 million library items from 79 institutions. These materials include items from law, medical, and special collections.

The law library offers its users access to an ever-expanding list of electronic research databases as well as e-books. E-books are accessible through the library catalog.
Databases offered include Lexis/Nexis and Westlaw as well as over 100 OhioLINK databases (including Index to Legal Periodicals, Medline, and Ohio Capitol Connection). Many of these OhioLINK databases contain the full text of journal articles. The law library also offers access to certain web-based subscription databases such as Hein-On-Line. Housed within the law library are two computer laboratories and a computer training classroom.

SPECIAL PROGRAMS

Professional Skills Programs

Milton A. Kramer Law Clinic Center

The Supreme Court of Ohio authorizes student practice under attorney supervision in the final year of law school. Through the clinic, students provide legal representation to indigent clients and community groups and receive academic credit. The supervising attorneys are full-time members of the law faculty. The clinical program is the capstone of the skills curriculum and offers specialized practice experiences in Criminal Justice, Community Development, Civil Litigation Practice, focused on consumer matters, predatory lending, social security disability, and other public benefit issues, Immigration, Health Law, and Family Law.

Center for Business Law and Regulation

To better prepare its students and future leaders with a thorough understanding of the business issues facing entrepreneurs, entities, and other clients, the School of Law created the Center for Business Law and Regulation. The center focuses on expanding curricular offerings and programs as well as engaging in opportunities for legal, empirical, and interdisciplinary research, assessing the role and impact of government in the regulation of business. The center will also host special lectures and symposia to highlight topics in business law and foster public debate and inquiry regarding business regulation.

Center for the Interdisciplinary Study of Conflict and Dispute Resolution

Case Western Reserve University School of Law created the Center for the Interdisciplinary Study of Conflict and Dispute Resolution in 2004. The center’s mission is to bring a greater alternative dispute resolution sensitivity and skill development to our students in order to better prepare them for the multiple roles they will perform as lawyers in a global economy. The center will also advance the academy’s understanding of conflict, strengthen existing models of teaching dispute resolution, and create new responses to conflict and dispute resolution through an interdisciplinary approach. The center will collaborate with the law school’s other Centers of Excellence in the development of new curricular offerings, experiential learning opportunities, and special programming; as well as host events and symposia at the law school that will emphasize the intersection between law and other disciplines such as psychology, sociology, anthropology, biology, medicine, philosophy, economics, and religion that have systematically examined the problem of conflict and dispute resolution.

Center for Law, Technology, and the Arts

The Center for Law, Technology, and the Arts was established as an internationally recognized forum for the interdisciplinary study of law, technology, and the arts. The Center focuses on teaching, research, and programs pertaining to intellectual property, technological innovation and technology transfer, the intersection of science, economics, philosophy, and the law, legal issues concerning biotechnology and computer technologies, and laws and cultural issues relating to the creative arts. Through the Center, the law school is able to offer students opportunities to address important, topical issues relating to law and technology and law and the arts through a variety of courses, lectures, events, and symposia.

Frederick K. Cox International Law Center

The Frederick K. Cox International Law Center has developed one of the most ambitious and comprehensive international law programs in the nation. Through its rich and innovative curriculum, experiential labs and clinics, and summer internship programs, the center prepares students for global opportunities in law practice, business, and public service. The center’s daylong symposia, lecture series, research, and publication projects explore critical issues in global legal reform, ranging from war crimes to intellectual property, and from judicial reform to peace in the Middle East. Our students have a wide range of unique study, work, research, publication, cultural exchange, and career development options. Adding depth and context to the learning environment, the center frequently brings leading experts from around the world to lecture on cutting-edge commercial and human rights issues.

Law-Medicine Center

The Law-Medicine Center at the Case School of Law has been in operation for over 50 years. It began with a focus on forensic medicine, but has broadened to include the whole range of legal, social, economic, scientific, and ethical issues in which law and medicine are interrelated. Besides the regular course offerings, the center frequently presents lectures, symposia, and workshops, and sponsors major conferences. It publishes a student-edited journal, Health Matrix: Journal of Law-Medicine. Participants in the center’s activities include not only university personnel, but also professionals from such institutions as University Hospitals of Cleveland and the Cleveland Clinic.

Litigation Program

Since the mid-1970s, the School of Law has invested heavily in its litigation program. Students practice the basic skills of trial advocacy in such courses as LAWS 397, Trial Tactics (4), and in the co-curricular moot court and mock trial programs.
Canada-United States Law Institute

The Canada-U.S. Law Institute, established in 1976, is jointly sponsored by the law schools of Case and the University of Western Ontario. Its primary educational purpose is to give students of both schools a comparative perspective on their own country’s legal system. Each semester, up to six students from each school spend the term in residence at the other school. The school in which the student is a degree candidate gives full credit for the semester’s work. The two schools also exchange faculty, usually for periods of one or a few days, but occasionally to teach one or more courses for a full semester.

A second purpose of the institute is to provide a framework for the exploration of transnational and international legal issues affecting the relationship between Canada and the United States. In addition to the regularly scheduled courses on Canadian-U.S. topics, the institute sponsors workshops and conferences, including annual conferences in Cleveland, which, in recent years, have dealt with Canadian-U.S. economic ties.

The institute also sponsors a regular publication, the Canada-U.S. Law Journal; the annual Niagara Moot Court Competition, in which students from U.S. and Canadian law schools participate; and special research projects, often with funding support.

STUDENT ACTIVITIES

Publications

The School of Law publishes three scholarly journals, all student-edited. The oldest is the Case Western Reserve Law Review; published quarterly. The Journal of International Law is published two to three times a year; the JIL editorial board also has responsibility for the Canada-U.S. Law Journal (sponsored by the Cana-da-U.S. Law Institute), published once a year. Health Matrix: Journal of Law-Medicine began as a joint undertaking of all six of the university’s professional schools but since 1990 has been sponsored solely by the law school and its Law-Medicine Center.

Competitions

Moot Court

A student board administers the Dean Dunmore Competition, a year-long program in which second-year (and a very few third-year) students participate. It culminates in a round-robin tournament involving 16 finalists. From those finalists, the board selects teams who will compete the following year in the National Moot Court Competition, the Craven Competition in constitutional law, and the Niagara Competition (sponsored by the Canada-U.S. Law Institute). Case Western Reserve also enters the Jessup International Competition; that team is selected by another student group, the Society of International Law Students.

Mock Trial

The Jonathan M. Ault Mock Trial Board sponsors an intramural competition from which emerge the members of interscholastic teams. Currently, the law school sends student representatives to the National Trial Competition, the National Student Trial Competition of the Association of Trial Lawyers of America, and a competition sponsored by the Academy of Trial Lawyers of Allegheny County, Pennsylvania.

REGULATIONS AND RULES OF CONDUCT

The Academic Regulations and Code of Conduct of the School of Law are provided to each student upon matriculation through the law school’s website.

In addition to the university’s rules of conduct, law students are expected to comply with the American Bar Association’s Model Code of Professional Responsibility and Model Rules of Professional Conduct, to the extent that these are applicable, and with the law school’s own Code of Conduct. The Model Code and Model Rules are available in the law library. The school’s Code of Conduct, like the Academic Regulations, is provided to each student upon matriculation through the law school’s website.

COURSE DESCRIPTIONS (LAWS)

LAWS 001. Comparative Law and Religion Seminar (3)

This seminar will focus on issues in law and religion in comparative perspectives.

LAWS 002. Education Law Seminar (3)

This seminar will build upon the foundation established by the first-year curriculum and focus on selected legal topics related to education law and policy with a particular emphasis on constitutional (federal and state) issues. Such legal topics will include (but are not limited to) the regulation of educational institutions, student, teacher, and parental rights, equal educational opportunity, school finance, and the federal role in education. Enrollment is limited to 12. Grade is based on a presentation and a paper.

LAWS 003. Reproductive Law and Ethics Seminar (3)

This seminar will introduce students to philosophical and legal materials related to reproductive ethics and law.

LAWS 004. Settlement Law Seminar (2-3)

This seminar will examine the theory and practice of settlement of disputes. Matters to be considered include: the practical issues of how one negotiates the settlement and drafts settlement documents; the theoretical issues of why some cases settle and why some do not; the appropriate role of judges and mediators in facilitating settlements, and the procedural and substantive law affecting the settlement of law suits. Grade is based on a presentation and a paper. Enrollment is limited to 12.

LAWS 005. Federalism Seminar (3)

The seminar will explore the constitutional relationships between the federal government and the states. Through additional exposure to pertinent case law and concentrated study of early historical materials in addition to scholarly writings, the seminar builds on the basic Constitutional Law course and is designed to give students a deeper understanding of the dimension and complexity of our federal system. Topics will include the reason for a federal rather than a unitary or centralized governmental system, and how a system of divided political authority imposes restraints on federal and state legislative and judicial authorities. By way of contrast, the seminar may also explore how other countries administer federal systems and, in this country, the difference between federal/state federalism and state/local federalism.

LAWS 006. Legal History of European Union Seminar (3)

The seminar introduces students to the history, development, and present structure of the legal system of the European Union from the ECSC in 1951, through the Treaty of Rome in 1957, to the Treaty of Amster-
dam in 1997. The seminar will examine the “consti-
tutional” structures and institutions of the European Union, including the emergence of a binding jurispru-
dence from the European Court of Justice; will look at general interpretive principles emanating from the European civil law tradition, such as the doctrines of subsidiarity and proportionality; will explore the public
law of the European Union, the "four freedoms," human rights, and equal treatment of women and men; and will briefly treat private law rights emergent not only from treaty and parliamentary enactment but from Union jurisprudence. The seminar will concentrate on the historical and economic context, but legal doctrine and practice will also be considered.

LAWS 008. Famous American Trials Seminar (3)
This seminar is in part a course of American legal history and in part advanced evidence course. We will consider in some detail several (probably five) famous trials in American history, starting with the Salem witchcraft trials and ending (probably) with the trial of Charles Manson. For each trial considered, except the first, students will be expected to read an assigned book that concerns the trial and to address various issues for class discussion. Each student will also write a paper about a famous trial not covered in the assigned readings and make a presentation to the class regarding that case at the end of the semester. This seminar will be limited to 12 students and may be used to satisfy the writing requirement.

LAWS 009. Business Organizations Research Seminar (2)
An opportunity to undertake significant research and writing on the law of business organizations. Each student will be expected to complete a major paper in satisfaction of the upper level writing requirement. A satisfactory paper will meet the writing requirement for the concentration in Business Organizations. Limited to 12. Prereq: LAWS 261 or LAWS 204.

LAWS 010. African-American Lawyers Seminar (3)
This seminar takes an interdisciplinary approach to the study of African-American lawyers. It examines aspects of the history of black lawyers in America, as well as topics relating to black lawyers in contemporary America. The course will situate these experiences in the context of both the history of the legal profession and the history of race relations and the struggle for civil rights in the United States. Students will prepare a substantial research paper and make an oral presentation of their research to the class. Limited to 12.

LAWS 011. Firearms Regulation (3)
This class examines the constitutional and policy questions surrounding firearms regulation. The course will cover historical issues, modern statutory controls, and legal and policy questions surrounding firearms regulation. Prereq or Coreq: LAWS 202.

LAWS 012. Constitutional Law Research Seminar (2)
This seminar permits students to write an in-depth paper, exploring an area of Constitutional Law most interesting to them. There are no explicit rules governing subject matter except that the paper must have, as its central focus, constitutional doctrine, policy, and/or analysis. Several classes will be held during the semester. The focus of these classes will be the process of writing a paper and the research tools available. A thesis statement, an outline, and at least one draft before the final paper are required. The grade will be based solely on the quality of the paper. The paper may be used to satisfy the writing requirement.

LAWS 013. Current Controversies in Environmental Law (3)
This seminar will explore current legal and policy controversies in environmental law. Special attention will be paid to recent Supreme Court decisions and forthcoming environmental protection, federal courts, including current constitutional challenges to environmental programs and regulations. Issues likely to be discussed include the impact of recent federalism decisions on environmental protection, federal preemption of state regulation, environmental standing, the non-delegation doctrine, and cost-benefit analysis, among other topics. Students will read current Supreme Court and Circuit court opinions, appellate briefs, academic commentary and supporting materials. Grade is based on class participation, final presentation, and a paper. Limited to 12.

LAWS 014. Insurance Advanced Research (2)
This seminar will allow students concurrently enrolled in Insurance (LAWS 346) to satisfy the upper-level writing requirement. Students will receive advanced instruction in legal research in insurance law and will complete a series of research and writing exercises, including drafting a statute or administrative rule and preparing and presenting a report supporting adoption of the statute or rule. At least one oral presentation will be required. Depending on the topic area chosen in a particular year, students may be required to write a brief in a case involving interpretation of an existing or proposed statute or rule. Limited to 12. Coreq: LAWS 346.

LAWS 015. Research Law and Ethics Seminar (3)
This seminar will introduce students to philosophical, legal, and policy materials related to research ethics and law. We will consider the regulation of research involving animals, humans, fetuses, and embryos. Attendance at classes is mandatory. Grade is based on class participation, final presentation, and a paper. Limited to 12.

LAWS 016. International Environmental Law Seminar (3)
This seminar will explore current legal and policy controversies in the rapidly evolving field of international environmental law. The class will begin with consideration of current international environmental concerns and the nature of international law. The seminar will then proceed to consider several international environmental issues in some detail, analyzing current and proposed policy measures. The class will consider existing and proposed legal measures to address international environmental concerns and their alternatives. Special attention will be paid to high-profile international environmental treaties and the interface between domestic U.S. and international environmental law. Specific topics likely to be covered include remedies for transboundary pollution, sustainable development, climate change, and conservation of biodiversity. Weekly readings will include primary materials (treaties, court decisions, etc.) and academic commentary. Students will be expected to read and consider the assigned material, prepare questions for class discussion, and arrive prepared to talk about the relevant legal and policy issues in some detail. Class participation will be graded. Each student will be expected to complete a substantial paper on a current issue or controversy in international environmental law. This paper may be used to satisfy the writing requirement. In addition, each student will be required to give a short presentation of his or her paper. There are no prerequisites for this seminar, however, some background in environmental and/or international law may be helpful.

LAWS 017. Scientific Evidence and Advanced Research (2)
Students must be concurrently enrolled in LAWS 214 (no exceptions). Enrollment limited to six students.

LAWS 018. Professional Responsibility Advanced Research (2)
This seminar will allow students concurrently enrolled in Professional Responsibility (LAWS 375) to satisfy the upper-level writing requirement. Students will receive advanced instruction in legal research in Professional Responsibility and will be required to complete a series of written exercises, including drafting a rule and writing a brief and a judicial opinion. The exercise will include a series of planning questions to help students structure their work. Each exercise will require the students to develop expertise in an area of Professional Responsibility through performance in simulated professional roles. At least one oral presentation will be required.

LAWS 019. Commercial Information and the Law (3)
This seminar focuses on defining 'commercial information' from a lawyer's perspective and analyzing ways in which laws in different jurisdictions are developing to protect owners and developers of such information from unauthorized access, interference, disclosure and/or use of their information products and services. The subject will be taught from a comparative/international perspective because of the increasingly global nature of many of the issues for discussion. Class discussion topics will include: the nature of commercial information and its relationship to the legal concept of property; the relationship between commercial information and intellectual property law (specifically copyright, patent, and trade secret law); case studies involving Internet business methods, computer software and electronic databases and the way in which intellectual property laws have developed in relation to these information products; the use of contract law and technological protection measures to protect the value of information stored and accessed electronically; and problems of financing businesses, and generally valuing business assets, where the main valuable assets are commercial information products.

LAWS 020. Issues and Trends in Civil Rights Law (3)
This seminar will cover the Civil War era civil rights statutes (e.g., Section 1833); provisions of the Civil Rights Acts governing discrimination in programs receiving federal funds; prohibitions against discrimination in places of public accommodation; and the Voting Rights Act of 1965, among other topics. Students will achieve an understanding of the statutory framework of civil rights law as well as specific issues that are unresolved or of particular importance in each area. The seminar will also contextualize these legal issues within the larger historical and contemporary framework of racism and discrimination. Grade is based on class participation, final presentation, and a paper. Limited to 12.

LAWS 021. Animal Law (3)
This seminar will review selected federal and state laws that pertain to animals, focusing on the Animal Welfare Act, wildlife statutes, and criminal anti-cruelty laws. Students will review recent cases and laws which address the larger questions posed by the animal rights movement, distinguishing between regulations designed for animals and those designed for humans involved with animals. After gaining familiarity with the landscape of animal law, students will examine the animal rights movement as an example of a social justice/reform movement. Topics will include: the conflicts and intersections between law and science; methods and tactics used in animal rights advocacy; the validity and efficacy of using philosophical Justifications for legal arguments or change; definitions of property; the historical and geographic context of this movement within the spectrum of other reform movements. Students can chose to write one paper to...
LAWS 022. Intellectual Property Advanced Research (2)
This advanced research seminar is designed to provide students with an opportunity to engage in in-depth and systematic research on a topic related to intellectual property law. The topic will be chosen in consultation with the instructor. Each student will be required (1) to write a substantial research paper on his or her chosen topic; and (2) to make a presentation on his or her research to the entire class. We will meet as a class at least four times during the semester, and each student will be required to meet individually with the instructor several times during the semester.

LAWS 023. Religion, Ethics, and the Law (3)
This is a paper seminar, limited to 12 students. The course will explore the interrelationship between religion, ethics, and the law in the American legal system. We will begin with a series of general questions. To what extent do we have true separation of church and state in American jurisprudence? Why should religious beliefs be given more deference than political opinions or other personal expressions? Does the law set the standard for public morality or reflect it? In order to establish a successful legal system, does society need to reach a consensus as to its moral and ethical values? When is the government ethically justified in punishing individuals for their misconduct, and what theories justify punishment within the criminal justice systems? In the second part of the course we will focus on a variety of issues that raise legal, ethical, and religious questions. Topics may include capital punishment euthanasia, genetic testing war crimes, and others. Prereq: Students must have taken and passed their RAW and Constitutional Law classes.

LAWS 024. ePayment Systems Seminar (1)
This seminar builds on the foundation established during the first-year curriculum and focuses on the law and technology of payment systems. Such topics will include the contractual relationship amongst and between the various organizations transacting to enable a B2c payment; the various elements of such agreements; the various impacts of a payment system (criminal, civil, and administrative); the implications for legal structure and policy; and the ethical considerations of a lawyer advising clients within this domain. Grade is based on a paper, presentation, and class attendance and participation.

LAWS 025. Bioethics Research and Writing Seminar (2)
This seminar is for students interested in doing their upper-level writing requirement and/or concentration paper on a topic in the area of bioethics and law. It is a research and writing seminar, so the focus of class meetings will be on developing the papers. Students will be required to read and edit each other's drafts. Grade is based on class participation, final presentation, and paper. All students interested must pre-register for the course. Permission of instructor required. Students will need to schedule meetings with the professor during the Spring. All topics must be approved no later than July 1.

A paper course designed to encourage students to extend their interests to the cutting edges. After an initial group meeting individual sessions will be held to select a topic and thereafter to produce a publishable paper. Students may use this paper to satisfy their writing requirement.

LAWS 027. Affirmative Action Seminar (3)
This seminar will involve an in-depth study of the U.S. Supreme Court's recent decisions in the University of Michigan affirmative action cases, Gratz v. Bollinger and Grutter v. Bollinger, and the various types of arguments for and against the affirmative action programs considered in those cases. In the process, we will draw upon earlier affirmative action cases, secondary materials, and litigation materials (such as briefs and expert reports). Consideration will be given to general moral and pragmatic questions concerning the consideration of race in higher education admissions, including normative and empirical arguments about diversity, the use of affirmative action as a remedy for past discrimination, fairness arguments, "anti-caste" arguments and race neutral alternatives. Throughout the course, special attention will be paid to litigation strategy and evidentiary issues. Grade is based on class participation, final presentation, and a paper.

LAWS 028. Advanced Criminal Law Seminar (3)
This seminar focuses on substantive criminal law rather than criminal procedure. It uses the first-year criminal law course as a foundation and examines a number of issues not typically covered in that course. Student interests will influence the topics chosen for examination, which will include: theft offenses, conspiracy, fetal abuse, decriminalization of drug use and commercial sex, and the roles of the executive, judicial, and legislative branches in making criminal law. Grade is based on class participation, a presentation, and a research paper.

LAWS 030. Seminar on Entertainment Law: The Motion Picture Industry (3)
The first half of the seminar will focus primarily on the legal aspects of producing and financing a motion picture. After an initial consideration of the economics of Hollywood, the class will examine in some detail the acquisition of motion picture rights in a novel or script. The class will then explore various financing vehicles used to fund motion pictures, and the securities implications of each form. Comparisons with the music and theatre industries follows. The second half of the seminar will be devoted to student oral reports on topics germane to motion pictures or some other branch of the entertainment industry. In the past, student topics have included: the role of entertainment unions, like the Screen Actors Guild or the American Federation of Musicians; antitrust in the motion picture industry; a film producer's liability of imitative acts; copyright protection for parody and satire; and financing independent films, to name just a few. Students are also required to write a paper on some aspect of their oral reports to satisfy the writing requirement for graduation. Prereq: LAWS 261.

LAWS 031. White Collar Crime: Prosecution and Defense (2)
This course will address issues relating to the prosecution and defense of white collar crime in America, including defining/understanding "white collar crime", the role of the federal government in investigating and prosecuting white collar crime, corporate vs. individual responsibility, analyzing various white collar offenses: mail fraud and wire fraud, RICO, perjury/false statements/obstruction, and securities fraud. The course will engage students in simulated discussions and exercises developed around high-profile cases, with a focus on strategic decision-making in trial. As part of their final written exam, students will be required to prepare and deliver a live jury summation.

LAWS 032. Intellectual Property Theory Seminar (3)
This course is the study of the philosophy of intellectual property. We will explore and ask several questions such as: Should one's intellectual product be entitled to protection? What are the reasons for granting or denying protection? What form, if any, should this protection take? What are the costs and benefits to society of protecting one's intellectual product? Prereq: LAWS 229 or LAWS 235.

LAWS 033. Intellectual Property and Indigenous Peoples Seminar (3)
This course explores issues surrounding intellectual property laws and the extent to which such systems can and should be used to protect traditional and indigenous knowledge. Topics to be examined include: Intellectual Property Legal Framework: an overview of current mechanisms for protecting intellectual property and an examination of how such mechanisms apply with respect to traditional and indigenous knowledge as well as other forms of collective knowledge. Indigenous and Traditional Knowledge: overview of some characteristics of traditional and indigenous knowledge as well as ideas about the nature of such knowledge. Conceptions of Authorship and Ownership in Intellectual Property Law: explicit and implicit conceptions of authorship and ownership that are embodied in intellectual property rules and the implications of such ideas. Intellectual Property Law and Cultural Expression: how intellectual property rules affect the creative process and cultural production. Commercial Exploitation and Compensation: commercial exploitation of traditional and indigenous knowledge and biological resources, compensation for such use and aspects of the economics of intellectual property protection. Globalization and Intellectual Property Protection: the implications of globalization for the protection of traditional and indigenous knowledge. Law and Policy Implications: discussion of the relevant actors involved in current discussions on protecting indigenous and traditional knowledge and the potential consequences of current legal rules and proposed reforms. Prereq: LAWS 144.

LAWS 034. International Tax Policy Seminar (3)
The seminar will explore the policies that inform United States taxation of international transactions, with particular emphasis on issues of nationality and residence for purposes of taxation, source of income, and the tax regime applicable to foreign persons. Other topics that may be covered include tax havens, tax treaties and treaty tax shelters. Limit 12. Prereq: LAWS 282. Coreq: LAWS 212 and permission of instructor.

LAWS 036. Appellate Practice (3)
Appellate Practice will examine the strategies, styles, and philosophies employed in the conduct of appellate practice. The course will focus on (1) appellate brief writing, (2) appellate oral argument, and (3) working with an appellate record. It will be co-taught by a full-time faculty member and two (or three) adjuncts. One hour of class time each week, taught by the full-time professor, will focus on brief writing and/or working with an appellate record. During the second hour of class time each week, the class will break out into small groups to work on oral advocacy. In addition, the students will be expected to devote substantial one-on-one time with the full-time professor on their brief writing. Prereq: LAWS 801 and LAWS 802.

LAWS 037. Copyright in the Digital Millennium Seminar (3)
Copyright in the Digital Millennium is a seminar that explores the challenges to traditional copyright
law presented by the advent of digital technology and the Internet. Beginning with the current litigation involving Internet file-sharing, we explore the legal and doctrinal issues raised by efforts to apply copyright and other legal and technological measures to digital works. In order to evaluate the competing arguments in this debate, students will examine the doctrinal, historical, and theoretical underpinnings of copyright law from multiple perspectives.

LAWS 038. Labor and Employment Law Issues in the Global Economy (3)
This seminar will consider the impact of globalization on workers and labor law.

LAWS 041. Comparative Judicial Systems (2)
Students will study and work on contemporary problems confronting national judicial systems. The academic component will cover the different ways in which judicial systems and their adjudication and dispute resolution processes are organized, with a focus on critical failures in judicial performance (political interference, corruption, delay, torture, and illegal detention). Students will also study different approaches at the binational, transnational, and international levels designed to accelerate justice reform. Uniquely, students will work in small teams of no more than four to conduct research and provide advice on active civil and criminal justice reform initiatives in up to five foreign countries, chosen from Africa (e.g., Israel, Turkey), Latin America (Brazil, Mexico), or Europe (e.g., Italy, France). (Countries and projects will be determined in the summer based on the intensity of the national reform activity and student interest.) The grade will be based on class and team participation, a paper, and bibliography. Students may satisfy the writing requirement.

LAWS 042. Comparative Judicial Systems (2)
(See LAWS 041.)

LAWS 043. Biotechnology Law and Policy (2)
This course is designed to expose the law student and graduate student in science or business to the legal, business, and policy issues relevant to the biotechnology industry. We will cover issues related to patents, corporate organization and financing (particularly venture capital as it relates to the Start-Up Biotech Company), licensing and other transactions, regulatory issues relevant to the Food and Drug Administration, university technology transfer, and academic conflicts of interest. Prereq: LAWS 229.

LAWS 045. Copyright Litigation (2)
This course will begin with an overview of a copyright litigation case and then proceed to discuss issues relating to pre-litigation strategy, infringement, and defenses to infringement. Thereafter, the course will explore the drafting of a complaint and the answer thereto, including counterclaims; drafting discovery documents; preparing witnesses; and taking and defending a deposition, which will take place in the context of a mock trial, many of the issues that pertain to a trial, including the roles of judge and jury, jury instructions, direct and cross-examination, jury selection, and post-trial motions. Prereq: LAWS 235.

LAWS 047. Law of the Music Industry (2)
This course will cover the major components of the music industry, including recording agreements (major label and independent labels), record producer deals, songwriting and music publishing concepts, group issues, personal appearances, and music in cyberspace. There will be an extensive discussion of fundamental copyright, trademark, and cyberlaw concepts, as well as advanced copyright concepts specifically related to the recording and publishing industry. Special attention will be paid to the topic of musical copyright infringement litigation. Course materials will include selected cases, forms of the above agreements, and selected handouts. Guest speakers will include a variety of industry professionals, including personal managers, recording artists, record company executives, and concert promoters. Students will be invited to participate in a variety of opportunities, including attending a music industry seminar at The Rock and Roll Hall of Fame sponsored by Cleveland's volunteer Lawyers for the Arts and attending the annual Mountain Dew High School Rock-Off held at the Odeon. Prereq: LAWS 235.

LAWS 048. International Humanitarian Law (1)
This course is designed to prepare the student members of the Jean Piaget Competition team, but is open to all students with an interest in international humanitarian law. The course will be taught in two all-day Friday-Saturday sessions in January and February by international humanitarian law expert Gregory Noone, who is currently a fellow at the U.S. Institute of Peace and was previously Head of the Foreign Military Rights Affairs Branch of the Office of the Judge Advocate General at the Pentagon. Using case studies as well as simulations and role-playing exercises, the course will address the field of international humanitarian law as a whole, including the laws of armed conflict, international criminal law, international human rights law, and the role of international organizations such as the ICRC and U.N. The objective of the course is to convey the reality of international law. Like humanitarian law itself, the course will not deal solely with legal disputes or judicial matters, but with practice and real life situations. The course grade will be based on a paper that will not satisfy the Writing Requirement.

LAWS 049. Expert Testimony in Civil Cases (3)
This course addresses the use of expert witnesses in civil trials, focusing on evidentiary issues. We will first examine several theoretical and conceptual issues concerning the role of experts as well as the pertinent standards of admissibility. We will give careful attention to what it means to make an argument from expert opinion. Then we will examine the use of expertise in a variety of contexts, including the proof of identity, proof of causation, proof of breach of duty, and proof of damages. Prereq: LAWS 104, 207, 212, which may not be taken concurrently.

LAWS 051. Empirical Methods for Lawyers (3)
This course will introduce students to some of the most basic and important quantitative tools of the social sciences that usefully bear on many legal issues and help students develop a rough idea of how to make use of these tools. The material will be presented in a manner that is fully accessible to those with no prior quantitative training or background in the subjects covered. The course will put especial attention to the application of empirical methods in an array of public and private law areas. Grade is based on a short paper (pp. 8-10) and a final examination.

LAWS 052. Legal Counsel to the Technology Entrepreneur (2)
This course is to be taken in conjunction with and as part of the course on Engineering Entrepreneurship offered at the Weatherhead School of Management. Engineering Entrepreneurship is a two-semester course that focuses on entrepreneurship in a technology-based setting, whereby several teams of business students study the entrepreneurial process, how to write and present a business plan, innovation processes within an organization, strategic alliances, and ides generation and the creative process. In this course, it is the role of the law student, acting in teams of two, to serve as legal counsel to each of the aforementioned business teams. Each legal team is expected to advise their respective team members on a variety of legal issues pertaining to, among other things, intellectual property, corporate structure and financing, and various transactional concerns that arise in an entrepreneurial/technology-based setting. Prereq: LAWS 051.

LAWS 053. Tax Law of Charitable Giving (2)
This course will examine the tax law that relates to charitable giving during life and at death, including the rules of deductibility of charitable gifts of cash and other kinds of property, various vehicles for planned giving (charitable remainder trusts, charitable gift annuities, and others), and the impact of other existing and proposed tax provisions on charitable giving.

LAWS 055. Computer Law and Policy (2)
This course will address the ever-evolving issues that relate to intellectual property protection for computer software, with a particular emphasis on patent, copyright, and trade secret protection. The relationship of the Internet to such protection will also be explored. Throughout the semester, the course will consider the nuances of this dynamic area of the law and will also provide pragmatic approaches to common problems faced by intellectual property practitioners. Prereq: LAWS 229 or LAWS 235.

LAWS 056. Selected Topics in Business and Law (1)
This course will focus on the key principles of business operations and the financial tools necessary to measure business performance and the roles that lawyers play in advising business clients in today's environment, as well as the intersection of law and business in our economy. Coverage and emphasis will vary from year to year. The course will use case studies, real time filings by corporations, and 2-3 books written about well-known business transactions and is co-taught by a visiting practitioner or business leader and a member of the regular faculty.

LAWS 060. Cyberlaw (3)
This subject deals with how the law regulates and otherwise applies to activities taking place in ‘cyberspace.’ It considers how existing legal principles are being modified and extended in the digital information age to meet the needs of society, particularly in relation to electronic commerce. As the nature of dealings in cyberspace develops and new legal problems emerge over time, the focus of the subject may change to reflect contemporary legal issues. However, topics for discussion will be drawn from the following: the nature of the internet, legal regulation of cyberspace vs. self-regulation, the relevance of international law/international regulation, e-commerce contracting, ‘property’ in cyberspace with particular reference to intellectual property, trademarks and domain names, defamation on the Internet, online crime (e.g., fraud, pornography, etc.), information privacy and security, online dispute resolution and associated conflicts of law issues.

LAWS 062. Proposed Advanced Employee Benefits (ERISA) (3)
Continuation of Employee Benefits (ERISA); defined benefit plans, including in-depth consideration of defined benefit plan documents; VEBA’s, their use and regulation; group life, Accidental Death & Dismemberment, and Long Term Disability plans and related insurance documents; insured and non-insured medical benefit plans; reporting and disclosure requirements of ERISA, including summary plan descriptions, summary of material modifications, Form 5500, and
top hat” elections; and requests for favorable determinations of qualified plans, including Form 5300 and Notices to Interested Parties.

LAW 063. Selected Topics in Family Law (3)
This course explores in depth the theory, doctrine and practical application of the principles of various topics within the area of family law. Two topics will be chosen each semester for in-depth study. The subjects may include marriage, divorce, property division, spousal support, parent-child relations, child custody, visitation, child support, domestic violence, rights of unmarried partners, etc. Approximately half of the course will be devoted to exploration of the principles and doctrine of the topics covered (multi-jurisdiction approach will be utilized) and the other half will be devoted to simulation exercises involving litigation or alternative methods of resolving disputes concerning the issues in the topics covered. Students will be assigned roles as attorneys for parties to a simulated case and will prepare and present evidence in a simulated hearing in the matter. The grade will be based on an examination of the substantive material covered and performance in the simulation exercise.

LAW 064. International Environmental Law (2)
This course examines selected issues and current problems in international environmental law, with a particular focus on transboundary environmental problems, global “commons,” and the development, implementation and enforcement of international environmental agreements. Requirements for the class will include several short writing assignments and weekly simulations and role-play exercises. There will be no final exam.

LAW 065. Adoption Law (2)
This course surveys adoption law in the United States, including public and private adoptions, international adoptions, and the legal issues involving reproductive surrogacy.

LAW 066. Venture, Capital and Entrepreneurial Financings (3)
This course will explore legal and business issues associated with venture and other private financings and will examine corporate financing needs that motivate companies to seek financing, valuation issues, the process by which companies determine what type of financing to seek, how companies secure such financing and corporate governance issues associated with these financings. We will also discuss the financing process for private deals, looking at matters such as valuation, due diligence, securities law concerns, the negotiation process and how business deal terms are translated into legal documents. During the course of the semester, we will focus on and review deal documents from venture capital financings and private debt transactions.

LAW 067. Leadership and Communication Skills for Lawyers (2)
This 13-week interactive course will provide students with the tools and techniques needed to be more capable speakers and communicators. While the course will include some training for persuasive public speaking in a courtroom, most of the focus will be on developing effective communication skills so that students will have the requisite confidence, focus, and control to speak in a variety of settings. A section of the class will also concentrate on handling the media including how to control a message and advice for clients who may be in the public spotlight. The program will be interactive so that students have numerous opportunities to participate and speak. Role-playing exercises will be utilized as well as video-taped playback. Grading is based on participation and improvement and there will not be a final exam.

LAW 069. Islamic Law (2)
This course will cover major aspects of the Islamic Law. It will provide students with a better understanding of Islam and its adherents. Many topics related to Islam and its basic beliefs, including some contemporary issues, will be covered in this course.

LAW 070. Real Estate Mortgages (2)
Real estate mortgages are widely used. In fact, just about every land purchase or land improvement (whether involving a family residence or a complicated commercial development, like a shopping center) involves the use of a mortgage. Yet, even though the rights of the parties to the mortgage (i.e. the mortgagee (debtor) and the mortgagor (creditor or secured party)), as well as the rights of third parties claiming an interest in the land (like another purchaser or lien creditor) depend upon them, the unique equitable principles and legal rules which govern the mortgage are not well known or understood. These are studied in depth in this course. Actual problems are frequently presented and solved to assure that students obtain a strong practical capacity in as well as a theoretical understanding of mortgage law. The understandings of fundamental mortgage law gained in this course will also markedly assist the student in the study of other advanced courses. These include Secured Transactions in personal property under Article 9 of the UCC. (Article 9 actually is based on the same basic principles that govern real estate mortgages). Bankruptcy, Real Estate Transactions and Development, Banking, etc. It will also give the student some badly needed understanding of equitable principles which still pervade our current legal system. Specific topics studied include the law governing the creation of the mortgage, the limitations imposed on the mortgage contract by the fundamental anti-clogging rules developed by the courts of equity, the priority accorded a mortgage when in competition with competing interests in the same land, the legal rules governing the transfer of a mortgage, the redemption rights of the mortgagor and the foreclosure of the mortgage.

LAW 073. Disability Law (3)
Disability Law will provide a comprehensive overview of most major federal laws relating to individuals with disabilities. The course focuses on issues of rights and nondiscrimination in the areas of employment, government programs and services, public accommodations, higher education, education, housing, health care, and health insurance.

LAW 074. Finance, Law and Corporate Governance (3)
(See BAFI 470.) Cross-listed as BAFI 470.

LAW 075. Business Associations for L.L.M. Students (3)
This course is an introduction to the law of business associations including general and limited partnerships, limited liability companies, and corporations tailored to their specific needs.

LAW 077. Race, Ethnicity, and Criminal Justice (2)
An examination of the disparate racial and ethnic impact of an array of criminal justice policies, and an exploration of possible causes and approaches to solutions. Students will be introduced to the scope of racial and ethnic impacts of criminal justice policy, and complete projects which, in turn, raise either public or professional consciousness of these issues. Students will also explore an array of possible roles for attorneys in policy formation and change. This course should be limited to 12 students. Prereq: LAWS 327, waivable with showing of other criminal justice experience or knowledge.

LAW 078. Counterterrorism Law (2)
This course will take an in-depth look at counter-terrorism in the United States, Israel, and other countries. The course will examine the competing conceptions and definitions of terrorism at the national and international level and the institutions and processes designed to execute the “war on terrorism.” This will include study of the balance between security and liberty policies in the U.S. Patriot Act, the use of military tribunals or civil courts, the use of assassination or targeted killings, and the emerging law on enemy combatants and their detention, and the arguable need for new self-defense doctrines at the global level. Prereq: LAWS 327.

LAW 079. Counterterrorism Lab (2)
This lab will involve students in an integrated experience of academic research and public service. Students will work on research projects in counter-terrorism law in the United States, Israel, and other countries. The course will engage students in projects for a variety of organizations that are trying to develop expertise in counterterrorism law, including U.S. attorney offices, think tanks, defense attorneys, international governmental and non-governmental organizations. Students will study and research various aspects of counterterrorism in the U.S., foreign countries, and at the international level, including the balance between security and liberty policies in the U.S. Patriot Act, the use of military tribunals or civil courts, the use of assassination or targeted killings, and the emerging law on enemy combatants and their detention, and the arguable need for new self-defense doctrines at the global level. Prereq and Coreq: LAWS 078.

LAW 080. I.T. Principles for Lawyers (1)
This course is designed to allow students to achieve an overview of information technology terms and concepts.

LAW 083. Advanced Civil Procedure (2)
This class focuses exclusively on civil claim settlements occurring both in and outside of traditional trial courts and involving both federal and state law matters. The course will cover topics addressed not only by civil procedure laws, but also by laws in such diverse areas as contract, tort, professional responsibility, and evidence. It will include consideration of settlements of civil claims which have not yet arisen; have arisen but have not yet been pursued in litigation; and have prompted litigation.

LAW 084. Capital Markets, Venture Capital, and Mgmt., Principles for Lawyers (1)
This course is designed as an introductory course for second- and third-year law students who want to understand the way in which businesses are managed and financed, the various roles that capital markets play in their development, and the methods for measuring business success. Intensive case studies will be used as a framework for looking at real world situations. The course will integrate guest lectures from visiting business leaders. Cases and what they measure the success of their business and what financial information is required to do their job. Finally, a part of each class will evaluate real time business issues, applying the lessons learned from the case studies and modeling the expected outcomes. James Bildner, Case alumnus and CEO of Tier Technologies, will teach the course. Students will write a paper based on a case study. This
class will be seminar-format, with short writing assignments, weekly simulations, and role-play exercises designed to bring the materials to life. There will be no final exam.

LAWS 093. The War Crimes Prosecution Lab (2) The War Crimes Prosecution Lab is the result of a unique arrangement between Case Law School and the Offices of the Prosecutors of the International Criminal Tribunals for Rwanda and Sierra Leone, whereby Case law students undertake research and submit legal memoranda to the International Prosecutors on issues pending before the international tribunals. Students enrolled in International Criminal Law may receive 2 additional course credits and satisfy their Writing Requirement for their successful participation in the War Crimes Prosecution Lab. In addition, the International Prosecutor will send each student a personal letter of thanks at the completion of the project. Students enrolled in the Lab will be graded on their memo to the International Prosecutor and their class participation, in lieu of having to write the four papers for International Criminal Law. Coreq: Enrollment is open only to students simultaneously enrolled in International Criminal Law (LAWS 092). Students who have already participated in the International War Crimes Prosecution Seminar are not eligible for War Crimes Prosecution Lab, but may take International Criminal Law.

LAWS 094. Jewish Law (2) This course will explore the relationship between practical politics, the law, and government by examining the social and political context of contemporary issues of major significance, with emphasis on Ohio. Courses will include guest lecturers drawn from those professionals engaged in an aspect of the political process. Grades will be based largely on independent research and writing and class participation. The course is designed to complement, but not significantly overlap, existing courses in the public law concentration, most notably, State and Local Government and Legislation.

LAWS 088. Regulatory Policy Research Lab (2) Taught jointly between the School of Law and the Weatherhead School of Management, this course offers students an opportunity to engage in hands-on work on a current policy issue concerning government regulatory activity. Specific topics will vary from year to year, but will include such topics as land use planning, local regulation of business, and state and local tax policy. The course is taught over two semesters and students must enroll in both semesters to receive credit. The P/NC option may not be used for this course. Prereq: Open to 2nd year MBA students and 3rd year law students and 3rd year and 4th year JD/MBA students only.

LAWS 090. Canon Law (2) This course examines the legal system of the Roman Catholic Church. In addition to an historical overview of the science of canon law, lectures address specific canons of the Code of Canon Law and selected canonical issues. Subjects to be considered include marital law, ecclesiastical sanctions (i.e., criminal law) and procedures, trial procedures.

LAWS 092. International Criminal Law (2) This course surveys selected issues and current problems involving the criminal aspects of international law and the international aspects of criminal law. The course begins with an introduction to the origins and purposes of international criminal law. We will then explore the contours of the duty to prosecute those who commit international crimes. Next, we will focus on application of domestic and international law to the question of jurisdiction over international criminal activities. This is followed by three units examining substantive international criminal law as contained in multilateral treaties concerning terrorism, war crimes and crimes against humanity. Next, we will explore the procedural aspects of international cooperation in criminal matters, with particular attention to extradition and problems associated with obtaining evidence from abroad. We will also analyze the reach of U.S. constitutional protections to U.S. investigative and law enforcement activities overseas. Finally, we will study the new Yugoslavia and Rwanda War Crimes Tribunals and the permanent International Criminal Court. The course will count toward the nine-credit limit on non-law school courses. Prereq: LAWS 203, LAWS 204, or LAWS 261.

LAWS 085. Intellectual Property Transactions (3) Students will explore how companies develop business and legal strategies to protect their intellectual property assets through agreements with strategic business partners, content providers, vendors, and licensees. As part of the course, students will select a company name and protect it, draft and negotiate agreements, and hold a mock negotiation at the end of the semester. One prior course in patent, trademark, or copyright is required. Grade is based on a final examination.

LAWS 086. International Intellectual Property (3) This course will explore the relationship between practical politics, the law, and government by examining the social and political context of contemporary issues of major significance, with emphasis on Ohio. Courses will include guest lecturers drawn from those professionals engaged in an aspect of the political process. Grades will be based largely on independent research and writing and class participation. The course is designed to complement, but not significantly overlap, existing courses in the public law concentration, most notably, State and Local Government and Legislation.

LAWS 087. Public Law and Politics (3) This course will explore the relationship between practical politics, the law, and government by examining the social and political context of contemporary issues of major significance, with emphasis on Ohio. Classes will include guest lecturers drawn from those professionals engaged in an aspect of the political process. Grades will be based largely on independent research and writing and class participation. The course is designed to complement, but not significantly overlap, existing courses in the public law concentration, most notably, State and Local Government and Legislation.

LAWS 088. Regulatory Policy Research Lab (2) Taught jointly between the School of Law and the Weatherhead School of Management, this course offers students an opportunity to engage in hands-on work on a current policy issue concerning government regulatory activity. Specific topics will vary from year to year, but will include such topics as land use planning, local regulation of business, and state and local tax policy. The course is taught over two semesters and students must enroll in both semesters to receive credit. The P/NC option may not be used for this course. Prereq: Open to 2nd year MBA students and 3rd year law students and 3rd year and 4th year JD/MBA students only.

LAWS 090. Canon Law (2) This course examines the legal system of the Roman Catholic Church. In addition to an historical overview of the science of canon law, lectures address specific canons of the Code of Canon Law and selected canonical issues. Subjects to be considered include marital law, ecclesiastical sanctions (i.e., criminal law) and procedures, trial procedures.

LAWS 092. International Criminal Law (2) This course surveys selected issues and current problems involving the criminal aspects of international law and the international aspects of criminal law. The course begins with an introduction to the origins and purposes of international criminal law. We will then explore the contours of the duty to prosecute those who commit international crimes. Next, we will focus on application of domestic and international law to the question of jurisdiction over international criminal activities. This is followed by three units examining substantive international criminal law as contained in multilateral treaties concerning terrorism, war crimes and crimes against humanity. Next, we will explore the procedural aspects of international cooperation in criminal matters, with particular attention to extradition and problems associated with obtaining evidence from abroad. We will also analyze the reach of U.S. constitutional protections to U.S. investigative and law enforcement activities overseas. Finally, we will study the new Yugoslavia and Rwanda War Crimes Tribunals and the permanent International Criminal Court. The course will count toward the nine-credit limit on non-law school courses. Prereq: LAWS 203, LAWS 204, or LAWS 261.

LAWS 085. Intellectual Property Transactions (3) Students will explore how companies develop business and legal strategies to protect their intellectual property assets through agreements with strategic business partners, content providers, vendors, and licensees. As part of the course, students will select a company name and protect it, draft and negotiate agreements, and hold a mock negotiation at the end of the semester. One prior course in patent, trademark, or copyright is required. Grade is based on a final examination.

LAWS 086. International Intellectual Property (3) This course will explore the relationship between practical politics, the law, and government by examining the social and political context of contemporary issues of major significance, with emphasis on Ohio. Courses will include guest lecturers drawn from those professionals engaged in an aspect of the political process. Grades will be based largely on independent research and writing and class participation. The course is designed to complement, but not significantly overlap, existing courses in the public law concentration, most notably, State and Local Government and Legislation.

LAWS 087. Public Law and Politics (3) This course will explore the relationship between practical politics, the law, and government by examining the social and political context of contemporary issues of major significance, with emphasis on Ohio. Classes will include guest lecturers drawn from those professionals engaged in an aspect of the political process. Grades will be based largely on independent research and writing and class participation. The course is designed to complement, but not significantly overlap, existing courses in the public law concentration, most notably, State and Local Government and Legislation.

LAWS 088. Regulatory Policy Research Lab (2) Taught jointly between the School of Law and the Weatherhead School of Management, this course offers students an opportunity to engage in hands-on work on a current policy issue concerning government regulatory activity. Specific topics will vary from year to year, but will include such topics as land use planning, local regulation of business, and state and local tax policy. The course is taught over two semesters and students must enroll in both semesters to receive credit. The P/NC option may not be used for this course. Prereq: Open to 2nd year MBA students and 3rd year law students and 3rd year and 4th year JD/MBA students only.

LAWS 090. Canon Law (2) This course examines the legal system of the Roman Catholic Church. In addition to an historical overview of the science of canon law, lectures address specific canons of the Code of Canon Law and selected canonical issues. Subjects to be considered include marital law, ecclesiastical sanctions (i.e., criminal law) and procedures, trial procedures.

LAWS 092. International Criminal Law (2) This course surveys selected issues and current problems involving the criminal aspects of international law and the international aspects of criminal law. The course begins with an introduction to the origins and purposes of international criminal law. We will then explore the contours of the duty to prosecute those who commit international crimes. Next, we will focus on application of domestic and international law to the question of jurisdiction over international criminal activities. This is followed by three units examining substantive international criminal law as contained in multilateral treaties concerning terrorism, war crimes and crimes against humanity. Next, we will explore the procedural aspects of international cooperation in criminal matters, with particular attention to extradition and problems associated with obtaining evidence from abroad. We will also analyze the reach of U.S. constitutional protections to U.S. investigative and law enforcement activities overseas. Finally, we will study the new Yugoslavia and Rwanda War Crimes Tribunals and the permanent International Criminal Court. The course will count toward the nine-credit limit on non-law school courses. Prereq: LAWS 203, LAWS 204, or LAWS 261.
LAWS 204. Business Associations II (4)
This course is an elaboration of "corporateness" as a mode of business asset ownership and management. The functions and relationships of corporate enterprise participants, primarily promoters, shareholders, creditors, and managers, are fully investigated. The course first covers preorganizational problems and fundamental concepts of corporate financing. It then canvases the roles of corporate high management, with emphasis on the special duties (fiduciary and other) imposed on certain participants. Careful attention is paid to the allocation of prerogatives among those most intimately involved in corporate life. The discussion examines and tests the traditional view of directors as the repositories of everyday management power and shareholders as the possessors of a theoretical franchise to select management, veto fundamental changes, and enforce management responsibilities. Maintenance of the corporate structure for the protection of creditors and shareholders is treated in connection with problems of recapitalization and distribution. State statutory themes are taken in the context of the ALI-ABA Model Business Corporation Act. Threads of the federal corporate regimen being developed under the aegis of the Securities and Exchange Act are woven throughout the course fabric. The course examines and tests the preeminent role of the Securities and Exchange Act in the development of modern securities law. The course highlights both the practical applications and theoretical underpinnings of the Federal Rules of Evidence and the law of securities. The role of the Juvenile court in society: its jurisdiction, procedures, and dispositional alternatives. Students study both the quasi-criminal aspects of the juvenile court (jurisdiction over juvenile delinquents and status offenders) and the civil-protective aspects of the court (termination of parental rights and the handling of neglected, dependent, and abused children). In addition, the rights afforded juveniles are compared with the rights afforded adults in comparable circumstances. Many related juvenile justice issues, such as the right of a minor female to have an abortion without parental notification and the constitutionality of capital punishment for juvenile offenders, are also examined.

LAWS 205. Intellectual Property (3)
Deals primarily with intellectual property issues: the nature of intellectual property, infringement, and statutory requirements for patentability and copyrightability of software and the patentability and copywritability of software and the patentability and copywritability of software. The role of the Juvenile court in society: its jurisdiction, procedures, and dispositional alternatives. Students study both the quasi-criminal aspects of the juvenile court (jurisdiction over juvenile delinquents and status offenders) and the civil-protective aspects of the court (termination of parental rights and the handling of neglected, dependent, and abused children). In addition, the rights afforded juveniles are compared with the rights afforded adults in comparable circumstances. Many related juvenile justice issues, such as the right of a minor female to have an abortion without parental notice and the constitutionality of capital punishment for juvenile offenders, are also examined.

LAWS 206. Corporate Tax Problems (3)
An introductory course in federal income taxation of the individual taxpayer, including a consideration of the nature of income, specific statutory exclusions, business and nontax business deductions, the treatment of capital gains and losses, and elementary tax accounting.

LAWS 207. Evidence (3)
This is a comprehensive course in the law of evidence as applied in civil and criminal cases. Subjects include relevance, direct and cross-examination, impeachment, hearsay, judicial notice, privileges, examination of witnesses, expert and lay opinion testimony, and real, demonstrative, and scientific evidence. This course deals with both the practical applications and theoretical underpinnings of the Federal Rules of Evidence and common law precedents. Students may not take both LAWS 207 and LAWS 212.

LAWS 208. Health Law (3)
An introduction to basic comparative, transnational, and international law disciplines. Using areas of substantive and procedural law familiar to first-year students, the course examines issues arising from cross-national activity. Students are exposed to choice of law, comparative law, international law, and international institutions.

LAWS 219. Workers' Compensation (2)
Workers' compensation law has a statutory basis which continues to evolve through judicial decisions. The statutes deal with benefits for work-connected injury and disability. Course material is national in scope with an emphasis on recent Ohio cases. The course also touches on related areas of law, such as torts.

LAWS 220. Civil Law and Psychiatry (2)
The interaction between law and psychiatry and its effects on patient rights, institutional care, guardianship, psychiatric malpractice, suicide, psychic damages, and child abuse and custody. Students will test the analysis of legal issues against actual experience (videotaped interviews, visit to a state mental hospital). The course is jointly taught by a psychiatrist and an attorney specializing in mental health law.

LAWS 222. Health Care Professions (2)
This course covers law relating to the creation, functioning, and dissolution of the family as a legal unit. Topics include legitimacy, adoption, premarital agreements, cohabitation, marriage, family obligations, division of marital property, divorce and annulment, and child custody. Particular attention is given to the social forces that affect the development of rules and policies.

LAWS 224. Global Perspectives (3)
An introduction to basic comparative, transnational, and international law disciplines. Using areas of substantive and procedural law familiar to first-year students, the course examines issues arising from cross-national activity. Students are exposed to choice of law, comparative law, international law, and international institutions.

LAWS 225. Criminal Law and Psychiatry (2)
The interaction between criminal law and psychiatry: psychiatric diagnosis and treatment, competence to stand trial, the insanity defense, malingering mental illness, infanticide, sexual psychopath laws, and direct and cross-examination of mental health experts. Videotaped examples serve as a basis for discussion. A visit to the Justice Center Court Psychiatric Clinic is included.

LAWS 229. Patent Law (2-3)
Basic concepts of patent law as property considered primarily in its substantive aspects, including the relationship of patent law to other forms of property protection and to the public interest. The course is taught jointly by a psychiatrist and an attorney specializing in mental health law.

LAWS 230. Federal Income Tax (4)
The taxation of corporations, partnerships, and estates under the Internal Revenue Code. The course studies the concept of income and the allocation of income between the corporation and its shareholders, the allocation of certain functions to the profit sector and the allocation of certain functions to the nonprofit sector. It examines the legal structures available for the exploitation of natural resources. Primary focus will be on water, oil, and gas, but the legal issues of other extractive industries will also be considered.

LAWS 231. International Law (3)
The role of the Juvenile court in society: its jurisdiction, procedures, and dispositional alternatives. Students study both the quasi-criminal aspects of the juvenile court (jurisdiction over juvenile delinquents and status offenders) and the civil-protective aspects of the court (termination of parental rights and the handling of neglected, dependent, and abused children). In addition, the rights afforded juveniles are compared with the rights afforded adults in comparable circumstances. Many related juvenile justice issues, such as the right of a minor female to have an abortion without parental notice and the constitutionality of capital punishment for juvenile offenders, are also examined.

LAWS 232. Wills, Trusts, and Future Interests (4)
A survey of the law of intestate and testate succession, will substitutes, private and charitable trusts, and estates in trust. The course emphasizes the importance of effective tax planning techniques to the law of trusts.

LAWS 233. Corporate Tax Problems (3)
An introductory course in federal income taxation of the individual taxpayer, including a consideration of the nature of income, specific statutory exclusions, business and nontax business deductions, the treatment of capital gains and losses, and elementary tax accounting.

LAWS 235. Copyright Law (3)
Copyright law is the in-depth study of the legal doctrine and policy relating to the protection of one's artistic, literary, musical, and computer-related expression. We will focus primarily on the 1976 Copyright Act and amendments thereto, such as the Digital Millennium Copyright Act of 1998.
protection of interests in software by contract or by treating it as a trade secret. Issues relating to the risks of distributing computer software (i.e., the risks of products’ liability for computer software) will also receive considerable attention. Some time will be spent on the legal issues that arise when computers are interconnected by networks. Since many of the legal issues relating to computers arise because courts and lawyers do not understand how computers work and what they can and cannot do, the course begins with basic instruction in such matters as registers, central processing units, logic gates, and computer languages; this portion of the course includes ungraded homework assignments.

LAWS 244. Poverty, Social Inequality, and the Law (3)

An overview of the way the law impacts on disadvantaged people, and the law that supports advocacy on their behalf. Students will learn about legal problems that are common to poor people and identify potential solutions. The course will analyze the effectiveness of various legal interventions such as administrative advocacy, and litigation (including individual and class representation) in various contexts. Past and current means of using and changing the law on behalf of low-income people will be studied. Students will analyze the responsibilities of lawyers to represent low-income clients. Many of the concepts will be taught through the use of case studies; a client interview will be conducted, and court observation is required. Grade is based on oral case study presentation, written assignments, and class participation.

LAWS 245. Complex Litigation (2)

Analysis of key issues typically encountered in complex civil litigation including substantive implications of seemingly procedural choices. Class actions, multidistrict litigation, joinder and consolidation, Exploration of practical and ethical issues encountered in complex civil litigation.

LAWS 246. Advanced Contracts (3)

We will examine the methodology of law and economics and of deontological approaches to contracts, legal realism, the methodology of default rules, gap filling and incomplete contracts, adjustment of long-terms contracts, employment contracts and the employment at will doctrine, promissory estoppel, relational contracts, incorporation strategies in the U.C.C. and the new formalism in Contracts.

LAWS 247. International Human Rights (3)

The course considers the role of human rights in a transnational context with an emphasis on understanding the role of human rights in the United Nations.

LAWS 248. Criminal Procedure II (2-3)

After a brief introduction to the institutions and organs of the European Union, the course will consider the internal operations of the Community and its institutions. The course will focus on the legal impact of the European Court of Justice, as well as its rulings governing the free movement of goods, services, capital, and persons. The concept of European citizenship will also be dealt with.

LAWS 257. English for Foreign Graduate Law Students (3)

This course is designed to teach English compositional skills and grammar for legal studies. It will focus on the writing process, as-a-second-language focus, this course will seek to teach students the various steps of the writing process, focusing on the structural differences between legal writing and that of other academic disciplines.

LAWS 258. Business Torts (3)

This course builds on the foundation provided by Torts and focuses on the application of torts doctrines in the business context. Emphasis is placed on such topics as interference with economic relations, marketplace falsehoods, intangible assets, appropriation, and false light. Grade is based on a final examination.

LAWS 259. Business Associations, Advanced: Representation of Clients (3)

The course will provide students with an in-depth understanding of many aspects of representing clients in various business transactions. This course is an introduction to the law of business associations, including general and limited partners, limited liability companies, and corporations. The functions and relationships of enterprise participants, primarily promoters, equity owners, creditors, and managers are investigated. The course covers pre-organizational problems and then canvases the roles of ownership and management, with emphasis on the special duties (fiduciary and otherwise) imposed on certain participants in publicly and closely-held entities. The regulation of securities fraud, proxy voting and solicitations, and the issuance of securities under the federal securities laws is explored. Fundamental concepts of corporate finance, including valuation of the concern and claim structure, are investigated. Organic changes, including dissolutions, mergers, and tender offers, are discussed.

LAWS 262. Patent Prosecution (2)

This course will expose students to the issues and concepts of drafting a patent application. Topics include defining an invention, drafting a patent application, responding to Office Actions issued by the USPTO. Patent law is a prerequisite. Grade is based on three short papers and a multiple choice final.

LAWS 264. International Organizations (3)

Deals with legal issues surrounding some common characteristics of international organizations having wide membership, with an emphasis on the United Nations system. Many of the issues are constitutional or procedural; that is, they have to do with the powers of, and restrictions upon, the organizations or their members as set forth in the constituent instruments of the organizations or as developed in practice. Issues such as eligibility for membership and termination thereof, rights and obligations of members, dispute resolution, and legislative procedures will be addressed comparatively. The growth of international law through intergovernmental organizations is also addressed.

LAWS 265. Health Care and the Courts (3)

The seminar will examine a variety of health care issues that raise constitutional law questions. The course will focus on the following questions: (1) whether a constitutional right to health care exists, (2) what constitutional principles justify the state’s involvement in health care, and (3) how conflicts between individual liberty and state interests should be resolved. In analyzing these questions the class will address several contemporary issues including the right to refuse medical treatment for a child on religious grounds, mandatory HIV and drug or alcohol testing, reproductive rights, maternal-fetal conflicts, assisted suicide, national DNA data banking, and others.

LAWS 266. Sales and Secured Financing (4)

A concentrated survey of the law relating to the sale and financing of goods and secured financing. (1) Sales. The primary focus will be on the law relating to the sale of goods in commercial setting, i.e., Article 2 of the Uniform Commercial Code. Some attention will be given to the United Nations Convention on the International Sale of Goods. Considerable attention will also be given to consumer sales issues, e.g., the Uniform Consumer Sales Practices Act and similar legislation. There will be some coverage of leasing of goods under Article 2A of the UCC. (2) Secured Financing. Personal property security interests under Article 9 of the UCC will be examined in considerable depth. Real property mortgages will not be covered. Not open to students who are taking or have taken Sales (LAWS 381) or Property Security (LAWS 377). Students taking this course are precluded from subsequently taking either of those courses.

LAWS 267. Products Liability (2)

Explores in depth the liability of manufacturers and sellers for physical injury to persons or property caused by defective products. The relevant law includes UCC
warranty provisions. Restatement of Tort (Second) section 402A and other tort law, state “tort reform” statutes, and federal and state statutes regulating product safety, such as the FDA and the Consumer Product Safety Act. The course will also examine proposals to “reform” the law of products liability.

LAWS 268. Death Penalty Law and Process (2)
The course offers a review of the death penalty process, theory, and law from trial through execution, including examination of state laws and federal habeas corpus law. The course focuses on the legal principles implicated by the death penalty and also examines the social issues it raises including the social/legal arguments against the death penalty, race and gender issues, and the influence of political and other factors on the process. Prereq: LAWS 327.

LAWS 273. Computers and Crime (1)
The course will cover both the new kinds of criminal activity made possible by computer technology and the use of computer technology to commit traditional crimes like embezzlement and terrorism. The class will examine Internet gambling and the distribution of child pornography on the Internet to illustrate issues that arise in connection with the use of computer technology in criminal activity. The class will also focus on procedural issues like jurisdiction and venue that become problematic in the context of computer crime. Limited to 20. Prereq: LAWS 131.

LAWS 274. Community Development Law (2)
An examination of the law of economic and land development in underserved and deteriorated areas. Legal issues related to business organization, financing, real estate development, governmental programs, and regulation and taxation (among other areas) will be covered. Topics include background of urban deterioration, governmental and private sources of assistance, organizing the developing entity, financing the project, governmental programs, tax policy and programs, land assembly, and administration of developments.

LAWS 275. Fundamentals of Law Practice Management (2)
An overview of the components of a successful practice. Applicable to practices of any type and size, the course integrates contemporary business theories and practices with the values of the legal profession and the realities of a law practice. Topics covered include assessing and responding to the market for legal services, client development, pricing, systems to insure quality, use of technology, firm structure and governance, and financial considerations. Class sessions include lectures, discussions, analysis of business cases developed in legal settings, and guest lectures. Students work in small teams to develop a hypothetical business plan for a firm or practice group.

LAWS 277. Immigration Law (2)
The general principles of immigration law and procedure, including federal authority to regulate immigration, removal of aliens (deportation and exclusion), administrative and judicial review, fleeing persecution (refugees, asylees, and others), immigrant and nonimmigrant visas, and consular practice. The course will emphasize practical application of current immigration law.

LAWS 279. Advanced Real Estate Development: Shopping Centers (2)
The course takes one point of view of the attorney for a real estate developer with a strong emphasis on shopping center development, including apartment complex and office building developments, but provides insights useful to an attorney for the other side: a tenant, financial institution, or major department store. The approach is practical as well as academic; the course may be considered a capstone for students interested in real estate. Topics include negotiations and documentation; actual documents are used.

LAWS 281. Environmental Anatomy of a Business Transaction (2)
Students will explore how issues of environmental law affect the structure and progress of a business transaction. A case study will start with a letter of intent and will proceed through environmental due diligence, the drafting of environmental representations, warranties, indemnities and schedules; the closing of the transactions; the making of environmental claims under the contract; and mediation of those claims to resolution. Ethical issues of new information about violations discovered in due diligence that must be reported to government agencies will be examined. Students will divide class time among the following activities: (a) the presentation of short research memoranda on the issues in the transaction, (b) the critiquing of drafts of transaction and mediation documents, and (c) role playing as sellers, buyers, bankers, environmental consultants, government agency personnel and their lawyers at different stages of the transaction. The course is designed to allow students to integrate concepts from first- and second-year courses in contracts, business associations, property, and environmental law in a series of problem solving exercises. Prereq: LAWS 331.

LAWS 282. Business Tax Problems (4)
The course is an introduction to the federal taxation of business entities (corporations, partnerships, limited liability companies, etc.) and the investors in those entities. Students will examine the tax consequences of several common transactions, such as entity formation, operating distributions, liquidations, and reorganizations. Special attention will be given to the tax considerations affecting choice-of-entity decisions. Prereq: LAWS 211, and LAWS 261 or LAWS 203 and LAWS 204.

LAWS 283. Medical Malpractice (2)
The course will involve liability and quality of care issues in the health care field, with an emphasis on the liability of physicians, hospitals, and to a lesser extent insurers. Topics will include defining the standard of care, theories of liability, defenses to medical malpractice, tort reform, and quality control.

LAWS 284. Advanced Contracts eCommerce and The New Economy (1)
The course will consolidate and expand the students’ basic understanding of contract law by focusing on the formation and enforceability of electronic contracts. Students will study recent changes in the law, including the Uniform Electronic Transactions Act, the Uniform Computer Information Transactions Act, the Electronic Signatures in Global and National Commerce Act, the European Union e-Commerce Directive, and the Canadian provincial e-Commerce law. The course will also give students a practical perspective on contractual drafting. Materials will be drawn from Magg, P., Soma, J., and Sprowl, J., “Internet and Computer Law Cases, Comments and Questions,” (West 2001). Class participation, a class presentation and an examination will be required. Prereq: LAWS 123.

LAWS 285. Courts, Public Policy, and Social Change (3)
Examines the social impact of law and use of social research in the legal process, assesses efforts to use law to effect social reform, and empirical studies of legal processes and institutions. Cross-listed as POSC 429.

LAWS 286. Litigation Practice (4)
This course will examine the lawyer's role in resolving disputes. The course will take the students through a case from the initial client through litigation in a trial court up to summary judgment and then on appeal from a grant of summary judgment. We will examine (1) issues pertaining to resolution of the dispute, including negotiation, alternative dispute resolution mechanisms, and the costs and benefits of litigating in court, (2) issues pertaining to the development and use of facts, including exploration of the lawyer's role as investigator, the use of formal discovery mechanisms, and the different burdens posed by the different levels of scrutiny applied by a court at different stages, (3) issues pertaining to the role of the lawyer, including his or her role as counselor to the client, negotiator with and warrior against the adversary, and advocate to the court. The course will consist primarily of simulations and class lectures, and will also involve substantial written assignments, including drafting of pleadings, discovery materials, and briefs. Enrollment for both terms (LAWS 286 and LAWS 287) is required. Students who have taken or are enrolled in Alternative Dispute Resolution (LAWS 351); Appellate Advocacy (LAWS 262); Lawyering Process (LAWS 401); or Pretrial Practice (LAWS 399) may not enroll in this course. Students who take this course are free to take either Trial Tactics (LAWS 397) or Trial Practice (LAWS 395). The course satisfies the Lawyering Process requirement that is a prerequisite for Clinic courses. Students who complete the course in their second year may—but are not required—to compete in the Dunmore Moot Court Competition in their third year. Limited to 12.

LAWS 287. Litigation Practice (3)
(See LAWS 286.) This course is the second semester of LAWS 286. Enrollment in both semesters is required.

LAWS 289. Secured Transactions (2)
This course deals with Article 9 of the UCC and other legal and equitable rules relating to the use of personal property as security for debts. Topics covered include creation of a security interest (mortgage), rights and obligations of the debtor (mortgagor) and the secured party (mortgagor), priority of interests in the same property, redemption rights of the debtor, and foreclosure of a security interest by the mortgagor. May not be taken by students who have taken or are taking the 4-credit Sales and Secured Transactions course (LAWS 266). Students who have taken or are planning to take the 3-credit Sales (LAWS 381) course may enroll.

LAWS 290. Federal Judicial Externship Academic Year Program (3)
Externship opportunities are available to a limited number of second- and third-year students who have not participated in the summer judicial externship program. Participants are selected by the instructor from a pool of interested students in the fall of their second year. Students chosen will be placed by the instructor with a selected federal judge or magistrate in the Cleveland, Akron, Medina, or Youngstown areas. Throughout the semester, students will attend seminar classes at the law school for a total of 17.5 hours and will work in the judge’s chambers for a minimum of 15 hours per week. Students must keep and submit to the instructor weekly, contemporaneous time records of their work in chambers. Topics to be considered in the seminar classes will include the role of law clerks, advanced legal research techniques, the process of judicial decision making and opinion writing, learning from observation and supervision, ethics in the judicial process, reflective lawyering, what makes effective advocacy, and
other topics. Students will work in chambers under the supervision of the judge and his or her law clerks where their primary role will be to perform legal research and assist in the development of judicial opinions. Copies of the students' written work will be provided to the instructor for review. Grade is based on classroom participation and work done in the judge's chambers. Enrollment is limited to 12. Students will be notified of acceptance into the program by August 1.

LAWS 291. Appellate Institutions and Process (3)
This course will examine the role of appellate courts in our legal system and provide a practical introduction to appellate litigation. Topics to be covered will include: the role of appellate courts (federal and state) in the American legal system; their jurisdiction, the scope and standards of review; the function of appellate courts in relation to trial courts; the function of two appellate levels; the crisis of volume in the appellate system, and U.S. Supreme Court practice. Grade is based on a final examination.

LAWS 293. Financial Principles for Lawyers (3)
This course provides an introduction to the use of financial economics that are frequently relevant in many areas of law. Topics to be covered include the time value of money, uncertainty, claim structure (including the characteristics of debt, equity, and hybrid securities, and the benefits and detriments of debt and equity financing), behavior of securities markets, and analysis of financial statements. Use of these concepts in specific areas of legal practice will be discussed.

LAWS 294. eEvidence (1)
This course will focus on special problems arising from the use of electronic evidence and evidence in high-tech criminal and civil cases. Class participation, a class presentation, and an examination will be required. Prereq: LAWS 327 and LAWS 212.

LAWS 295. Law of Health Care Organization and Finance (2)
This course presents an overview of corporate health care law issues including: public and private reimburse providers. The course will examine the origins and antitrust and insurance regulation of health care providers. The course will examine the origins and public behind current corporate health care law and providers. This course will focus on special problems arising with persons represented by counsel. They will also have the opportunity to understand the financial motivation behind these transactions and to identify the unique health care law issues presented by them. Students will learn to develop alternative methods for structuring transactions to minimize or avoid such is-sues. The types of transactions to be examined include: physician recruitment, physician practice acquisitions, physician practice management companies, joint ventures between hospitals and physicians, mergers and acquisitions of health care providers, and formation of integrated delivery networks. Enrollment is limited to 25. Prereq: LAWS 295.

LAWS 299. Trademark Litigation (2)
This course will simulate a trademark infringement case. Students will be asked to represent a client, and in that capacity will identify issues, provide legal advice, and prepare papers and pleadings as necessary. In particular, students will be asked to conduct a limited number of the following simulations: draft complaint and an answer to the complaint, including counterclaims; draft discovery documents; prepare witnesses, including expert witnesses; take and defend a deposition; or prepare pre-trial motions and exhibits. Trademark law is a prerequisite. Grade is based on the students work in these simulated settings.

LAWS 301. Administrative Law (3)
This course examines legal issues surrounding the actions of state and federal administrative agencies. Areas of emphasis include statutory interpretation; the availability, timing, and scope of judicial review of agency action; and control of agency discretion. The course emphasizes written work, including advanced legal research training.

LAWS 303. Admiralty Law (2)
The general principles of admiralty law including jurisdiction, practice, maritime liens, collisions, salvage, limitation of liability, and the rights of injured maritime workers.

LAWS 304. American Legal History (3)
This course surveys the American legal past from the Revolutionary era to the present. It examines the development of a distinct American legal culture by exploring the interrelationships among legal institutions, thought, practice, and education in various historical periods.

LAWS 307. Securities Regulation (3)
This course explores the policies and techniques of state and federal investor protection, with emphasis on the distribution of securities by issuers and their affiliates. After an analysis of express general anti-fraud remedies, the “security” concept, and the diverse philosophies underlying “value judgment” and “discovery” approaches to regulation of business fund-raising practices, the course proceeds to a full consideration of the impact of the Federal Securities Act of 1933 on primary and secondary distributions. Concurrent as well as independent effects of state blue sky laws, typified by the Uniform Securities Act, are also treated. To round out the total pattern of investor protection in the distributional setting, the course includes limited excursions into the anti-fraud, private placement, public information availability, and broker-dealer aspects of the Securities Exchange Act of 1934. Prereq: LAWS 204.

LAWS 308. Advanced Securities Regulation (3)
This course begins by treating the security assessment process engaged in by investors, and then proceeds to a discussion of regulation designed to perfect the decision-making process and to overcome informational and other-than-informational deficiencies in the trading markets. Topics include periodic reporting; annual reports to shareholders; duties of broker-dealers and advisers in the trading markets; trading on, and selective disclosure of, nonpublic material information; and the disclosure duties of quiescent issuers. Attention is given to the regulation of tender offers and other large-scale acquisitions of securities, as a special problem of the trading markets. The course also deals with securities regulation which benefits holders of securities, including proxy regulation, securities regulation approaches to corporate mismanagement, and Exchange Act Section 16. Post-transaction relief is also discussed, and, if time allows, attention is given to the occupational licensing aspects of broker-dealer and adviser regulations. Prereq: LAWS 307.

LAWS 309. Antitrust Law (3)
A study of the implementation of federal trade regulation statutes with emphasis on the interrelationship of these laws with the competitive tensions of the contemporary economy.

LAWS 313. Business Planning (3)
Major events in the creation and development of a business are examined in light of partnership, corporate, and tax law problems. Students are presented with a series of hypothetical client-suggested transactions. Students seek the most appropriate means of attaining the business ends desired by the principals. From time to time, brief written memoranda covering issues raised by the problem scenarios may be required. Emphasis is placed on the interaction among partnership, corporate, tax, and securities concepts and doctrine. The significant business events that may be covered in the course include formation of a partnership; incorporation of a going concern; corporate distributions, recapitalizations, and repurchases of shares; sale of the corporate business; and corporate combination. Prereq: LAWS 203, LAWS 204, and LAWS 211.

LAWS 314. Selected Topics in Human Rights: International Crimes against Women (1)
This course will explore the development and implementation of newly recognized or emerging international human rights law. The course will draw upon at least three major lectures sponsored by the Klatsky Seminar in Human Rights in collaboration with the Frederick K. Cox International Law Center and the Journal of International Law. Students will read the works of the lecturer and other source materials and meet to discuss them in advance of the lectures, attend the lectures, and meet afterwards to explore the issues raised. Three short papers are required.

LAWS 315. Commercial Paper (3)
One of the basic courses in commercial law, dealing with the law of negotiable instruments and bank collections and deposits. These topics are considered primarily under the Uniform Commercial Code and, to some extent, recent federal banking and consumer credit legislation.

LAWS 319. American Indian Law (2)
An introduction to the body of law governing the relationship among Indian tribes and state and federal governments. Major themes include tribal sovereignty; the federal-tribal relationship; criminal, tax, and regulatory jurisdiction on reservations; and the rights of individual Indians. Does not fulfill writing requirement.
LAWS 320. Conflict of Laws (3)

Competing approaches to choice of law in cases having multi-state and/or multi-national contacts. The course also covers personal jurisdiction, constitutional and international limitations on choice of law, and enforcement of judgments. Comparative and international perspectives are integrated throughout. Students develop their own choice of law theory in a simulated restatement conference.

LAWS 323. Debtor-Creditor Law (3)

The creditor’s power to enforce its judgments through such judicial processes as attachment, execution, levy, garnishment, and creditors’ bills. The debtor’s power to resist creditors’ claims through statutory exemptions or federal bankruptcy discharge, or because the creditor has acted inappropriately or in bad faith. Also studied is the creditor’s power to set aside and avoid fraudulent transfers made by the debtor, a power which has generated much litigation in recent years. We also study the special rights of the federal government to enforce its claims, through the Federal Debt Collection Act of 1990, the Federal Priority Statute, and the Federal Tax Liens Statute. Finally, we survey collective creditors’ remedies under state law, including assignments for the benefit of creditors, creditors’ arrangements, and receiverships.

LAWS 324. Bankruptcy (3)

A study of bankruptcy, with emphasis on the current Federal Bankruptcy Act. Includes Chapter 7 (liquidation bankruptcy proceedings), Chapter 11 (business reorganization), and Chapter 13 (debts adjustment by individuals). Also noted and investigated are the quite different policies and legal rules that we apply to bankrupts because they no longer are capable of conforming to the usual legal standards. Students should take UCC and debtor-creditor courses before taking Bankruptcy.

LAWS 325. Taxation of Corporate Reorganization (3)

The course will examine the federal income taxation of corporate reorganizations, including mergers, stock-for-stock exchanges, assets-for-stock exchanges, split-ups, spin-offs, triangular and reverse triangular mergers, and recapitalizations. More specifically, the course will analyze the tax consequences to the corporations who are parties to the reorganization, and their shareholders and the carryover of net operating losses and other tax attributes. Prereq: LAWS 211 and either LAWS 260 or LAWS 281.

LAWS 327. Criminal Procedure I (3)

The investigative stage of the criminal process. Constitutional limitations on searches and seizures, interrogation practices, and pretrial identification procedures are examined. In addition, the exclusionary rule, the principal method for enforcing Fourth, Fifth, and Sixth Amendment rights, is considered.

LAWS 328. Discrimination in Employment (3)

The federal laws and regulations concerning discrimination in employment. These include Title VII of the 1964 Civil Rights Act, the Equal Pay Act, the Age Discrimination in Employment Act, the Americans with Disabilities Act, and federal executive orders requiring affirmative action in employment. Regulation of discrimination based on race, sex, religion, national origin, age, and disability will be studied, with a focus on practical considerations in prosecuting and defending employment-based civil rights actions.

LAWS 331. Environmental Law (3)

The course is designed to provide an overview of both the breadth and depth of environmental regulation in the United States and to consider ways our environmental regulatory system might be improved. Although all of the major environmental laws will be surveyed, several statutes will be examined in greater detail. Students will be expected to navigate select provisions of statutes and regulations through in-class problem sets. Guest speakers will also be invited to speak on topics of current interest.

LAWS 335. Equity and Equitable Remedies (3)

The course provides a short introduction to the equitable jurisdiction and in particular to the concept that “equity acts in personam.” The major emphasis of the course is on the specific performance of contracts and on injunctions against continuing torts. A major concern is the doctrine that equity affords a remedy only when the remedy at law is inadequate. The course also gives some attention to the law of restitution, since restitutions, even those granted by law courts, are traditionally considered to be equitable. Equitable liens, constructive trusts, equitable enforcement of “restrictive covenants,” and the doctrine of “equitable conversion” are considered. The defenses that apply to equitable remedies, such as laches, “unclean hands,” and the doctrine that “he who seeks equity must do equity” are also considered. If time permits, some consideration is given to injunctions against governmental officials and to other extraordinary remedies that form the common law basis for administrative law and judicial review of governmental actions.

LAWS 336. Ethics in the Professions (3)

Theories of professional ethics, as applied to the professions of law, medicine, nursing, social work, and management. A major portion of the course will be devoted to issues common to these professions, such as confidentiality, truth-telling, client or patient autonomy, and public trust. The course also considers the relationship between legal ethics and the ethical theories first developed. Open to students of law, medicine, nursing, applied social sciences, and management. May satisfy the writing requirement.

LAWS 340. Federal Courts (3)

This course explores the relationships between the federal courts, Congress, and state courts and governments. Topics include congressional control of federal jurisdiction, justiciability, federal court abstention, suits against state and federal governments and officials, habeas corpus, and federal injunctions on state proceedings.

LAWS 341. Estate Planning and Taxation (3)

This course covers disposition of individual wealth from both the property law and tax law viewpoints. Grade is based on class participation and major written project. Students may elect either to complete a research paper or to prepare an estate planning memorandum and documents for a hypothetical client. Prereq: LAWS 232 and LAWS 211.

LAWS 343. Federal Taxation of Partnerships & Partners (3)

This course will examine the basics of partnership taxation. The topics will include the tax consequences of capital contributions to and distributions from a partnership, the receipt of a partnership interest in exchange for services, the allocation of profits and losses among the partners, the computation of the adjusted basis of a partner’s interests, the sale or liquidation of a partner’s interest, the liquidation and termination of the partnership. Prereq: LAWS 211.

LAWS 346. Insurance (3)

A comprehensive introduction to the regulation of the insurance industry and to the legal issues arising from relations between the parties to insurance contracts. The course examines statutory regulation of the industry by state and federal agencies and analyzes cases involving aggressive regulation by the judiciary as well. Insurance decisions on the cutting edge of developments in contract, tort, and agency law are studied. Students are required to study the policy forms most frequently encountered in practice: the automobile policy, the homeowner’s policy, and the life insurance policy. The course also provides exposure to problems relating to other areas of insurance including commercial general liability coverage, fire insurance, professional liability (malpractice) coverage, and health insurance.

LAWS 348. International Negotiations and Agreements (3)

Introduces students to the role of the lawyer in the dispute avoidance (rather than dispute resolution) process in relation to international agreements. The course is taught from the simulation approach. Students take active part in a mock negotiation and drafting of the international agreement between the United States and another country to be selected (either Canada or Russia). In the mock negotiation students are divided into two six-person teams, one team representing the U.S. and the other team representing the other designated country. Prereq: LAWS 215.

LAWS 349. International Trade and Development (3)

The public international and United States law regulating international trade. (The private law of international trade and investment is dealt with in International Business Transactions, LAWS 354.) It includes the economic theory of international trade (although no exposure to a course in economics in secondary or undergraduate education is necessary) as well as a legal examination of issues regulating global and regional (e.g., the Canada-U.S. Free Trade Agreement, OECD) international trade. Primary emphasis is on the General Agreement of Tariffs and Trade (GATT) and the World Trade Organization (WTO) as well as such United States legislation implementing the GATT as antidumping and countervailing duties legislation and escape clause relief. The roles of trade and aid are also explored, as well as U.S. legislation affecting the transfer of resources to less developed countries.

LAWS 350. International Arbitration (2)

An advanced course covering the current status of arbitration as a dispute settlement mechanism in international affairs. This course will cover the use of arbitration as a means of resolving international disputes: a) between private parties; b) between private and governmental parties; and c) between governments. It will cover possible forums and rules of arbitral dispute resolution and the problems of the enforcement of foreign arbitral awards. Special aspects of dispute resolution in certain geographical and subject areas will be covered as will be the problem of sovereign immunity. Disputes arising from multinational business transactions will be focused on as will be maritime, environmental, and border disputes.

LAWS 351. Alternative Dispute Resolution (2)

Students will examine the processes of alternative dispute resolution (ADR) through reading materials, videotapes, guest lectures, and simulation exercises. Particular emphasis will be given to the interaction of lawyers and clients in business negotiations and in litigation. Negotiation, arbitration, mediation, the summary jury trial, and the mini-trial will be examined. The class will also cover impediments to ADR, such as

Case Western Reserve University General Bulletin 2004–2006 School of Law • 437


LAWS 353. Philosophy of Law (3)
This is an examination of the general nature of law, the broad concerns of jurisprudence, the study of comparative law, and many of the issues raised in the literature of legal philosophy. Students will examine the principles of legal positivism, mitigated natural law, and rights theory. Selected readings and cases will illustrate these theories, which will also be examined in the context of rule selection by new governments in developing or revolutionary societies. The course also looks at the general nature of legal systems: how politics, morality, and individual views of justice and rights affect particular court cases and the course and development of law generally. Topics will include abortion, obscenity and sin, civil disobedience, affirmative action, sorority death, and the death penalty. This is unlike any other of the legal theory or jurisprudence courses, and those who have sampled legal theory elsewhere in a different form are welcome and encouraged to enroll. Cross-listed as PHIL 335.

LAWS 354. International Business Transactions (3)
This course examines various types of international business activities from a transactional perspective. It focuses on international sales, international payments, and international licensing transactions and examines the different legal systems (state, federal, international) that may impact on these transactions. It also considers commercial aspects of the interpretation of cross-border contracts, dispute resolution concerning cross-border contracts, and the role of lawyers. Some basic issues relating to private international law/contracts of law are also addressed. There is also some introductory coverage of international electronic commerce transactions and related legal issues.

LAWS 356. Jurisprudence (3)
The main themes in the history of Western jurisprudential thought. Ideas such as the nature of justice, the definition of law, the power of the state, legal and moral obligation, and the nature of the judicial process are explored through the works of such writers as Aristotle, Aquinas, Austin, Dworkin, Holmes, Hart, and Finnis, together with selected works of literature.

LAWS 359. Labor Law (3)
The basic course in the area of union-management relations, designed both for students desiring to pursue the field further and for those whose interest lies in an introduction to legal principles in this area. The course begins with a brief historical study of the evolution of the labor movement and prestatutory law. It then considers federal regulation under the National Labor Relations Act of union organizational efforts, management-union interaction, and the representational process, then proceeds to the collective bargaining process. The collective bargaining process is examined in some depth with special emphasis on the scope and substance of the duty to bargain in good faith, the enforcement of collective bargaining agreements in courts and by arbitrators, and the legal regulation of industrial warfare, the strike and lockout.

LAWS 360. Labor Arbitration and Collective Bargaining Workshop (3)
Students participate in a collective bargaining project involving contract drafting and negotiation, with settlement required prior to a predetermined strike deadline. They also arbitrate a grievance arising under their executed agreements. The course materials deal with bargaining strategy and game theory, arbitration process and procedure, and the subject matter of collective bargaining agreements: seniority, management rights, union security, wages, vacations, holidays, discharge, and discipline. In addition, students will make use of tools of labor law research in drafting an arbitration brief. Prereq: LAWS 359 or equivalent.

LAWS 363. Land Use Control (3)
This course analyzes the public control of land use, primarily at the local and state levels. Both legal and policy perspectives are considered. Attention is given to constitutional limitations such as the takings doctrine, equal protection, and due process. Topics considered include zoning, subdivision controls, exactionary regulations, and historic preservation.

LAWS 365. Legislation (2-3)
This course is a study of the legislative process and product. The class will examine theories of the legislative function; campaign and election regulation; the processes through which the legislature acts; and the drafting and interpreting of statutes.

LAWS 370. Intellectual Property Survey (3)
This course is designed to provide students with an overview of several areas of law traditionally associated with intellectual property or IP, including copyright law, which pertains to the protection of literary, musical, and artistic creations and has issues replete with First Amendment implications; patent law and trade secret law, which focus on the protection of technological works ranging from chemical formulae to software, to biotechnology; and trademark law, which relates to the goodwill associated with corporate identity and product recognition. We will also devote time to the study of the philosophy and economics of intellectual property keeping in mind, throughout the course, the need to strike an optimal balance between incentives to create and commercialize intellectual creations on the one hand and public access to these creations on the other hand.

LAWS 373. Professional Responsibility (3)
Examines the power of state and local governments. Among topics considered are the purpose and role of local governments; the source and scope of local governmental power; state and federal constitutional restraints on local governmental activity; the distribution of powers between state government and local governments; and the various options by which state and local governments finance their activities.

LAWS 374. State and Local Government (3)
Examines the power of state and local governments. Among topics considered are the purpose and role of local governments; the source and scope of local governmental power; state and federal constitutional restraints on local governmental activity; the distribution of powers between state government and local governments; and the various options by which state and local governments finance their activities.

LAWS 375. Professional Responsibility (3)
This course deals with questions underlying the responsibilities of the lawyer as a professional, to self, society, client, and the profession. Premises concerning the lawyer’s role or roles within the context of the adversary system are examined in some detail, as is the idea of professionalism. The Model Code of Professional Responsibility and the Model Rules of Professional Conduct are analyzed as generalized statements of the aspirations and obligations of lawyers, and as applied to concrete problems. Required.

LAWS 381. Sales (3)
One of the basic courses in commercial law. It serves equally as an introduction to the general organization, structure, and appropriate application of the Uniform Commercial Code. Primarily we study the law of Sale of Goods under Article 2 of the U.C.C. Necessarily this includes a study of products liability law, which is explored under both sales warranty and strict tort liability theories. The interrelationship between these competing theories of products liability law are also investigated. Other specific topics studied are the legal rules applicable to 1) the formation of sale contract, including the battle of the forms, statute of frauds, and parol evidence rule, 2) performance of and excuse of performance from the sales contract, 3) title warranties and title transfers, and 4) remedies for breach of the sales contract. Students may not take both LAWS 381 and LAWS 266 (Sales and Secured Financing).

LAWS 385. Real Estate Transactions and Finance (2-3)
Covers basic real estate transactions as well as issues involved in complex finance and development. Topics include: brokers, land contracts of sale, deeds and title covenants, the recording system, title insurance, mortgages, shopping center development, cooperatives and condominiums, ground lease financing, construction lending, distressed properties, selected federal income tax issues, and the real estate attorney’s professional responsibilities. Whenever possible, issues will be examined in the context of model transactions.

LAWS 386. Advanced Evidence (2)
This seminar is designed to cover specific issues in evidence, e.g., privilege, toxic torts, computer-generated evidence, expert testimony, syndrome evidence, and profile evidence. A paper and presentation are required. The paper may satisfy the writing requirement.

LAWS 390. Topics in Advanced Labor Law (2)
Covers relations between employers, employees, and unions not covered in the basic Labor Law Course (LAWS 359). Among topics included are hot cargo agreements, obligations of successor employers, duty to fair representation, union security, federal preemption of state labor legislation, internal union affairs, and labor law reform. Prereq: LAWS 359.

LAWS 391. Sports and Entertainment Law (2)
Sports and Entertainment Law is the study of legal issues and problems relating to the music, television, and sports industries. This course focuses on the applicability of various legal doctrines to these industries, such as intellectual property law, labor law, and contract law. Also, emphasis will be placed on negotiation tactics and letter and contract drafting by conducting several negotiation and drafting exercises as well as a simulated representative relationship between the student and the athlete/athlete. In the context of a mock litigation/arbitration, students will also be required to draft legal briefs in support of the contractual positions taken during the contract drafting exercises. Prereq: LAWS 261 and LAWS 211. Prior course work in intellectual property, labor and employment law, or alternative dispute resolution is recommended, but not required.

LAWS 392. Mass Media Law and Policy (3)
This three-credit course, taught by Professor Bryan Adamson, is designed to cover the law and regulation of electronic and print media.

LAWS 393. Trademark Law (5)
Trademark Law is the study of how commercial entities use words and designs to identify the source their...
products and services in the minds of consumers and competitors. This course focuses on domestic and international trademark acquisition, retention, transfer, registration, and infringement. In addition to the common law of trademarks and unfair competition, much of this course will be devoted to studying the statutory scheme of federal trademark law.

LAWS 395. Trial Practice (2)
This course provides practical training in jury and nonjury courtroom trial procedure. Students are assigned as lawyers in criminal and civil cases to conduct jury selection, examine and cross-examine witnesses, make objections, and argue motions in a simulated courtroom environment. Students may not take both Trial Practice and Trial Tactics (LAWS 397). Prereq: LAWS 207 or LAWS 212.

LAWS 396. Civil Rights Litigation: Reproductive Rights and the First Amendment (2)
This course will cover the basics of the Supreme Court’s reproductive rights jurisprudence, and looks at a series of topics relating to the intersection of reproductive rights and First Amendment rights, including freedom of speech and freedom of religion. In addition to reading cases, students will be assigned problems to discuss in class, with a focus on the practical problems of litigating civil rights cases (such as immunities, evidentiary concerns, and remedies). While the course is not coextensive with LAWS 003, there is some overlap, such that students should probably take only one of the two. Prereq: LAWS 202.

LAWS 397. Trial Tactics (4)
An intensive course in trial tactics, techniques, and advocacy. The emphasis during the first half of the semester is on practice in the separate components of a trial: direct examination, objections, cross-examination, use of rehabilitative devices, examination of expert witnesses, jury selection, opening statements, closing argument, and pretrial preparation. During the second half of the semester each student acts as co-counsel in a full trial. Videotape recording is used for critiquing student performance throughout the semester. Students may not take both LAWS 397 and LAWS 395 (Trial Practice). Prereq: LAWS 207 or LAWS 212, which cannot be taken concurrently.

LAWS 399. Pretrial Practice (2)
This course picks up where most first-year legal research and writing courses leave off. We will examine intensively, among other things, the various discovery devices (including depositions, interrogatories, documents that the court will admit), pretrial motion practice, litigation as a means of achieving the best possible negotiated result, and alternative dispute resolution mechanisms (including mediation and arbitration). In other words, we will study the things that lawyers spend most of their time doing and thinking about: how lawyers go about gathering and preserving evidence, the everyday interactions they have with courts, and the reasons they do all these things even though they rarely expect to get all the way to trial. The course will include simulations and extensive drafting assignments.

LAWS 400. Pretrial Practice: Criminal (2)
This course introduces students to the key activities lawyers undertake in a criminal case in advance of trial. This course examines the various steps leading up to trial, such as the preparation of an indictment, the drafting of discovery requests, motion practice related to discovery and the suppression of evidence, preparation and negotiation of plea agreements, and other motion practice related to the pre-trial phase. This course is designed to expose students to the pretrial phase in a criminal case from the perspective of both the prosecution and defense. Anticipated topics for discussion will include case investigation, the gathering of evidence, pretrial problems typically encountered in a criminal case, and the role sentencing guidelines can have in shaping plea negotiations and other pretrial negotiations. The course will include simulations, drafting assignments, opportunities for mock oral argument, and negotiating exercises. Limited to 12 students.

LAWS 401. The Lawyering Process (2)
Certain legal skills basic to the practice of law, including interviewing, counseling, and negotiating, are discussed, and students have the opportunity to practice those skills in simulated interviews and negotiations under the supervision of the instructor. Videotapes of lawyers and/or students are shown and reading materials assigned. Class discussions of reading materials and videotapes and experience in simulations enable students to confront basic problems of interpersonal communications, role conflicts, and decision-making posed by law practice.

LAWS 402. Pretrial Practice: Medical Malpractice (2)
This advanced skills course is a specialized version of the Pretrial Practice (Civil) course. The focus is on the work of counsel for plaintiffs and defense counsel in medical malpractice cases including pleading, discovery, motion practice, and settlement negotiation. The course will emphasize the special problems confronted in medical malpractice cases such as obtaining and interpreting medical records and dealing with expert medical witnesses.

LAWS 403. Criminal Justice Clinic (4)
Students handle a limited number of misdemeanor cases in municipal courts throughout Cuyahoga County. The seminar sessions are devoted to discussions of cases being handled by the students and to ethical and strategic considerations of criminal law practice, trial tactics, and plea bargaining. Hypothetical case studies are also used to increase the breadth of the students’ exposure to the criminal justice system. Each student also handles some prosecution in local court. Prereq: LAWS 401 and LAWS 327.

LAWS 407. Death Penalty Lab (2)
This Lab will involve students in an integrated experience of academic research and public service. Students will work on semester-long research projects arising from actual death penalty cases that will be of assistance to practitioners in death penalty cases or research projects for governmental and non-governmental organizations engaged in support for, opposition to, or reform of the death penalty at a local state, national, or global level. Issues include: jury selection issues; proportionality issues; economic impact of the application of the death penalty; examination of issues surrounding a specific state’s ability to provide a viable clemency; issues of international law; research, investigation, and litigation of case specific issues ranging from actual innocence, ineffective assistance of counsel, ineffective assistance of experts, prosecutorial misconduct, judicial misconduct, juror misconduct, etc. Prereq: LAWS 407.

LAWS 411. Civil Clinic I (3)
Students must be enrolled in and complete both semesters to receive credit. Students represent plaintiffs or defendants in a variety of matters, including landlord-tenant disputes, domestic relations cases, small business ventures, contract preparation, and administrative proceedings. A major part of the student’s responsibility is to determine whether a legal problem actually exists and, if so, to resolve it as expeditiously as possible. The seminar sessions are devoted to discussions of matters being handled by the students and to the ethical and practical problems encountered in civil law practice. Emphasis is on the use of such tools as negotiation, litigation, and settlement procedures to accomplish specific objectives. Prereq: LAWS 401. Prereq or Coreq: LAWS 207 or LAWS 212.

LAWS 412. Civil Clinic II (3)
Continuation of LAWS 411. Both semesters must be completed before credit is given.

LAWS 415. Family Law Clinic I (3)
Students must be enrolled in and complete both semesters to receive credit. Students represent parties in a variety of family law matters, including contested and uncontested divorces, domestic violence petitions, custody, support, and property division. A major part of the student’s responsibility is to analyze the problems and determine the best way of resolving them. Seminar sessions are primarily devoted to specific skills and to discussions of cases being handled by the students. The ethical and practical problems encountered in family practice are emphasized, as well as case theory. Prereq: LAWS 401. Prereq or Coreq: LAWS 207 or LAWS 212, and LAWS 210.

LAWS 416. Family Law Clinic II (3)
Continuation of LAWS 415. Both semesters must be completed before credit is given.

LAWS 418. Health Law Clinic I (3)
Students must be enrolled in and complete both semesters to receive credit. Students represent parties in a variety of health law matters, including premature discharge or inappropriate transfer from medical facilities; informed consent and substituted consent; entitlement to public or private insurance coverage, health services, and income benefits; and mental health issues such as guardianships and involuntary hospitalization. A major part of the student’s responsibility is to analyze the problems and determine the best way of resolving them. Seminar sessions are primarily devoted to specific skills and to discussions of matters being handled by the students. The ethical and practical problems encountered in health law practice are emphasized, as well as legal theory. Prereq: LAWS 401. Prereq or Coreq: LAWS 207 or LAWS 212; LAWS 227 or LAWS 220.
LAWS 419. Health Law Clinic I (3)
Continuation of LAWS 418. Both semesters must be completed before credit is given.

LAWS 430. Community Development Clinic I (3)
Students must be enrolled in and complete both semesters to receive credit. Students represent individuals and entities in a variety of community development matters which may include first time home buyer real estate purchases, construction and rehabilitation; business and non-profit entity formation; individual and entity representation in neighborhood rehabilitation projects; and group representation in other contexts. This clinic is primarily transactional in nature and is designed to expose students to the special problems encountered in representing entities and in structuring transactions. Seminar sessions will be devoted to discussions of applicable law pertaining to specific cases students are working on and development of the skills necessary to represent individuals and entities in transactional matters. Students also will be exposed to the ethical problems associated with entity representation. Prereq: LAWS 401 or LAWS 286/LAWS 287. LAWS 203 or LAWS 204 may be taken concurrently.

LAWS 431. Community Development Clinic II (3)
(See LAWS 430.)

LAWS 434. Intellectual Property Entrepreneurship Clinic (3)
This clinic experience will teach the third-year students/legal interns a range of legal skills through advising and representing clients who are engaged in entrepreneurial activities, concerning a variety of legal issues relating to the protection, exploitation, and commercialization of the clients’ innovative ideas. Initially, the clients will be teams of engineering students enrolled in the Weatherhead School of Management’s course on “Engineering Entrepreneurship,” although the clientele may change and/or expand to ensure that the clinic meets as many pedagogical goals as possible. (Other possible clients are students enrolled in the Physics Entrepreneurship Program see http://pep.phvs.cwru.edu/.) The clinic will provide the law students with opportunities to practice legal skills such as interviewing and counseling clients on a variety of legal issues pertaining to, among other things, intellectual property protection, corporate structure and financing, and various other transactional concerns that arise in an entrepreneurial/technology-based setting. A major part of the responsibility of the students is to analyze the clients’ problems and determine the best way of resolving them. Seminar sessions will be devoted to discussions of applicable law pertaining to specific cases students are working on, and to development of skills necessary to represent individuals and entities.

LAWS 436. Immigration Law Clinic I (3)
The Immigration Clinic will be both a real client representational clinic and provide students with experience of working on consulting projects with such organizations as the American Immigration Law Foundation. Examples of the activities that students may work on include 1) representation of individuals in matters before the Immigration Court, 2) preparation of legal memoranda, briefs, or policy papers on targeted immigration law issues. Examples of the kinds of cases and issues to be included are asylum, removal, petitions based upon the Violence Against Women Act, protections of non-citizen victims of domestic violence, and legality of detention. This is a year-long course.

LAWS 438. Digital Law and Business (3)
The course provides Law and MBA students with an understanding of legal issues that need to be addressed in the development of digital business at the level of web site management and transactions. The course also highlights the critical role of technology as a source of new legal requirements, and also as a means to address and enforce legal requirements that are critical in conducting on-line business (e.g. demand for authenticity, or non-repudiation). The course is organized as a series of topics that focus on critical aspects of e-business development and related contractual issues, business transactions and their enforcement, security, privacy, intellectual property rights, consumer protection, international legal issues and e-business regulation. Specific legal topics include: a). Copyright, trademark, and (to a lesser extent) patent issues (web development, content management). b). Contract law in the e-business context (formation, regulation, E-sign, UETA, UCITA, etc.) (B2B, B2C transactions, financial transactions). c). Online privacy law and privacy policies (marketing topics). d). DMCA, ACPA, ECAP and the Patriot Act, COPPA, e). Web site Terms of Use (web development). f). Web site affiliate agreements (web development). g). Web site development and maintenance agreements (web development). h). Web product distribution agreements. i). Shrinkwrap, clickwrap, and EDI agreements (B2B). j). Various IP-related licensing, confidentiality, development, and assignments, agreements, domain naming (Internet). Cross-listed as MIDS 438.

LAWS 440. International War Crimes Project (2)
Students in this unique course undertake legal research projects for the Office of the Prosecutor of the International Criminal Tribunal for the Former Yugoslavia and Rwanda related to issues pending before the Tribunal. The course sessions explore the establishment of the Tribunal, its jurisprudence, and its Rules of Procedure and Evidence. Grades are based on the quality of student papers and in-class presentation. After successfully completing the project, each participating student will receive a personalized letter of appreciation from the International Prosecutor.

LAWS 500. Supervised Research Seminar (1-2)
Second- and third-year students may earn graded credit for an individual research project of scholarly depth and scope, under the close supervision of a faculty member. Approval of the faculty supervisor is required before registration. No student may undertake more than two Supervised Research projects or earn more than a total of four hours of Supervised Research credit. No student may work on more than one Supervised Research project in one semester. May satisfy the writing requirement.

LAWS 508. ERISA (3)
This class will cover employee benefits law.

LAWS 509. Law of the Visual Arts (3)
This course deals with legal aspects of the world of visual arts. In particular, the course will explore art theft; plunder of art in times of war; governmental regulations affecting the import and export of works of art; tax and estate planning issues for art collectors; artists' rights (including freedom of speech, moral rights, copyright, and resale royalty rights); and the problems art museums face in acquiring, exhibiting, and deaccessioning works of art. Several classes will examine works of art with particular relevance to the course. In addition, the CMAS Deputy Director of Development, its legal counsel, and the chairman of its board will talk about the myriad legal issues the CMA and its staff face on a daily basis.

LAWS 512. Tax Policy Seminar (3)
This advanced seminar for students interested in fundamental issues of tax policy and tax reform considers the favorable treatment of capital gains, the advisability of adopting a comprehensive tax base under a new definition of gross income, the use of tax incentives to achieve non-tax policy goals, and the basic system of taxing corporations and shareholders. May satisfy the writing requirement. Prereq: LAWS 211 and LAWS 206.

LAWS 524. Health Care Advanced Research Seminar (2)
Students will undertake significant research in health law, participating in group discussions to help refine each other's topics, identify research materials, and critique rough drafts. May satisfy the writing requirement. Prereq: LAWS 227 and permission of the instructor.

LAWS 537. Health Care Controversies (3)
The course is open to students in the schools of law, medicine, and management. Students will confront current controversies in law, bioethics, and health care policy, such as active euthanasia, discrimination in access to health care resources, social control of new genetic technologies, the relationship between patients and physicians in managed care, and policies on donation and allocation of transplant organs. Students often will work in interdisciplinary teams, and will have an opportunity to discuss the issues with outside experts, health care practitioners, and patients. Prereq: LAWS 227.

LAWS 550. Advanced Nonprofit Organizations Seminar (3)
In this seminar, students will explore selected topics related to structure, governance, tax exemption, and government oversight of nonprofit organizations. Class readings and discussions for the first several weeks will build on the basic understanding developed in LAWS 234, Law of Nonprofit Organizations. Topics will be selected to consider framework in context, using recent real-life case studies. Students will write a significant paper on a chosen topic and present it to the class. The course grade will be based on the paper, the presentation, and class participation. Paper may satisfy writing requirement. Prereq: LAWS 234.

LAWS 556. Judicial Externship Seminar (4)
Students in the spring of their first year are selected for summer externships with specific federal district and circuit judges. Classes in the spring of the first year, during the externship summer, and in the fall of the second year complement the eight weeks of externing in the judge's chamber. Prereq: Permission of the instructors.

LAWS 557. Genetics and Law (3)
The current federal Human Genome Project is attempting to understand the health and behavioral implications of the 50,000 to 100,000 genes in the human body. Genetic tests are being offered to let people
know if they are at risk of having a child with a genetic defect or if they will later in life suffer from cancer or other disease. Genetic predispositions are also being investigated for certain behaviors such as gay sexual preference, intelligence, and anti-social behavior. This course will cover the tort law, family law, constitutional law, criminal law, employment law, and insurance implications of developments in genetics.

LAWS 561. International Issues in Intellectual Property Seminar (3)  
This seminar will examine selected issues in comparative and international law affecting patents, copyrights, trademarks, and trade secrets. By looking at comparative systems, we will understand the differing philosophies underlying intellectual property in different legal cultures. By examining the movements to harmonize and unify national systems (looking at the process of harmonization, extraterritorial enforcement of rights, conflicts of law, and global protection), we will see how the different cultures are being merged. May satisfy the writing requirement. Prereq: LAWS 370.

LAWS 563. Biomedical Research Law and Policy (3)  
The 20th-century biomedical research revolution has generated many conflicts demanding legislative, judicial, and administrative action. This seminar will address some of the most pressing issues. Topics include: experimentation on human beings (ethical principles and regulatory system); issues raised by "research" (e.g., artificial heart); random clinical trials; research on children, elderly, and mentally disabled; research involving human fetuses and embryos; research on "neonates"; gender and racial bias in research; HIV research issues; use of Nazi and other "haunted" research data; experimentation on animals; scientific fraud and misconduct, and commercialization of biomedical research. May satisfy the writing requirement.

LAWS 569. Constitutional Law II Laboratory (2)  
Some students enrolled in Constitutional Law II (LAW 202) may enroll in this clinical or practicum seminar designed to expose them to many of the issues discussed in class as those issues arise in the context of legislative proposals and specific "client" complaints. The source of these issues will be the Ohio ACLU. Students will work in pairs and will be required to research and evaluate specific First Amendment issues, writing opinion letters, assisting in the preparation of briefs and pleadings in pending litigation, and evaluating the First Amendment consequences and implications of legislation introduced or proposed to be introduced in the Ohio General Assembly. Students need not be certified by the Ohio Supreme Court to practice as law students; second-year students may enroll. Coreq: LAWS 202.

LAWS 570. Foreign Graduate Seminar (2)  
This seminar is the required introductory course for foreign students enrolled in the Graduate Program in U.S. Legal Studies. It begins with a series of lectures introducing students to American legal education; American government, courts, and culture; various common law subjects; and professional responsibility. Throughout the year, seminar sessions are held with legal practitioners from law firms and corporations in the Cleveland area who are involved in an international practice. Limited to the foreign LL.M. students.

LAWS 571. Jurisprudence: Selected Problems (3)  
The seminar will explore classic jurisprudential questions using great works of literature as the vehicle through which the explorations will be made. The questions are: What is the nature of law? of justice? What is the nature of the obligation to obey or respect the law? Some of the texts which will be used include: "Antigone," "The Merchant of Venice," "Billy Budd," "Man for All Seasons," and "Judgment at Nuremberg."

LAWS 573. Vietnam War and the Law Seminar (3)  
This seminar explores the Vietnam War as a legal event. After an introduction to the history of the Vietnam War and U.S. involvement in Southeast Asia, we will examine several of the legal issues and events related to the war. Topics may include: the Vietnam War and international law; the Tonkin Gulf Resolution and the constitutionality of the war; extension of the war to Cambodia; selective service, draft evasion and resistance, desertion, and amnesty; GI rights, GI dissent, and the military justice system; My Lai, the rules of engagement, and America's conduct of the war; legal strategies of the anti-war movement; the Pentagon Papers case; and the legal legacies of the Vietnam War. May satisfy the writing requirement.

LAWS 574. Selected Topics on American Legal Professions (3)  
This seminar will consider the history, structure and demographics of the American legal profession. We will focus primarily on recent changes in the organization and operation of law practice and the effect of those trends on the delivery of legal services and the working lives of lawyers. Students will be required to write and present a substantial paper, which may satisfy the writing requirement. Grade is based on class participation, a presentation, and a paper.

LAWS 576. Advanced Evidence Seminar (3)  
Examines selected topics chosen by participants and approved by the instructor. Illustrative topic areas are rape shield laws, probabilistic evidence, toxic tort cases, rape prosecutions, junk science, the residual hearsay exception, use of social science research as evidence, and jury studies.

LAWS 587. Research Seminar in Taxation (2)  
An opportunity to undertake significant research and writing in taxation, with each student expected to complete a major paper and present that paper to the class. Grade is based on the paper and class participation. Prereq: LAWS 211.

LAWS 592. International Economic Integration (3)  
As countries open their economies to the world economy, new strains are placed on their legal systems. This course explores how legal systems adapt to open markets and free trade. Topics covered may include intellectual property, environmental, and labor laws. We will also examine specific countries' experiences (New Zealand, Chile, Mexico), the mechanisms for growing international trade agreements (expansion of NAFTA, for example), and methods of legal reform. May satisfy the writing requirement.

LAWS 595. American Contract Law (3)  
The subject matter and coverage of this course is approximately the same as the subject matter and coverage of first-year Contracts (LAW 123) as elaborated and modified to reflect that it (a) is limited to foreign students who are candidates for the LL.M. in U.S. Legal Studies and (b) consists of 3 (nor 5) credit hours.

LAWS 596. Social History of Crime Seminar (3)  
This course is designed to offer students a somewhat different optic on the way that law operates in society, different, that is, from the sense one might get from reading case books. Here our concern is with the meaning of law in the largest sense, not so much from the standpoint of legal doctrine, but in the sense of how it works as a system of power to advance certain interests in society at the expense of less powerful groups. By "social history" I refer to the study of ordinary people, as opposed to political leaders and rulers. Thus the course explores how the law played out in the lives of ordinary men and women during the period from the eighteenth century to the present. What is a crime? How have certain customary rights been criminalized and why? What are the ideological underpinnings of the law? These are some of the questions we will take up as we examine crime in Britain and the U.S. from a thematic perspective.

LAWS 599. Doing Business in the United States (3)  
The course is designed to introduce foreign students to many areas of U.S. domestic law through consideration of a transnational business transaction. Examples of areas of law covered: restrictions on foreign investment, regulatory agencies, banking and finance, importing and exporting, business entities, litigation and alternative dispute resolution, labor relations, immigration law, taxation. Limited to candidates for the LL.M. in the U.S. Legal Studies.

LAWS 712. The Picet Moot Court (1)  
The Picet Moot Court course provides one co-curricular credit for the work of the three students who have been selected to represent Case Law School in the annual Jean Picet International Humanitarian Law Moot Court Competition. Students must take International Humanitarian Law, as well as International Law, International Criminal Law, or International Human Rights as pre- or co-requisites.

LAWS 718. Health Matrix Seminar (2)  
The Health Matrix seminar will provide training in writing, editorial skills, and advanced legal research. Topics to be covered will include topic development, web-based research, advanced Westlaw and Lexis training, writing techniques, and plagiarism. 2L associates also will have responsibilities for journal production work, such as verifying footnotes.

LAWS 719. Health Matrix Seminar (1)  
The Health Matrix seminar will provide training in writing, editorial skills, and advanced legal research. Topics to be covered will include topic development, web-based research, advanced Westlaw and Lexis training, writing techniques, and plagiarism. 2L associates also will have responsibilities for journal production work, such as verifying footnotes.

LAWS 740. Journal of International Law Seminar (3)  
The seminar will provide training in writing, editorial skills, and advanced legal research for students writing notes for the Journal of International Law. Topics to be covered include plagiarism, selecting a topic, web-based research, advanced Lexis and Westlaw research, advanced research training in selected substantive areas, and writing techniques. Satisfactory completion of the note will satisfy the upper-level writing requirement. Grade is based on the quality of the note and class participation.

LAWS 745. Law Review Seminar (2)  
The seminar will provide training in writing, editorial skills, and advanced legal research for students writing notes for the Case Western Reserve Law Review. Topics to be covered include plagiarism, selecting a topic, web-based research, advanced Lexis and Westlaw research, advanced research training in selected substantive areas, and writing techniques. Satisfactory completion of the note will satisfy the upper-level writing requirement. Grade based on the quality of the note and class participation.

LAWS 746. Law Review Seminar (1)  
(See LAWS 745.)
This course will be the first Contemporary Issues in Law and Technology course. The course will be co-taught by Craig Nard and Declan McCullagh (LTA Fellow in Law and Technology and Washington Bureau Chief for Wired News). The course will cover (1) overview of principles of First Amendment analysis and its relationship with Internet and the Communications Decency Act; (2) filtering and private restrictions on Internet Speech; (3) threats and the compilation of personal information; and (4) tensions between the First Amendment and the Copyright clause in digital content.

LAW 801. Core Lawyering Skills - Part 1 (3)
This course is the first of a sequence of required courses in the CaseArc Program which trains students in the fundamental skills of practicing law. Students are introduced to the fundamentals of legal analysis and rhetoric beginning with objective written legal analysis. In addition, they receive instruction in manual and, to a limited extent, computerized legal research. Finally, students begin to develop the basic skills of interviewing, fact gathering and client counseling. The course is taught by a combination of classroom instruction, small group discussions and through performance and critique of simulation exercises. The goal is to integrate the learning and application of legal theory, doctrine and practice in an authentic manner. Students are assigned to an instructional team consisting of a doctrinal professor, a research, analysis and writing professor, a clinical professor, a skills professor and a librarian. The team coordinates the assignments and exercises so that students are provided a learning experience that combines lecture, discussion, and hands-on experience. Students must take this course in the fall semester of their first year.

LAW 802. Core Lawyering Skills - Part 2 (2)
This course is the second of the sequence of required courses in the CaseArc Program which trains students in the fundamental skills of practicing law. Students build on their learning in CORE 1 by confronting more complex and challenging problems. The format of the course and teaching methods are similar to CORE 1, but the writing component of the course shifts from the objective mode to the persuasive, and the research component incorporates electronic research in depth. In addition, the students learn more complex fact gathering, document analysis, and counseling. Finally, students are introduced to negotiation theory and technique and to the principles of effective oral presentation in formal and informal settings. Students must take this course in the spring semester of their first year. Prereq: LAWS 801.

LAW 803. Core Lawyering Skills - Part 3 (2)
This is the third of the required sequence of courses in which students are introduced to the fundamental skills of practicing law. Students build on their learning in CORE 1 and CORE 2 by applying the principles of legal research, analysis, writing, interviewing, counseling and negotiation in the transactional setting. Students also learn about the challenges of applying these lawyering skills in the representation of groups and entities. The format of the course and teaching methods are similar to CORE 1 and CORE 2. Students must take this course and Focused Problem Solving in their second year. They will be assigned one in the fall and the other in the spring. Prereq: LAWS 801 and LAWS 802.

LAW 804. Focused Problem Solving (2)
This is the fourth of the required sequence of courses in which students are introduced to the fundamental skills of practicing law. Students apply and expand the skills learned in CORE 1 and 2 in the context of a specific area of law. The overarching emphasis of the course is legal problem solving, and strategy formulation and implementation. Students will identify and evaluate options to solve specific legal problems, engage in fact gathering, develop strategies for accomplishing goals, interview and counsel clients, evaluate ends/means considerations, and depending on the type of problem, function in the litigation and/or transactional contexts. Students must take this course and CORE 3 in their second year. They will be assigned one in the fall and the other in the spring. Prereq: LAWS 801 and LAWS 802.

LLM 601. Basic Federal Income Tax (2)
The fundamental concepts of the current U.S. system. Gross income; deductions (personal and business); the computation of gains and losses; adjusted basis; basic tax accounting principles; time value of money considerations; and certain restrictions on loss deductions.

LLM 611. Corporate Tax I (2)
The tax consequences of the formation of the corporation; distributions of cash or property to shareholders; stock dividends; redemptions; and liquidations.

LLM 612. Corporate Tax II (2)
Corporate reorganizations, including acquisitive and divisive reorganizations; more details on the rules of Subchapter S. Prereq: LLM 611.

LLM 613. Income Tax Accounting (2)
The cash and accrual methods of accounting; inventory methods; constructive receipt issues; cash equivalents; the economic benefit: claim of right, and tax benefit rules; original issue discount; below-market loans; imputed interest.

LLM 614. Taxation of Property Transactions (2)
Gain or loss on the sale or exchange of property; the basis of property and adjustment to basis, including depreciation or amortization; the nonrecognition provisions (such as like-kind exchanges, the rollover of involuntary conversions, gain or loss on the sale of a residence); the passive activity loss rules; the at-risk rules; depreciation recapture; tax consequences to the debtor and creditor involved in the restructuring of debt.

LLM 617. Qualified Plans of Compensation I (2)
The requirements under the Internal Revenue Code of a qualified retirement plan, including the eligibility, vesting, funding, and participation requirements; defined benefit plans; defined contribution plans; and various provisions under ERISA.

LLM 619. International Aspects of U.S. Income Tax I (2)
The course develops the student's understanding of the basic concepts of international taxation by focusing on U.S. taxation of foreign corporations and individuals with U.S. activities. Topics include the source rules, determination and taxation of “effectively connected” income, withholding taxes, branch taxation, the special rules for foreign investment in U.S. real property, tax treaties, and foreign currency.

LLM 620. International Aspects of U.S. Income Tax II (2)
The course builds on the concepts developed in International Aspects of U.S. Income Tax I (LLM 619) and focuses on the U.S. taxation of the foreign activities of U.S. corporations and individuals. Topics include the foreign tax credit, subpart F and other “anti-deferral rules,” the taxation of transfers to foreign corporations, transfer pricing, and the individual foreign earned income exclusions. No prerequisite, but students with no experience in international tax who plan to take both I and II should take International Aspects of U.S. Income Tax I (LLM 619) first.

LLM 621. Basic Estate Planning (2)
The basic Internal Revenue Code provisions of the federal wealth transfer tax law. Topics include the gross estate; the marital deduction and other deductions; the taxable estate; gift taxes.

LLM 622. Advanced Estate Planning (2)
Estate planning techniques, including marital deduction planning; generation-skipping trusts; life insurance; estate planning regarding qualified retirement plans; estate freezes (Chapter 14 of the Internal Revenue Code); other planning opportunities. No prerequisite, but the student should have a basic understanding of federal wealth transfer taxes before taking this course.

LLM 623. State and Local Taxation (2)
In addition to constitutional issues, specific topics include income and franchise taxes; property taxes; sales and use taxes; value-added and single business tax issues. Research on state and local tax problems will be discussed.

LLM 627. Advanced Partnership Tax (1-2)

LLM 628. Partnership Tax (2)
The tax consequences of the formation of the partnership; the adjusted basis of a partner's interest; capital accounts; the receipt of a partnership interest in exchange for services; the allocation of profits and losses; partnership distributions; transfers of partnership assets and partnership interests; special rules pertaining to the death of a partner; special basis adjustments; the liquidation of a partner's interest; the liquidation of the partnership. The substantive law and the tax aspects of limited liability companies will be analyzed and discussed.

LLM 630. Income Taxation of Estates and Trusts (2)
An examination of the different types of trusts including grantor trusts, simple trusts and complex trusts; consideration of the tax treatment of estates; analysis of the concept of Distributable Net Income and its effect on trusts and their beneficiaries; analysis of the tax treatment of split-interest charitable trusts.

LLM 632. Tax Procedure and Research Methods (2)
The procedural provisions of the Internal Revenue Code, including the provisions governing the assessment and collection of taxes; the statute of limitations; petitions to the U.S. Tax Court; the mitigation provisions governing inconsistent positions; refunds; other similar matters. Instruction on research methods, including computer research. All participants are required to perform some legal research outside class.

LLM 634. Consolidated Tax Returns (2)
Topics include the affiliated group; the election to file and discontinuance filing consolidated returns; taxable years, income included in returns, and methods of accounting; consolidated taxable income; intercompany transactions, special limitations on deductions; net operating losses; excess loss accounts; intercompany distributions; the disposition of stock of a subsidiary.

LLM 638. Advanced Corporate Tax Problems (2)
A more detailed examination of corporate reorganizations (including original issue discount problems in recapitalizations), distributions, redemptions, liquidations, and S corporation taxation; personal holding
companies; accumulated earnings tax; collapsible corporations; the carryover of net operating losses and other tax attributes.

**LLM 640. Executive Compensation (Nonqualified Plans) (2)**
Incentive stock options; nonqualified stock options; restricted stock plans; constructive receipt problems; “Rabbi” trusts; stock appreciation rights plans; other nonqualified deferred compensation methods; golden parachutes; other compensation methods and techniques.

**LLM 645. Criminal Tax and Procedure (2)**
The course covers the various tax and tax-related crimes under the Internal Revenue Code and Titles 18 and 31 of the United States Code. These include tax evasion and false return charges, money laundering, and currency transaction crimes. In addition, students analyze the stages of a criminal tax investigation and prosecution in both non-grand jury and grand jury settings.

**LLM 648. Federal Taxation of Exempt Organizations (2)**
This course will cover the basics of the taxation of tax-exempt organizations, including the following topics: the requirements for tax-exempt status (the organizational and operational requirements); an analysis of the application for exemption process; unrelated business taxable income, private inurement, public and private foundation status, intermediate sanctions, and various other topics.
Since awarding the region’s first business degree in 1930, the Weatherhead School of Management’s spirit of innovation has been the driving force that has elevated the University’s management programs to national prominence. Among these innovations is the nation’s first Ph.D. program in operations research, one of the first academic divisions of management information systems, and the first integrated network of IBM personal computers for M.B.A. instruction.

The School of Management at Case Western Reserve University was created in 1967 through the federation of Western Reserve University and Case Institute of Technology. In 1980, in recognition of the support and achievements of Cleveland’s entrepreneurial Weatherhead family, the school was named the Weatherhead School of Management.

Today, the Weatherhead School offers academic programs leading to bachelor’s, master’s, and doctoral degrees, as well as certificate and executive education programs. Our students are an outstanding and diverse group, selected for their superb academic records, work experience and intellectual and personal attributes. This combination of excellence and diversity assures that the Weatherhead School will produce effective leaders for the regional, national and international business communities.

The Weatherhead School of Management has been fully accredited by AACSB International—The Association to Advance Collegiate Schools of Business since 1958.

MISSION

The Weatherhead School is an international center of management scholarship committed to preparing and enhancing organizational leadership. The School is dedicated to making discoveries of enduring consequence, to developing innovative educational programs, to fostering strategic partnerships with students and organizations, and to providing services to multiple communities. The School delivers measurable value to its constituencies through its scholarly commitment to discovery, learning, and service:

- Through the scholarship of discovery, we develop, integrate, and apply new ideas through traditional research and pioneering approaches that transcend conventional boundaries;
- Through the scholarship of learning, we create an environment in which students develop the knowledge and skills to be effective leaders in their professions and communities; and
- Through the scholarship of service, our faculty and students share their knowledge to achieve significant outcomes with partner organizations, our alumni, our community, and our world society.

VISION

The Weatherhead School of Management aspires to be the worldwide leader in developing an outcome orientation in its missions of discovery, learning and service, in achieving a consistent record of innovation, and in creating a learner-centered environment, emphasizing an active learning partnership among students, faculty, and organizations. Because of its distinctive record of achievement in these three areas, the school will be recognized by students and key external stakeholders academic colleagues, organizational leaders, and the larger community as one of the top management schools in the United States and in the world.

CORE VALUES

Five core values unite the faculty and staff of the Weatherhead School as management educators, scholars, and colleagues within the University community. These core values express the ethos of our School as well as our aspirations for its future. They guide us in our missions of discovery, learning, and service, and will be reflected in all of our efforts:

- We have an overriding scholarly commitment to create and share knowledge for the common good.
- We aspire to make contributions of enduring consequence. We continually strive for outcomes that influence and ultimately change the way people think and act.
- We believe management should be a noble profession, committed to the enhancement of human life, to innovation, to leadership and to the creation of healthy organizations.
- We value a diverse community, characterized by open dialogue and mutual respect among individuals with different specializations, backgrounds, cultures and perspectives.
- We are a learning organization, valuing the abilities to reflect upon and alter assumptions and to pioneer in unexplored territory. We are committed to increasing individual creative capacities, nurturing new and expansive patterns of thought, achieving collective aspirations, and encouraging lifelong learning.
ACADEMIC DEGREE PROGRAMS

Undergraduate Programs
Degrees granted by the Weatherhead School of Management
- Bachelor of Science in Accounting
- Bachelor of Science in Management
- Bachelor of Arts in Economics (awarded by the College of Arts and Sciences)

Professional Programs
Degrees granted by the Weatherhead School of Management
- Master of Accountancy
- Master of Business Administration (M.B.A.)
- Executive M.B.A.
- Master of Science in Management - Operations Research
- Master of Science in Management - Supply Chain
- M.S. in Positive Organization Development and Change (new program; see page @@)
- Executive Doctor of Management (E.D.M.)
- Master of Nonprofit Organizations (M.N.O.) (granted jointly by the Weatherhead School of Management and the Mandel School of Applied Social Sciences)

Joint Degree Programs
(Degrees granted by the Weatherhead School and other schools of the University)
- B.S. in Mathematics/M.S. in Management
- J.D./M.B.A.
- M.N.O./J.D.
- M.N.O./M.S. in Social Administration
- M.N.O./M.A. in Music History
- M.S. in Management/M.B.A.
- M.S. in Nursing/M.B.A.
- M.B.A./M.S. in Social Administration
- M.B.A./Master of International Management (Joint degree awarded by the Weatherhead School and the American International Graduate School of Management (Thunderbird))
- M.Acct./M.B.A.
- M.D./M.B.A.
- Master of Engineering and Management (degree conferred jointly by the Case School of Engineering and the Weatherhead School)
- Master of Public Health/MBA

GRADUATE PROGRAMS
Degrees granted by the University’s School of Graduate Studies
- Ph.D. in Management
- Ph.D. in Operations Research
- Ph.D. in Organizational Behavior

NON-DEGREE CERTIFICATE PROGRAMS
- Certificate in Entrepreneurship
- Certificate in Health Systems Management
- Certificate in Management Information Systems
- Certificate in Nonprofit Management
- Certificate in Operations

ADMINISTRATION
Gerald Korngold
Acting Interim Dean and Dean of the School of Law
Myron J. Roomkin
Dean Designate of the Weatherhead School of Management (appointment effective November 1, 2004)
John Aram
Director, Executive Doctor of Management
Deborah L. Bibb
Director, Career and Student Life
Barbara J. Bolek
Director, Health Systems Management Center
Kevin Carduff
Director, Undergraduate Program Services
Bo A.V. Carlsson
Director of Ph.D. Programs and Research

Frances B. Cort
Assistant Dean for Professional and International Programs
Christine Gill
Director, Marketing and Admissions for M.B.A. Programs
Robert J. Bricker
Associate Dean for Graduate Programs
Marian J. Hogue
Assistant Dean for Academic Affairs
James Hurley
Director, Undergraduate Support Services
Mindy Kannard
Director, Employer Cultivation
Gary J. Previts
Associate Dean for Undergraduate and Integrated Studies Programs
N. Mohan Reddy
Acting Director, Executive M.B.A. Program
J. B. Silvers
Associate Dean for Resource Management and Planning
Peggy Sobul
Director, Alumni Affairs
Ellen Brooks Van Oosten
Assistant Dean and Executive Director, Lifelong Learning
Betty Vandenbosch
Associate Dean for Executive Education Programs

EMERITI FACULTY
Theodore M. Alford
Professor Emeritus of Management Policy and Dean Emeritus, Weatherhead School of Management
Julio N. Berretttoni
Professor Emeritus of Operations Research
David A. Bowers
Professor Emeritus of Banking and Finance
K. Laurence Chang
Associate Professor Emeritus of Economics
Hamilton Emmons
Professor Emeritus of Operations
Miles Kennedy
Associate Professor Emeritus of Information Systems
Lucille Mayne
Professor Emeritus of Banking and Finance
Thomas F. Morrissey
Professor Emeritus of Banking and Finance
Weatherhead Degree Programs

Undergraduate Programs

BACHELOR OF SCIENCE IN ACCOUNTING

The importance of accountancy to business, government, and society is well recognized. Like the professions of architecture, law, engineering, and medicine, accountancy demands of its students both a high degree of technical training, a broad knowledge of the fundamentals of economics and business, and a commitment to public well being. Career opportunities in accounting include the public, corporate, government, nonprofit and health care sectors. The undergraduate program in accountancy is designed to prepare students for entrance into these careers and to provide a foundation for the examination to become a Certified Public Accountant (CPA) or to achieve other professional certifications.

As part of the sequence of courses leading to the Bachelor of Science degree in Accounting offered through the Weatherhead School of Management, the student takes required and elective courses in related fields of banking and finance, economics, marketing, organizational behavior, management information decision systems, management policy, and operations.

Nine semester hours of accountancy taken at another accredited institution may be considered in transfer toward the Bachelor of Science degree in Accounting. Transfer credit for courses beyond introductory accountancy (six semester hours) must be approved by the Department of Accountancy.

- Introductory Accounting may be taken the first year
- Accounting majors may not take Weatherhead classes on a pass/no-pass basis

BACHELOR OF ARTS IN ECONOMICS (COLLEGE OF ARTS AND SCIENCES)

Economics is concerned with the problems of allocating scarce resources to meet human needs. Students who study economics gain an understanding of how consumers (households), producers (firms), and governments make decisions affecting the allocation of resources and, therefore, a society's economic performance. Economics also involves an ex-

<table>
<thead>
<tr>
<th>FALL SEMESTER</th>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 125</td>
<td>Calculus I ..........................................</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 150</td>
<td>Expository Writing ..................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Natural Science ....................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>History/Philosophy/Religion ....................</td>
<td>3</td>
</tr>
<tr>
<td>PSCL 101 or</td>
<td>Psychology or Sociology ..........................</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 112</td>
<td>Sociology .............................................</td>
<td>3</td>
</tr>
<tr>
<td>PHED</td>
<td>Physical Education ..................................</td>
<td>0</td>
</tr>
<tr>
<td><strong>First Semester Credits........................................16</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCT 101</td>
<td>Intro. To Fin. Accounting .........................</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 250</td>
<td>Managing Orgs and People I ........................</td>
<td>3</td>
</tr>
<tr>
<td>STAT 207</td>
<td>Business Statistics ..................................</td>
<td>3</td>
</tr>
<tr>
<td>ECON 102</td>
<td>Microeconomics ......................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective ..................................</td>
<td>3</td>
</tr>
<tr>
<td><strong>Third Semester Credits.......................................15</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCT 300</td>
<td>Corporate Reporting I ................................</td>
<td>3</td>
</tr>
<tr>
<td>BAFI 355</td>
<td>Corporate Finance ...................................</td>
<td>3</td>
</tr>
<tr>
<td>BLAW 331</td>
<td>Business Law .........................................</td>
<td>3</td>
</tr>
<tr>
<td>MIDS 301</td>
<td>Information Systems ..................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective ..................................</td>
<td>3</td>
</tr>
<tr>
<td><strong>Fifth Semester Credits......................................15</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCT 314</td>
<td>Auditing and Attestation ............................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Research and Communication .........................</td>
<td>1</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective ..................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .......................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .......................................</td>
<td>3</td>
</tr>
<tr>
<td><strong>Seventh Semester Credits....................................16</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SPRING SEMESTER</th>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 126</td>
<td>Calculus .............................................</td>
<td>4</td>
</tr>
<tr>
<td>***</td>
<td>Global &amp; Cultural Diversity .....................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Natural Science or Science/Society .............</td>
<td>3</td>
</tr>
<tr>
<td>COSI 100 or</td>
<td>Science or Communications .......................</td>
<td>3</td>
</tr>
<tr>
<td>PHED</td>
<td>Physical Education ..................................</td>
<td>0</td>
</tr>
<tr>
<td><strong>Second Semester Credits........................................16</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCT 202</td>
<td>Management Accounting .............................</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 251</td>
<td>Managing Orgs and People II ......................</td>
<td>3</td>
</tr>
<tr>
<td>ECON 103</td>
<td>Macroeconomics .....................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Arts &amp; Humanities sequence ........................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective ..................................</td>
<td>3</td>
</tr>
<tr>
<td><strong>Fourth Semester Credits......................................15</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACCT 301</td>
<td>Corporate Reporting II .............................</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 305</td>
<td>Federal Income Taxation ...........................</td>
<td>3</td>
</tr>
<tr>
<td>OPRE 301</td>
<td>Operations ............................................</td>
<td>3</td>
</tr>
<tr>
<td>MKMR 301</td>
<td>Marketing Management ................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Research and Communication .......................</td>
<td>1</td>
</tr>
<tr>
<td><strong>Sixth Semester Credits........................................16</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PLCY 399</td>
<td>Management Policy ...................................</td>
<td>3</td>
</tr>
<tr>
<td>ACCT 304</td>
<td>Advanced Accounting ..................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Research and Communication .......................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .......................................</td>
<td>3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .......................................</td>
<td>3</td>
</tr>
<tr>
<td><strong>Eighth Semester Credits......................................13</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
amination of how the interaction of these decisions in markets and in the political process produces certain outcomes and how legal and institutional arrangements can influence these outcomes. Finally, the study of economics leads to a better appreciation of the ways in which trade, investment, and the movement of people and information across national boundaries tie the global economy together.

An undergraduate major in economics provides an excellent preparation for a variety of professional careers, such as management, law, and government service. A major is essential for those wanting to pursue graduate work in economics.

**Major (for B.A. degree)**

A major in economics consists of 33 hours, with a minimum of 27 hours of economics courses. It leads to the Bachelor of Arts degree.

**Degree Requirements**

**Core Theory**

ECON 102 and 103  
STAT 201 or STAT 207  
ECON 307  
ECON 308 or 309  
ECON 326

**Electives**

12 ECON credits (at least 6 credits in each of two concentrations)

**Senior Capstone**

Required, to be chosen from a menu of options and in coordination with your major advisor

**Economics Concentrations**

**Resources & Markets**

ECON 255 - Economic History of the United States  
ECON 332 - Economics of Labor Markets  
ECON 341 - Banking and Finance  
ECON 368 - Environmental Economics  
Industrial Organization  
ECON 328 - Experimental Economics  
ECON 329 - Game Theory  
ECON 361 - Managerial Economics  
ECON 369 - Economics of Technological Innovation

**Public Economics**

ECON 342 - Public Finance  
ECON 343 - Economics of State and Local Governments  
ECON 345 - Public Choice  
ECON 377 - Economics of Nonprofit Organizations  
ECON 378 - Health Care Economics  
ECON 386 - Urban Economics

**International Economics**

ECON 372 - International Finance  
ECON 373 - International Trade  
ECON 375 - Economics of Developing Countries

**Minor (for B.A. or B.S. degree)**

A minor in economics consists of 15 hours, as follows:  
ECON 102, ECON 103, and three additional economics courses (9 hours) selected in consultation with the minor advisor, with at least two of the courses in one concentration.

**Social Science Sequence (for B.S. based upon Engineering Core Curriculum)**

The sequence requirement is satisfied by taking ECON 102, ECON 103, and one other 200- or 300-level ECON course.

**Social Sciences/Social Institutions Requirement (for B.A. or B.S. degree based on Arts and Sciences General Education Requirements)**

The three-credit minimum may be satisfied by taking any one of the courses below. The six-credit sequence may be satisfied by taking any two of the courses listed below:  
ECON 102, ECON 103, or ECON 205.

**BACHELOR OF SCIENCE IN MANAGEMENT**

A graduate of the Bachelor of Science in Management program obtains a broad education within a scientific framework that enables him or her to bring an unusual degree of analytical capability to the problems of management and business. To respond to students’ interests and goals, elective sequences are offered, leading to careers in information systems and finance. Each student consults with an advisor in the Office of Undergraduate Services at the Weatherhead School.

**Management Concentrations (B.S.)**

**Concentration I: Finance (15 hours)**

**Required:**

- BAFI 356 - Investments  
- BAFI 359 - Intermediate Corporate Finance  
- BAFI 372 - International Finance  
Choose (2) elective courses from:  
- BAFI 357 - Financial Modeling, Analysis & Decision  
- ACCT 300 - Corporate Reporting I

**Concentration II: Information Systems (15 hours)**

**Required:**

- MIDS 326 - System Design & Analysis  
- MIDS 327 - Database Management  
- MIDS 385 - Web Systems Integration

**Choose (2) elective courses from:**

- MIDS 307 - Computer Programming & Problem Solving with JAVA  
- MIDS 310 - Technology of Information Systems  
- MIDS 315 - Multimedia Systems  
- Approved EECS course

**Notes about the Weatherhead Curriculum**

- Introductory Accounting may be taken the first year  
- Management majors may not take Weatherhead classes on a pass/no-pass basis

**Minor Areas of Concentration**

**Accounting Minor**

ACCT 101, 202, 300  
At least two additional 300-level courses approved by the Department of Accountancy  
Total hours required: 15

**Banking and Finance Minor**

Total Hours Required (15 hours)

Requirements:

1. Required courses (9 hours)
   a. BAFI 355
2. One of the following courses (3 hours):
   a. BAFI 341
   b. BAFI 359
3. Any one of the following courses (3 hours):
   a. ACCT 300
   b. ECON 326
   c. ENTP 310
   d. BAFI/ECON 342
   e. BAFI/ECON 372

**Information Systems Minor**

Total hours required: 15

Requirements:
1. One of either ENGR 131 or MIDS 307.
2. MIDS 301 and three additional MIDS or other courses as approved by the Minor advisor.

---

**Entrepreneurial Studies Minor**

Total hours required: 15

Requirements:
One of either ACCT 202 or ACCT 303
MKMR 301
ENTP 301, 310, and 311

---

**Other Minors**

Consult Weatherhead Office of Undergraduate Services in the Weatherhead School of Management.

---

**INTEGRATED STUDY PROGRAM**

Highly qualified students who are candidates for either the B.S. in Accounting or the B.S. in Management may be eligible to accelerate their programs toward completion of the Master of Accountancy (M.Acc.). Because of this acceleration opportunity, successful candidates are able to complete their graduate programs of study in two semesters after completing their undergraduate requirements.

---

**BACHELOR OF SCIENCE IN MANAGEMENT**

<table>
<thead>
<tr>
<th>Fall Semester</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 125</td>
<td>Calculus I .................................................. 4</td>
</tr>
<tr>
<td>ENGL 150</td>
<td>Expository Writing ........................................ 3</td>
</tr>
<tr>
<td>***</td>
<td>Natural Science ................................................ 3</td>
</tr>
<tr>
<td>***</td>
<td>History/Philosophy/Religion ............................. 3</td>
</tr>
<tr>
<td>***</td>
<td>Human Behavior and Development ....................... 3</td>
</tr>
<tr>
<td>PHED</td>
<td>Physical Education ......................................... 0</td>
</tr>
<tr>
<td><strong>First Semester Credits</strong></td>
<td>16</td>
</tr>
<tr>
<td>ACCT 101</td>
<td>Intro. To Fin. Accounting ................................ 3</td>
</tr>
<tr>
<td>MGMT 250</td>
<td>Managing Orgs and People ................................ 3</td>
</tr>
<tr>
<td>STAT 207</td>
<td>Business Statistics .......................................... 3</td>
</tr>
<tr>
<td>ECON 102</td>
<td>Microeconomics ............................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective .......................................... 3</td>
</tr>
<tr>
<td><strong>Third Semester Credits</strong></td>
<td>15</td>
</tr>
<tr>
<td>ECON 326</td>
<td>Econometrics .................................................... 3</td>
</tr>
<tr>
<td>BAFI 355</td>
<td>Corporate Finance ............................................. 3</td>
</tr>
<tr>
<td>ENTP 301</td>
<td>Entrepreneurial Strategy .................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .................................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .................................................... 3</td>
</tr>
<tr>
<td><strong>Fifth Semester Credits</strong></td>
<td>15</td>
</tr>
<tr>
<td>***</td>
<td>WSOM Concentration .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>WSOM Concentration .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Research and Communication ................................ 1</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .................................................... 3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring Semester</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 126</td>
<td>Calculus ..................................................... 4</td>
</tr>
<tr>
<td>***</td>
<td>Global &amp; Cultural Diversity .......................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Natural Science or Science/Society ............... 3</td>
</tr>
<tr>
<td>***</td>
<td>The Arts ...................................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Literature/Language ...................................... 3</td>
</tr>
<tr>
<td>PHED</td>
<td>Physical Education ......................................... 0</td>
</tr>
<tr>
<td><strong>Second Semester Credits</strong></td>
<td>16</td>
</tr>
<tr>
<td>ACCT 202</td>
<td>Management Accounting .................................... 3</td>
</tr>
<tr>
<td>MGMT 251</td>
<td>Managing Orgs and People II ........................... 3</td>
</tr>
<tr>
<td>ECON 103</td>
<td>Macroeconomics .............................................. 3</td>
</tr>
<tr>
<td>***</td>
<td>Arts &amp; Humanities sequence ............................ 3</td>
</tr>
<tr>
<td>***</td>
<td>Non-WSOM elective .......................................... 3</td>
</tr>
<tr>
<td><strong>Fourth Semester Credits</strong></td>
<td>15</td>
</tr>
<tr>
<td>MIDS 301</td>
<td>Information Systems ........................................ 3</td>
</tr>
<tr>
<td>OPRE 301</td>
<td>Operations ...................................................... 3</td>
</tr>
<tr>
<td>MKMR 301</td>
<td>Marketing Management ...................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Research and Communication ............................ 1</td>
</tr>
<tr>
<td>***</td>
<td>WSOM Concentration .......................................... 3</td>
</tr>
<tr>
<td><strong>Sixth Semester Credits</strong></td>
<td>16</td>
</tr>
<tr>
<td>PLCY 399</td>
<td>Management Policy .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>WSOM Concentration .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>WSOM Concentration .......................................... 3</td>
</tr>
<tr>
<td>***</td>
<td>Research and Communication ............................ 1</td>
</tr>
<tr>
<td>***</td>
<td>Open elective .................................................... 3</td>
</tr>
</tbody>
</table>

Highly qualified students who are candidates for the B.S. in Accounting may be eligible to accelerate their programs toward completion of the Master of Accountancy (M.Acc.). Because of this acceleration opportunity, successful candidates are able to complete their graduate programs of study in two semesters after completing their undergraduate requirements.
Accountancy (M.Acc.). Because of this acceleration opportunity, successful candidates are able to complete their graduate programs of study in two semesters after completing their undergraduate requirements.

Joint B.S./Master of Accountancy (M.Acc.)

This program allows students to begin graduate course work while studying for the award of their undergraduate accounting degree. Undergraduate accounting majors accepted for this opportunity will be permitted to enroll for 6 credit hours of Weatherhead School graduate courses during the senior year. These hours will also be part of the undergraduate elective requirements and will count toward the satisfaction of the M.Acc degree program requirements, reducing the graduate program requirements from 36 to 30 hours.

Before taking graduate course work, the student must have completed all prerequisites for the course on the undergraduate level and have a “B” average in those prerequisites. Students will complete and be awarded their Bachelor of Science in Accounting prior to their Master’s program.

Accelerated B.S./Master of Accountancy (M.Acc.)

This program allows motivated students to accelerate their pursuit of both the B.S. and M.Acc. degrees. In addition to applying six credit hours of Weatherhead graduate course work towards their undergraduate degree program, students in this program may begin taking additional graduate course work before completing their undergraduate degree requirements. To enroll in this program, students must have:

- Completed 90 hours of undergraduate course work
- Completed all of the undergraduate Weatherhead General Education Requirements
- Completed 36 hours of the Weatherhead Management requirements (including 12 hours of the required Accountancy course work)
- Achieved at least a 3.0 overall GPA

Students in this program will receive both the B.S and the Master's degree at the end of the program. For the first eight semesters of study, the student will register as undergraduates in Case Western Reserve University; thereafter, students will register in the graduate professional degree program in the Weatherhead School of Management.

Application to either Integrated Study program in Accountancy should be made in the junior year to the Director of the Master of Accountancy Program. Also, the GMAT (Graduate Management Admission Test) should be completed during the junior year. Students in the Accelerated Program should design a comprehensive study plan of course work with the Coordinator for Integrated Studies.

Professional Practicum

The primary goal of this active learning experience is the intellectual, personal and professional growth of the student in an area related to the student’s academic goals. Students develop new skills and gain insights into their career and academic goals. The Practicum should provide the students with new skills, insights, and experiences that are transferable to the academic setting. A practicum is a planned, structured, and supervised workplace experience at an approved “site” organization.

The Practicum is an experiential learning arrangement between the student, the employer and the practicum advisor in conjunction with the Career Center. Employers provide appropriate supervision and work related learning. The practicum advisor guides and evaluates the student’s experience. All Practica developed through Career Center must be taken for transcript notation and have a faculty member serve as a Practicum Advisor. If a student elects to work in an internship/practicum without enrolling in the course for academic notation, they will not have the benefits of a full-time student status nor do they represent the Practicum Program in any official capacity.

Program Requirements

The Practicum Program is administered by the Career Center in collaboration with the Weatherhead School of Management. To be eligible, a student must have completed 60 credit-hours prior to the start of the work assignment, must be enrolled as a full-time student, and must be in good academic standing. To participate in the program, students apply to the Career Center in the semester preceding the work assignment. A student may participate in up to two practica but must spend at least one intervening semester on campus.

(See course descriptions listed other Management Courses near the end of the Weatherhead School section of this Bulletin.)

The M.B.A. Program

The Weatherhead School of Management’s innovative M.B.A. program is based on the underlying philosophy that our graduates must create value for organizations and society. The Weatherhead M.B.A. curriculum emphasizes the assessment and development of management skills along with knowledge of the functional areas of business and offers a liberalizing experience through exploration of the diverse contexts of management.

In 1997, the Weatherhead School introduced a new, integrated core curriculum, which will enhance the potential of each student to create value by:

- drawing from different perspectives to identify, analyze, and resolve complex problems;
- being creative and agile in designing systems and adapting to change;
- developing and enhancing organizational leadership;
- making a personal commitment to life-long learning;
- adding value in a special area of expertise;
• contributing to the betterment of communities and society.

M.B.A. PROGRAM STRUCTURE

The full-time M.B.A. is delivered as a 63-hour program for candidates with diverse academic backgrounds and as a 47-hour program for students with undergraduate business degrees from U.S. universities or the equivalent. Evening and Saturday part-time instruction is available as a 48-hour program for candidates with diverse academic backgrounds and as a 42-hour program for students with undergraduate business degrees from U.S. universities (or the equivalent). The M.B.A. program is divided into the core curriculum and the elective sequence. See the Departmental Course Offerings section for detailed course descriptions.

FULL-TIME M.B.A. PROGRAM

63-Hour Curriculum

Core Courses: 33 hours

The incoming full-time M.B.A. class entering the program in Fall 2004 may elect to take a waiver exam to exempt from one or more core courses in the program if they have completed equivalent coursework in another degree program. Passing the waiver exam does not shorten the program, but allows students to replace the core course with an elective. The only courses that are not waivable are MBAC 410 and MBAC 411. MBAC 410: Leadership Assessment and Development I (2)
MBAC 410L: Team Development Lab (.5)
MBAC 411: Strategic Issues and Applications I (2.5)
MBAC 412: Management and Career Skills I (.5)
MBAC 413: Human Value in Organizations (2.5)
MBAC 413L: Negotiations Lab (.5)
MBAC 414: Statistics and Decision Models (2.5)
MBAC 415: Financial Reporting and Control (2.5)
MBAC 416: Financial Management (2.5)
MBAC 423: Information Design and Management (2.5)
MBAC 424: Marketing (2.5)
MBAC 425: Operations Management (2.5)
MBAC 426: Economics (2.5)
MBAC 440: Leadership Assessment and Development I (2)
MBAC 498: Action Learning Consulting Course (6)

47-Hour Curriculum

Core Courses: 17 hours

Because of the integrative nature of the full-time core, no courses may be waived, regardless of undergraduate equivalent courses.
MBAC 410: Leadership Assessment and Development I (2)
MBAC 410L: Team Skills Lab (1)
MBAC 411: Strategic Issues and Applications (3)
MBAC 412: Management and Career Skills (1)
MBAC 413: Human Value in Organizations (1)
MBAC 413L: Negotiations Lab (1)
MBAC 414: Statistics and Decision Models (1)
MBAC 415: Financial Reporting and Control (1)
MBAC 416: Financial Management (1)
MBAC 423: Information Design and Management (1)
MBAC 424: Marketing (1)
MBAC 425: Operations Management (1)
MBAC 426: Economics (1)
MBAC 440: Leadership Assessment and Development II (1)

Advanced Electives: 24 credits

CONCENTRATIONS

A concentration is not necessary to complete degree requirements. Some students, however, may wish to pursue a concentration. More detailed information about concentrations is available at www.weatherhead.case.edu.

Independent Study

M.B.A. students are limited to six hours of elective credit as independent study. Other courses at the University may be eligible for M.B.A. elective credit. Contact the registrar for additional information.

Non-Credit Supplemental Instruction in Computer Familiarization

The Weatherhead School offers noncredit supplemental instruction to M.B.A. students in computer familiarization.

Statistics, Accounting and Finance Preparation Workshops

All admitted students in the 63-hour curriculum who do not have an academic or employment background in these areas are strongly encouraged to attend the appropriate workshop, in advance of starting the M.B.A. program. The workshops are offered during the two weeks before the start of full-time orientation in August.

There is a cost of $400 to attend all three workshops. See the new student website for individual workshop costs.

EVENING M.B.A. PROGRAM

The Evening and Saturday M.B.A. programs are designed for qualified students who wish to pursue their graduate management education while employed. The majority of these students work full-time for organizations in the Cleveland area. The same full-time faculty teach both evening and daytime classes. The full-time, evening, and Saturday programs have the same admission standards, and all are accredited by the AACSB.

Evening and Saturday instruction is available as a 48-hour program for candidates with diverse academic backgrounds and as a 42-hour program for students with undergraduate business degrees from a U.S. institution. With one “overload” semester, the 48-credit hour program can be completed in three years. With two overload semesters, the 42-hour program can be completed in two years. Both the 48- and 42-hour programs can be completed in the Saturday program within 21 months.

Evening 48-hour Curriculum

Students who have completed undergraduate equivalent course work of one or more of the following M.B.A. core courses may substitute an elective for the
course. Substitution of four or more electives will qualify students for the 42-credit track (see next section). 
MGMT 413: Human Value in Organizations (3) 
QUMM 414: Statistics and Decision Models (3) 
ACCT 401: Financial Reporting and Control (3) 
BAFI 402: Financial Management (3) 
MIDS 409: Information Design and Management (3) 
MKMR 403: Marketing (3) 
OPMT 405: Operations Management (3) 
ECON 403: Economics (3) 

Evening 42-hour Curriculum Core Courses:

Students with undergraduate business degrees who can waive from or replace four or more courses from the list above are eligible for the 42-credit track. The following two courses are not waivable or replaceable under any circumstances.
MGMT 403: Leadership Assessment and Development
MGMT 499: Strategic Issues and Applications (3)

Evening Advanced Electives: (credit hours vary by core curriculum decisions)

There are no requirements to achieve a concentration to complete degree requirements. For more information about choosing a concentration please refer to the section describing concentrations in the full-time program description.

EXECUTIVE MASTER OF BUSINESS ADMINISTRATION

The Executive Master of Business Administration (E.M.B.A.) program, a two-year, five-semester program, is specifically designed to provide experienced managers with the knowledge, skills and perspective required for expanded general management and executive responsibility. An applicant to the program must have 10 years of experience, 5 of those in a management capacity, company endorsement, and an in-person interview. The program is conducted every week in all-day sessions on alternating Fridays and Saturdays, plus three, 3-4 day off-site residencies and the 10-day international study tour. For more information call Jennie Lahman, Director, E.M.B.A program at 216-368-2554.

EXECUTIVE DOCTOR OF MANAGEMENT

The Executive Doctor of Management (E.D.M.) Program is an interdisciplinary, doctoral degree program designed specifically for experienced and practicing executives. The E.D.M. program focuses on the broad economic, political, social, and technological forces shaping contemporary institutions including business.
Qualifications for the E.D.M. Program include a master’s degree, at least 15 years of experience, including a minimum of 10 years in management positions, and a personal commitment to seeking a broader and deeper understanding of the global context of management today. For further details, a program brochure and information on applying to the E.D.M. Program contact Sue Nartker, Managing Director, at 216-368-2042.

Master of Accountancy

The Master of Accountancy is an integrative program, which builds directly upon the student's undergraduate education. Entering students must have an undergraduate degree in accountancy from an accredited U.S. program or the equivalent. Students who do not have an accountancy degree may still be admitted but will need to take courses to provide an appropriate foundation in business and accountancy. The program is normally 36 semester hours for those who have an undergraduate accountancy degree. Entering students without an accountancy degree will usually require an extended period of study in the program to meet prerequisites in the following areas:

- General Business. Business law, corporate finance, marketing, micro and macro economics, organizational behavior, operations management and statistics
- Accountancy. Principles, intermediate financial accounting, advanced financial accounting, managerial accountancy, U.S. taxation and auditing

The program is primarily designed for students interested in full-time study. Part-time students are also admitted, contingent upon their commitment to complete the program on a timely basis. Students may be admitted for study at the beginning of the Fall, Spring, or Summer terms, but it is generally advantageous to begin study in the Fall term. Some scholarships are available to exceptional applicants for the full-time program.

Undergraduate accountancy students at Case Western Reserve University are strongly advised to enter and complete the Master of Accountancy program in their fifth year. University policies permit such students an opportunity to complete the Master of Accountancy in 30 hours, rather than 36, if course selection is properly planned. Certain highly qualified Case Western Reserve University students in Accountancy may be eligible to accelerate their completion of the B.S. in Accountancy and the Master of Accountancy through the integrated studies program. This program allows such students to enroll as both an undergraduate and a graduate student during the senior year. Because of the necessity for proper planning of course work and programs, undergraduate students are strongly encouraged to apply for the Master of Accountancy in the junior year.

A typical 36-hour course of study for a student with an undergraduate accountancy background:

Accountancy Core (6 hours) 
ACCT 520 Advanced Financial Accountancy Theory (3) 
ACCT 540 Analysis of Contemporary Accountancy Issues (3)

Accountancy Electives (12 hours)

Students may choose any 12 hours from any graduate accountancy courses (excluding basic courses in the MBA core). A concentration is not required, but students may develop a concentration in
taxation, reporting and assurance services, or managerial accounting.

Supporting Electives (18 hours)

The electives allow students to develop a background in areas that complement and support careers in professional accountancy. Concentrations are not required, but students may choose concentrations in certain areas such as corporate finance, human resources, information systems, policy formulation, operations management, international management, and other areas. No more than 3 hours of accountancy course work may be taken as a supporting elective. Courses must be taken in at least two areas (not including accountancy). These electives may not include basic courses in the MBA core. Courses will be selected in consultation with the graduate program advisor.

Contact Professor Larry M. Parker, Director of the Master of Accountancy Program, for further information. (216) 368-2065; lmp3@case.edu

Master of Science in Management in Operations Research (M.S.M.-OR)

Operations research (or management science) uses mathematics, statistics, and computers to help managers make decisions regarding complex organizational problems. These types of problems arise in manufacturing and service companies as well as many other kinds of organizations. Decision problems may be solved by developing mathematical models of the problem, using a computer to obtain a solution, then validating that the solution can be implemented and performs as predicted by the model.

Purpose of the M.S.M.-OR

The purpose of the 36-credit-hour M.S.M.-OR Program is to train students in the techniques and applications of operations research and provides them with some basic understanding of business fundamentals in order to contribute value to organizations and communicate effectively with professionals in other business disciplines.

M.S.M.-OR Curriculum

Requirements for the M.S.M.-OR degree are typically completed in 18 months of full-time study. The program is available full-time or part-time. Contact the Department of Operations for more detailed information (216-368-3845) or e-mail at msm-oper@case.edu. Visit the Department website at http://weatherhead.case.edu/orom.

The M.S.M.-OR curriculum comprises three components: the Business Core, the Operations Research Core, and a Specialty Track.

Business Core (6 credit hours total):
The Business Core provides students with an introduction to the major principles and concepts of business operations. Business Core selections include Accounting, Economics, Finance, Information Systems, Marketing or Operations. The specific set of courses selected depends on the specialty track chosen.

Operations Research Core (18 credit hours total):
The Operations Research Core provides a solid grounding in the techniques of management science. Course requirements include:

Prerequisite Mathematics Courses (if needed)

Core Courses (1.5 credit hours each):

Specialty Track (12 credit hours total):
To obtain an in-depth, marketable set of skills in one area of concentration, students take a coherent sequence of courses in one of four tracks. Representative courses in the tracks include the following:

Operations Management

Finance

Information Systems

Master of Science in Management in Supply Chain (M.S.M.-SC)

Supply chain management deals with the coordination of all activities that impact a product flowing from its sources of raw materials to customers for the purpose of creating value in the end product. The product may be a physical good, a service,
an idea, information, or other entity that flows through a defined pipeline or channel.

Purpose of the M.S.M.-SC
The purpose of the 36-credit-hour M.S.M.-SC Program is to train students at the masters’ level in supply chain methods and concepts, business fundamentals, and quantitative techniques in order to be effective analysts in manufacturing and service companies.

M.S.M.-SC Curriculum
Requirements for the M.S.M.-SC degree may be completed in 18 months or less (one calendar year) by taking 6 credit hours in the Summer semester and 15 credit hours in both the Fall and Spring semesters. The program is available full-time or part-time. Contact the Department of Operations for more detailed information (216-368-3845) or e-mail at msm-oper@case.edu. Visit the Department website at http://weatherhead.case.edu/orom.

The M.S.M.-SC curriculum consists of two components: the Business Core and the Supply Chain Core.

Business Core (12 credit hours total):
The Business Core provides students with an introduction to the major principles and concepts of business operations. Subject areas addressed in the Business Core are Accounting, Finance, Marketing, and Operations.

Supply Chain Core (24 credit hours total):
The Supply Chain Core consists of the following quantitative and managerial courses:

Prerequisite Mathematics Courses (if needed)

Required Courses
Quantitative (1.5 credit hours each):
  - Linear Programming
  - Deterministic Models with Applications

Managerial (3 credit hours each):
  - Supply Chain Management
  - Logistics/Physical Distribution Management
  - Purchasing/Materials Management
  - Enterprise Resource Planning

Master of Science in Management in Information Science (M.S.M.-IS)
The M.S.M.-IS is offered currently as a joint program with the full-time M.B.A. degree. The joint M.S.M.-IS degree is 75 credits for students in the traditional four-semester M.B.A. Curriculum and 62 hours for students in the accelerated curriculum. Refer to the M.B.A. joint degree information for details.

Master of Science in Positive Organization Development and Change (MPOD)
(Pending Faculty Senate and Board approvals, expected by December 2004)

The Department of Organizational Behavior offers a 40 credit hour program extended over 16 months.

The primary learning format features include:
  - Five one-week residencies on campus
  - A 10-day international study tour (Residency 5)
  - An online conference/symposium

MPOD RESIDENCY SCHEDULE AND LEARNING MODULES

Residency 1: Foundations of Positive OD and Change
Major Topics:
  - Positive Organization Science
  - Introduction to Appreciative Inquiry (AI)
  - Transformational Leadership and Emotional Intelligence

Residency 2: Building Generative Relationships
Major Topics:
  - Interpersonal Effectiveness
  - Leading and Facilitating Extraordinary Teams
  - Practicum in AI

Residency 3: OD for Strategic Impact
Major Topics:
  - Systems Thinking and Strategy Development
  - Building the Sustainable Enterprise
  - Leading Whole-System Change

Residency 4: Organizing for a Knowledge World
Major Topics:
  - Designing and Intelligent Enterprise Consulting Skills for Strategic Impact
  - High Impact Coaching

Residency 5: Global Citizenship and Multicultural OD
Major Topics:
  - International Study Tour
  - Succeeding through Diverse Organizations
  - Business as an Agent for World Benefit

Residency 6: Leading and Organizing for the Future
Major Topics:
  - Lifelong Learning and Development
  - New Forms of Organizing
  - Integrative Action Learning

The six residencies will be connected via internet-mediated learning, fieldwork, and virtual conferencing.
For additional information contact: Ronald Fry, Faculty Director Department of Organizational Behavior Weatherhead School of Management Case Western Reserve University Cleveland, Ohio 44106-7235 (216) 368-2055

Master of Nonprofit Organizations (M.N.O.)

(Weatherhead School of Management and Mandel School of Applied Social Sciences)

The M.N.O. is an advanced professional degree offered through the Mandel Center for Nonprofit Organizations, a University-wide center for education, research, and community service. The Mandel Center is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law, and the College of Arts and Sciences.

The M.N.O. degree is a 60-credit-hour program, including 33 hours of required course work, 12 hours from a menu of “choice” courses, and an additional 15 hours of elective courses. Electives may be selected from either the “choice” courses or from an array of relevant courses offered by the University’s professional schools and the College of Arts and Sciences. Students may pursue the M.N.O. on a full- or part-time basis.

The Mandel Center also offers a 45-credit-hour Executive M.N.O. degree program option for candidates with demonstrably high potential as nonprofit leaders. Applicants to this program option should have ten years of professional and/or volunteer experience, five years of managerial and/or supervisory experience, and excellent academic qualifications. The foundation for this option is the curriculum of the 60-hour M.N.O. degree with an emphasis on the 33-credit “core” of the degree plus 12 credits of “choice” courses. For further information, contact the Mandel Center’s Director of Recruitment, Rebecca W. Zirm, J.D., at (216) 368-6025.

ADMISSION REQUIREMENTS

For additional information concerning the M.N.O. Program (including scholarship information), contact the Director of Recruitment at (216) 368-6025, by e-mail at admissions@mcno.case.edu, by mail at Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7167, or on the web at: www.case.edu/mandelcenter.

SCHOLARSHIP AID

The Mandel Center offers scholarship assistance based on need for the M.N.O. program.

ADVANCED STANDING FOR CERTIFICATE HOLDERS

If admitted to the M.N.O. program, students who have completed the Certificate in Nonprofit Management (CNM) may be eligible for advanced standing based on certificate course work completed with a grade of B or better.

WAIVER POLICY

A total of six credit hours are eligible for waiver, subject to the following requirements: courses to be waived must have been taken within the past five years and prior to admission to the M.N.O. program. A grade of B or above must have been earned from an accredited institution. Courses cannot be waived based on academic probation, and the final decision to waive rests with the instructor of the course. A waived course may shorten degree requirements.

TRANSFER CREDIT

Courses granted transfer credit must be approved as applicable to the M.N.O. program. Courses must be taken at an accredited institution. Satisfactory grades must be achieved. These grades are not counted in the cumulative grade point average. Transfer credit is limited to six credits.

SUBSTITUTION

An additional nine credits may be approved for substitute credit. Substitute courses replace required M.N.O. courses but do not reduce the total number of credits required to complete the program. Substitute courses must be selected and approved in accordance with a clearly defined written proposal consistent with the student’s interests/needs and the M.N.O. program mission.

RESIDENCY REQUIREMENT

Students must complete a minimum of 54 hours of course work in residence, through the Weatherhead School of Management, to be eligible to receive the M.N.O. degree.

REGISTRATION

Registration for M.N.O. and certificate programs is done through the Weatherhead School of Management. Refer to the section on Registration and Academic Information for information about course changes and withdrawals. For additional information about registration, contact the Mandel Center at (216) 368-8566.

RETENTION AND GRADUATION REQUIREMENTS

The retention requirements for continued study in the M.N.O. program are:

Minimum GPA after 15 credit hours of study: 2.5
Minimum GPA after 23 credit hours of study: 2.7
Minimum GPA after 30 credit hours of study: 3.0
Minimum GPA for graduation: 3.0

A student will be placed on academic probation after any semester in which the minimum GPA is not attained. A student on academic probation must achieve the
retention level in the next semester in which he or she registers.

NON-DEGREE STUDENTS

A maximum of two courses (six credits) from Mandel Center offerings may be taken by non-degree students. Non-degree students may be admitted through the Weatherhead School of Management on a space-available basis. Contact the Weatherhead School Admissions Officer at (216) 368-2030 for an application and additional information.

Joint Degree Programs

J.D./M.B.A.

The Weatherhead School of Management at Case Western Reserve University has a formal full-time joint degree program with the School of Law. Students enrolled in the program who fulfill the requirements set for graduation by both schools will receive both a J.D. and an M.B.A. degree.

Purpose

For those who wish to specialize in the governmental aspects of management, the M.B.A. and J.D. degree programs complement each other. J.D./M.B.A. graduates from Case Western Reserve have worked in the areas of labor law, tax law, health law, legal aspects of systems management, etc., for law firms, corporations, and government agencies. J.D./M.B.A.s often join entrepreneurial firms that are in special need of business and legal advice during the period of rapid organizational growth.

Program Structure

The Weatherhead School of Management offers two curriculum options for M.B.A. students: the accelerated, 11-month M.B.A. Program (for students with undergraduate business degrees); and the traditional, two-year M.B.A. program (for students with all other undergraduate degrees).

Students enrolled in the traditional M.B.A. Program may complete the three-year J.D. program and the two-year M.B.A. program in four academic years (including a 9-credit overload which can be taken during the academic year or during the summer semester). Students in the accelerated M.B.A. Program may complete the J.D./M.B.A. Program in 3 years, plus one semester. Joint degree candidates may start the J.D./M.B.A. program at either school.

The School of Law allows joint degree students to use 12 credit hours from the M.B.A. to fulfill both J.D. and M.B.A. requirements. The Weatherhead School allows joint degree students to use 12 credit hours from the School of Law to fulfill both M.B.A. and J.D. requirements. If J.D./M.B.A. students are enrolled in the accelerated MBA curriculum track, they may use 9 credit hours from the school of law and 12 hours from the school of management to fulfill both J.D. and M.B.A. requirements. This joint degree track may be completed in one summer and three academic years. Students must achieve a grade of C or better to receive double-credit for the courses. This reduces the total number of hours required for the two degrees by 24 credit hours (21 credits in the accelerated curriculum) if the residence requirement for each school is met.

Students in the joint program are encouraged, but not required, to make use of the summer programs of the two schools in planning their joint programs. (They may also opt for enrolling in overload courses during the fall or spring semesters.) The School of Law is a full-time day school with no evening division. Therefore, J.D./M.B.A. students may enroll only on a full-time basis, except during summer sessions.

Joint degree students must receive both the J.D. and the M.B.A. degrees simultaneously upon completion of degree requirements at both schools in order to receive the 24 or 21 hours cross-credits described above.

Admission to the J.D./M.B.A. Program

J.D./M.B.A. applicants must meet all of the admission requirements of both schools, including taking both the LSAT and the GMAT and completing separate applications to both schools (indicating in the section on both applications that they are applying for the J.D./M.B.A.) and paying both application fees. Students may defer the decision to apply to the J.D./M.B.A. program until after enrolling in either the M.B.A. or J.D. program provided that the application to the second school is received before the beginning of the third semester in either program. Normally, students are expected to take one full year of study in one program followed by one full year of study in the other. Students in the J.D. program may begin the M.B.A. after their second year of law school but will need to coordinate their programs carefully to insure that they can complete both degrees within the final two years. During the third and fourth years of the J.D./M.B.A., students combine courses in both schools each semester. Best J.D. contact for joint degree candidates: Andrew Morriss—368-3302. Best M.B.A. contact for joint degree candidates: Frances Cort—368-3315.

Registration

Throughout the joint degree program, J.D./M.B.A. students continue to register in the first school they attended. After completion of both degree programs, two separate transcripts and diplomas are awarded. Course work for both programs must be completed within six years of the date of initial enrollment in either program.

J.D./M.B.A. Curriculum Structure

For more information about the JD/MBA curriculum structure, please visit this website: http://www.weatherhead.cwru.edu/mba/ft_joint_jdmba.htm

M.D./M.B.A.

The M.D./M.B.A. degree was developed to respond to the growing need in the
medical and health care community for doctors who have management skills and knowledge.

Program Structure

In the M.D./M.B.A. Program, students may double count elective courses from the M.D. and reduce hours from the M.B.A., which shorten their M.B.A. degree by 12 credit hours. Students can complete the four-year M.D. degree and two-year M.B.A. degree in five years (including taking a course overload for four semesters. Students with an undergraduate degree in business may be eligible for the accelerated MBA curriculum track. Students in this track may complete their MD/MBA program in four academic years and one full-time summer.

Admission to the M.D./M.B.A. Program

M.D./M.B.A. applicants must meet all of the admission requirements of both schools, including taking both the MCAT and the GMAT and completing separate applications to both schools (indicating in the section on both applications that they are applying for the M.D./M.B.A.) and paying both application fees. Students may defer the decision to apply to the M.D./M.B.A. program until after enrolling in either the M.B.A. or M.D. program providing that the application to the second school is received before the beginning of the third semester in either program.

Regulation

M.D./M.B.A. students register at the medical school for all years except for the year (Year 1 or Year 3) and any summer session in which they take only M.B.A. courses. During these periods, M.D./M.B.A. students register and pay tuition at the WSOM.

Joint degree students must receive both the M.D. and the M.B.A. degrees simultaneously upon completion of degree requirements at both schools in order to receive the 12 hours of cross-credits described above.

If the M.D. is registering through the Medical School, WSOM will not charge for the semesters during which the students are taking one-two additional M.B.A. courses as an overload. During the summer—and when the student is taking a full-time course load at school—the student will register and pay tuition to WSOM.

Structure of the M.B.A. Curriculum in the M.D./M.B.A. Program

Please visit the M.D./M.B.A. website http://www.weatherhead.cwru.edu/mba/ft_joint_mdmba.htm for complete information about the joint degree curriculum structure.

The Health Care Certificate (5 courses, 15 credits) may be taken independently of the M.B.A. during the first two years of Medical School. Students wishing to pursue the M.B.A. later will be credited with 15 hours toward the degree. If a Medical School student begins as a student in the HSM Certificate Program and wishes to switch to the M.D./M.B.A. Program, all course work will transfer to the M.B.A. degree, as long as the student applies to the M.B.A. program within 6 academic years of enrolling in the certificate program.

For more information about the M.D./M.B.A. joint degree program, contact Frances Cort at 216-368-3315 or fxc@po.cwru.edu.

M.B.A./M.P.H.

Admission Requirements:

Students must meet all admission requirements for both the M.B.A. and M.P.H., including the GRE and GMAT tests.

Program Structure

The Weatherhead School awards the M.B.A. degree for 63 credit hours taken over 2 years. The School of Graduate Studies awards the M.P.H. degree for 36 credit hours over 2 years. Because of the complementary nature of both degrees, students who integrate the M.B.A./M.P.H. course work to complete the joint degree will be able to reduce the degree credits of the M.P.H. by 6 credits and the M.B.A. by 12 credits, without compromising the integrity of either degree. Joint degree candidates will count 6 credits from their 9 Health Care Concentration elective credits towards their M.P.H. degree, replacing 3 M.P.H. concentration curriculum credits and 3 elective credits. Conversely, 12 M.P.H. credits may be counted in fulfillment of M.B.A. electives. The total reduction of credit requirements for both degrees is reduced from 99 to 81 credits. Although the anticipated length of time to complete the dual degree is three years, some full-time M.P.H./M.B.A. students may be able to complete the joint degree in two or two and one-half years, including one or two summer sessions. Students completing the joint degree on a part-time basis may complete joint degree requirement in four to four-and-one-half years. M.B.A. course scheduling is flexible to accommodate day, evening, and full- and part-time students.

Graduation

Candidates must complete degree requirements for both degrees and both degrees will be conferred simultaneously as is required for all joint degrees offered by the Weatherhead School.

Curriculum Requirements

M.P.H. Courses

Core Curriculum (24 credits)

- Statistical Methods in Public Health
- Epidemiology Theory and Methods
- Health Management and Policy
- Environmental and Occupational Health
- Capstone Experience
- Public Health Capstone Seminar (6 credits – 4 semesters)

Total Credit Hours – 30

M.B.A. Courses

Core Curriculum (33 credits)

- Leadership Assessment and Development
THE M.S.S.A./M.B.A.

Program Objective

The M.S.S.A./M.B.A. joint degree program is designed for candidates who wish to prepare for advanced social work practice in a variety of clinical settings, while developing the skills to assume management responsibility in those organizations.

Admission Requirements

Candidates must apply separately to the M.S.S.A. program at the Mandel School of Applied Social Sciences and the M.B.A. program at the Weatherhead School of Management, and complete all application requirements of both schools, indicating on both applications their intent to join the joint degree program. Admission decisions are made independently by each school. After admission, each school will copy the other school on the admission decision. Candidates to the joint program will be expected to meet admission standards for academic records, test scores, and other criteria set by both schools. In addition, candidates must have completed a minimum of two years of full-time experience in a social service organization.

Program Structure

M.S.S.A./M.B.A. students may begin the joint degree in either school. Students will continue to register in the school at which they began the program, regardless of the school they are attending. When students have completed all degree requirements for both degrees, they will receive separate transcripts and diplomas for each degree.

Students in the joint M.B.A./M.S.S.A. degree program may begin their program at either MSASS or WSOM. Students who prefer to be considered for an internship between the first and second years of the program may prefer to begin the curriculum at WSOM.

For more information, please contact Frances Cort at 216-368-3315 or visit M.B.A./M.S.S.A. website: http://www.weatherhead.cwru.edu/mba/ft_joint_mbsamba.htm

Full-time Credit Requirements

There are 102 credits in the joint M.S.S.A./M.B.A. Program (51 credits at MSASS, 51 credits at WSOM), compared with 125 credits if both degrees were completed separately. By integrating the course work, completing some course work over the summer, and reducing the elective requirements in each program, joint degree students may complete the M.S.S.A./M.B.A. in three years, instead of the four years required if both degrees were to be completed separately. Students will be charged the MSASS tuition rate for all M.S.S.A. coursework and the WSOM tuition rate for all M.B.A. coursework.

M.B.A./M.S.M.-OR AND M.B.A./M.S.M.-SC

Contact the Operations Department at (216) 368-3845 or msm-oper@case.edu, for detailed information about the M.S.M. degrees offered through the Department of Operations or visit the Department website at http://weatherhead.case.edu/orom.

Degree Requirements

Students may pursue the M.S.M.-OR/ M.B.A. or M.S.M.-SC/MBA on a full-time or part-time basis. Students planning to attend part-time should confer with an advisor to determine the appropriate sequence of courses in the program. Full-time and part-time students who already have begun the M.S.M. or M.B.A. program must complete their application to the joint degree program no later than upon completion of 18 credit hours in the M.S.M. program or 30 credit hours in the M.B.A. program (12 credit hours in the accelerated M.B.A. program).

Students in the joint degree program will receive both degrees simultaneously, regardless of whether course work for one of the degrees has been completed. Course work for both programs must be completed within six years of the date of initial enrollment in either program. Students in the joint degree program will be granted an automatic one-year extension.
to the five-year deadline for completion of the M.S.M. degree.

Retention Requirements

GPAs of students in the joint degree program will be calculated separately to determine compliance with retention requirements in each program. Students may have up to six additional credit hours beyond the minimum to meet degree requirements to improve their cumulative GPA in order to attain the graduation GPA requirement for the appropriate program.

Students must also comply with the 36-credit-hour residency requirement of the M.B.A. program and the 36-credit-hour requirement for the M.S.M.-OR/SC.

M.B.A./M.S.M. Program Structure

For more information, visit the Operations Department website: http://www.weatherhead.case.edu/orom or contact Frances Cort, Assistant Dean for Professional and International Programs to discuss curriculum options (phone: 216-368-3315, e-mail: fxc@case.edu). M.B.A./M.S.M.-IS

Based on marketplace demand, the Weatherhead School is offering students an opportunity to integrate two of the master's degrees most desired in the management marketplace.

Full-time students can complete the 75-credit M.B.A./M.S.M.-IS in four semesters — the same time it would take to complete the M.B.A. degree alone. Tuition for the dual degree is no more than the tuition for the full-time stand-alone M.B.A. Students in the accelerated curriculum can complete the 62-credit M.B.A./M.S.M.-IS in 14 months, including a summer semester, for which they would pay additional tuition.

Admission Requirements

Students who have been admitted to the M.B.A./program may elect to enter the M.B.A./M.S.M.-IS without further admission requirements.

Curriculum Structure for the 75-Credit Program:

Fall I Semester (18.5 credits)
- Leadership Assessment and Development
- Financial Reporting and Control
- Information Design and Management
- Managerial Finance
- Statistics and Decision Modeling
- M.S.M.-IS specialty course
- M.B.A. elective

Fall II Semester (18 credits)
- M.S.M.-IS specialty course
- M.S.M.-IS specialty course
- M.B.A. elective
- M.B.A. elective
- M.B.A. elective

Spring I Semester (19.5 credits)
- Human Values in Organizations
- Marketing
- Operations Management
- Strategic Issues and Applications
- M.S.M.-IS specialty course
- M.S.M.-IS specialty course
- M.B.A. elective

Summer
- Recommended Technology Management Internship
- Exit Assessment

Fall II Semester (18 credits)
- M.S.M.-IS specialty course
- M.S.M.-IS specialty course
- M.S.M.-IS specialty course
- M.B.A. elective
- M.B.A. elective
- M.B.A. elective

Spring II Semester (19 credits)
- M.S.M.-IS specialty course
- M.S.M.-IS specialty course
- M.S.M.-IS specialty course
- M.B.A. elective
- M.B.A. elective
- Leadership Assessment and Development Exit Assessment

For more information, please visit the M.B.A./M.S.M.-IS website: http://www.weatherhead.case.edu/mba/msmis.htm

M.S.N./M.B.A.

The Master of Science in Nursing/Master of Business Administration (M.S.N./M.B.A.) joint degree is designed to provide nurses with the managerial and organizational skills needed to manage patient care environments or health programs and, at executive levels, to partici-
Admissions
M.S.N./M.B.A. students must be admitted to both the Frances Payne Bolton School of Nursing and the Weatherhead School of Management. Applicants should write to the admissions offices of both schools for application materials and indicate that they are applying to the M.S.N./M.B.A. program. Separate application fees are charged by each school. For additional M.S.N. admissions information, contact: Office of Admissions Frances Payne Bolton School of Nursing Case Western Reserve University 2121 Abington Road Cleveland, Ohio 44106-4904

Academic Information
All M.S.N./M.B.A. students register through the Weatherhead School of Management. Degrees are awarded simultaneously upon completion of requirements for both.

M.S.N./M.B.A. Program Structure
For details about the curriculum structure, please visit this website: http://www.weatherhead.cwru.edu/mba/ft_joint_mnmmba.htm

Contact Frances Cort, Assistant Dean for Professional and International Programs, for full-time and part-time options (phone 216-368-3315; e-mail: fxc@po.cwru.edu).

M.B.A./M.I.M.

Program Description
The Weatherhead School of Management and the American Graduate School of International Management—better known as the Thunderbird School—in Glendale, Arizona, jointly offer a graduate level program in both management and international studies. This combined degree program, the Master of Business Administration/Master of International Management, provides the strengths and career planning advantages of both schools for students who wish to build a career in international business by offering:

- a unique management skills assessment and development process and strong functional concentrations in finance, marketing, MIS, operations, human resource management, entrepreneurship, and health care management available through the M.B.A. program at the Weatherhead School
- foreign language fluency, with an emphasis on business communications, and a wide range of course offerings in international studies and world business through the M.I.M. program at Thunderbird
- access to all placement services and alumni networks at both schools, both during enrollment in the joint degree program and as a graduate of the joint degree program

Program Structure
Because of the interdisciplinary advantages achieved when taking both degrees simultaneously, students in the M.B.A./M.I.M. joint degree program are able to accelerate and streamline course work in both schools. As a result, most students can complete the joint program in 81 hours (three semesters at Weatherhead and two terms at Thunderbird, for a total of 24 months), as compared to the 120 hours (4 years) required to complete the two programs separately. M.B.A./M.I.M. students must first enroll at the Weatherhead School and complete the program at the Thunderbird School.

Both degrees must be awarded simultaneously at the completion of all joint degree requirements.

Curriculum Structure
For information about the M.B.A./M.I.M. curriculum, please visit the M.B.A./M.I.M. website: http://www.weatherhead.cwru.edu/mba/ft_joint_mnmmba.htm

Application/Admissions Process
Prospective students who are interested in applying to the joint M.B.A./M.I.M. program offered by the Weatherhead School and the Thunderbird School should apply separately to each school. (Applicants to the Weatherhead School should indicate their interest in the M.B.A./M.I.M. in the appropriate area under “Intended Program” at the top of the first page of the Weatherhead M.B.A. application.) Separate transcripts, GMAT and TOEFL scores, recommendations, essays, and other materials required to complete application at each school must be sent individually to each school.

The admissions committees of each institution will maintain independent control over its admissions criteria and procedures. Students must be admitted separately to each of the programs. Admission to one school has no bearing upon admission to the other.

Students who have already been enrolled in the M.B.A. or M.I.M. program before pursuing their interest in the joint M.B.A./M.I.M. degree will be permitted to apply to the joint degree program provided they have completed no more than 27 hours in either program.

Students applying to the joint degree program are also eligible to apply for scholarships, fellowships, and loan programs at both schools. Please refer to the application catalog of each school for information regarding tuition, financial aid, etc.

For other information about the joint degree program please contact:

At Weatherhead:
Frances B. Cort
Assistant Dean for Professional and International Programs
(216) 368-3315

At Thunderbird:
W. Richard Bossert
Associate Vice President for Academic Affairs
(602) 978-7251

To request Thunderbird application materials, please contact:
Dean of Admissions
American Graduate School of International Management—Thunderbird
15249 North 59th Street
Glendale, AZ 85306-6003
(602) 978-7210 (800) 848-9084
Fax: (602) 439-5432

THE MASTER OF BUSINESS ADMINISTRATION/CERTIFICATE IN NONPROFIT MANAGEMENT DUAL PROGRAM (M.B.A./CNM)

M.B.A. students with a career focus in the management of nonprofit organizations may obtain a Certificate in Nonprofit Management (CNM) by completing an M.B.A. specialization in nonprofit management (nine credit hours) plus six credit hours of nonprofit management course work above their M.B.A. requirements. By enrolling in one additional course during each of the last two semesters of the M.B.A. program, full-time students may complete the M.B.A. and the CNM without extending their course of study or incurring additional tuition fees.

Credit Requirements for the M.B.A./CNM

Students in the dual program must fulfill 15 credits toward the CNM certificate and 63 or 47 hours (traditional or accelerated full-time curriculum) toward the M.B.A. degree. These students may double count nine credit hours of Mandel Center courses that have been approved for credit in both programs. Because of double counting, students completing the CNM and M.B.A. concurrently will have a 69-hour (53 in the accelerated track) program requirement.

Courses in the CNM/M.N.O. Curriculum Currently Approved for M.B.A. and CNM Credit

There is one required course for the M.B.A./CNM: MAND 401: Introduction to the Nonprofit Sector.

For a complete listing of courses that are eligible for both the M.B.A. and the CNM/, please visit this website: http://www.weatherhead.cwru.edu/pdpao/up-concentration/Nonprofit_Management.htm

Students wishing to propose any modification in the recommended sequence of study on the basis of prior course work, past experience, or professional interest must present a request, in writing, for consideration by the Weatherhead M.B.A./CNM faculty advisor.

Students pursuing the M.B.A./CNM are also expected to attend all meetings of MAND 411, the Mandel Center’s Nonprofit Leadership Dialogs series.

Admission/Enrollment Procedures in the Dual M.B.A./CNM Program

Candidates must complete both applications and be admitted to each program separately. M.B.A. students must apply no later than the end of the first year in the M.B.A. program. Candidates who have already completed the M.B.A. degree or the Certificate in Nonprofit Management may not apply for the dual M.B.A./CNM program.

M.S.S.A./CNM

The M.S.S.A./CNM combines the Master of Social Science Administration (M.S.S.A.) with the Certificate in Nonprofit Management. It provides excellent preparation for students whose career focus in the management of economic and community development and nonprofit organizations.

The program consists of five courses that must include MAND 406. The remaining four courses are chosen in consultation with the M.S.S.A/CNM faculty advisor. Candidates must complete both applications and be admitted to each program separately. M.S.S.A. students must apply no later than the end of the first semester in the M.S.S.A. program.

For more information, contact Rebecca W. Zirm, J.D., Director of Recruitment, 216-368-6025 or by e-mail at admissions@mcno.cwru.edu.

J.D./CNM

The J.D./CNM combines the Doctor of Jurisprudence (J.D.) with the Certificate in Nonprofit Management. It provides preparation for students who desire to practice law as it relates to nonprofit organizations, serve as managers of nonprofit organizations, or work in the field of planned giving.

The program consists of five courses that must include LAWS 234. Candidates must complete both applications and be admitted to each program separately. J.D. students must apply by no later than the end of the second year in the J.D. program.

For more information, contact Rebecca W. Zirm, J.D., Director of Recruitment, 216-368-6025 or by e-mail at admissions@mcno.cwru.edu.

Certificate Programs

CERTIFICATE IN HEALTH SYSTEMS MANAGEMENT

This program is designed for practicing professionals who have a bachelor’s degree, professional experience in the health care delivery system, or professional or graduate degree in the health sciences. Individuals with an M.B.A. or working toward an M.B.A. may also enroll in the Certificate program. Contact Fran Cort, Assistant Dean for Professional and International Programs (216 368-3315) or Barbara Bolek, Director of the Health Systems Management Center (216 368-6403).

Suggested curriculum and sequence of courses:

A total of 15 credit hours of course work from the following courses is required for completion of the Certificate:

- HSMC/BAFI 420 – Health Finance (3 credits).
- HSMC421/ECON421 – Health Economics and Strategy (3 credits).
- HSMC 422/MKMR 420 – Health Care Marketing (3 credits).
HSMC 424/ECON 424/BIOS 4224/MPHP 424 – Innovation, Markets, and Organization in the Pharmaceutical Industry
HSMC 427/LAWS 227 – Health Law (3 credits)
HSMC/MIDS 432 – Health Care Information Systems (3 credits).
HSMC 446/IIME 446 - Models of Health Care Systems (1.5 credits)
HSMC 447/IIME 447/BIOS 447 - Regulatory Affairs for the Biosciences (1.5 credits)
HSMC 456 – Health Policy and Management Decisions (3 credits).
HSMC 501 G – Medical School Electives (1-3 credits)
HSMC 502 – Health Care Executive Education Series (3 credits)

RELATED COURSES (WEATHERHEAD SCHOOL OF MANAGEMENT)
ECON 436 – Economics of Organizations: Structuring Incentives and Investing in Relationships (3 credits)
OPMT 422 – Management of Service Operations with E-Commerce (3 credits)

ADDITIONAL HEALTH COURSES (SCHOOL OF LAW)
LAWS 295 – Health Care Organization and Finance (2 credits)
LAWS 298 – Health Care Transactions (2 credits)

ADDITIONAL HEALTH COURSES (GRADUATE SCHOOL/ SCHOOL OF MEDICINE)
MPHP 429 - Introduction to Environmental & Occupational Health (3 credits)
MPHP 439 - Public Health Management and Policy (3 credits)

Please visit this website [http://www.weatherhead.cwru.edu/mba/cert_hlthmgmt.html](http://www.weatherhead.cwru.edu/mba/cert_hlthmgmt.html) for more information about course descriptions, certificate requirements, and recommended sequence of study in the health care management certificate.

Tuition Payment
Tuition for each 3-credit course will be charged at the current rate for the semester in which the student registers.

Academic Policy
Courses in the HSM Certificate Program are documented on an academic transcript from Case Western Reserve University. A Certificate in Health Systems Management will be awarded after the student completes five courses with passing grades and completes a graduation application through the Professional Degree Programs Administrative Office. All HSM Certificate participants who matriculate into the M.B.A. Program within five years of completion of the Certificate may transfer the five courses toward completion of M.B.A. degree requirement.

CERTIFICATE IN E-BUSINESS – 15 CREDITS

Required Courses - Either of the following two courses:
MIDS 446 – Managing E-Business Technologies
PLCY 473 – E-Business Strategy

Elective Courses – Any four of the following courses:
ECON 462 – E-Commerce and the New Economy
MIDS 446 – Managing E-Business Technologies
PLCY 473 – E-Business Strategy
OPMT 422 – Service Operations Management and E-Commerce
MIDS 415 – Multimedia Systems
MKMR/OPMT 407 – Supply Chain Management
OPMT 477 – Enterprise Resource Planning
PLCY/ENTP 440 – Entrepreneurial Finance
MKMR/ENTP 450 – Entrepreneurial Marketing

CERTIFICATE IN ENTREPRENEURSHIP – 15 CREDITS

Required Courses – 3 credits
ENTP 429 – New Venture Creation

Elective Courses – Any four of the following courses
ENTP 418 – New Enterprise Development
ENTP 419 – Entrepreneurship
ENTP 420 – Managing the Family Firm
ENTP 422 – Managing an Emerging Growth Enterprise
ENTP 424 – Advanced Principles of Entrepreneurship
ENTP 425 – Managing HR Issues in Entrepreneurial Firms
ENTP 426 – International Entrepreneurship
ENTP 427 – Entrepreneurial Strategy
ENTP 439 – Entrepreneurship/Entrepreneurship with the Corporation
ENTP 440 – Entrepreneurial Finance
ENTP 441 – Technology-Based Entrepreneurship
ENTP 450 – Entrepreneurial Marketing

CERTIFICATE IN BIOSCIENCE ENTREPRENEURSHIP – 15 CREDITS

Required Courses (12 credits)
BIOS 450 – Project Management in the Life Sciences (3 credits)
BIOS 446 – Regulation of the Life Sciences (1.5 credits)
BIOS 445 – Business Development in the Life Sciences (1.5 credits)
ENTP 429 – New Venture Development (3 credits)
BIOS 447 – Venture Law (3 credits)

Elective Courses – Select one of the following 3 credit courses
ENTP 427 – Entrepreneurial Strategy
ENTP 450 – Entrepreneurial Marketing
ENTP 440 – Entrepreneurial Finance
ENTP 441 – Technology-Based Entrepreneurship

CERTIFICATE IN NONPROFIT MANAGEMENT (CNM)

The Certificate in Nonprofit Management (CNM) Program is designed for practicing leaders and managers in human
service, fine and performing arts, cultural, educational, community development, religious, civic, and other nonprofit organizations who aspire to senior-level executive positions.

CNM students must satisfactorily complete a set of five approved courses (15 credits), including one required course, Introduction to the Nonprofit Sector. They must also attend all meetings of the Nonprofit Leadership Dialogs series.

Admission criteria include satisfactory undergraduate work, the ability to master graduate-level course work, familiarity and experience with nonprofit organizations, and leadership potential for executive-level management and leadership.

For additional information concerning the CNM program (including scholarship information), contact:
Rebecca W. Zirm, J.D.
Director of Recruitment
Mandel Center for Nonprofit Organizations
Case Western Reserve University
10900 Euclid Avenue
11206 Euclid Avenue, Lower Level (visitors)
Cleveland, Ohio 44106-7167
(216) 368-6025
admissions@mcno.cwru.edu
www.case.edu/mandelcenter

CERTIFICATE IN OPERATIONS

Program Objective and Requirements

The Department of Operations offers a graduate certificate consisting of 15 credit hours of coherent course work. Designed for practicing professionals who seek greater expertise, the Certificate in Operations program can be tailored to specific interests. Sample areas are the following: Supply Chain Management, Operations Research, and Quantitative Finance.

For more information about the certificate requirements and application procedures, please visit this website: http://weatherhead.case.edu/orom.

Upon completion of requirements below, the student should request the certificate through the Registration Staff in the Professional Degrees Program Administration Office.

1. Completion of 15 credit hours of the courses selected in collaboration with the Department’s Director of Graduate Programs.

2. Maintain a B (3.0) grade point average through all course work. The program must be completed within six years.

Graduate Programs

PH.D. IN MANAGEMENT

The Ph.D. in Management program is designed for individuals whose career goals are to conduct research and teach in academic, policymaking, or research institutions. The program provides both a general background in management and strong specialization in the individual’s choice of major field (accountancy, entrepreneurship, information systems, labor and human resource policy, marketing, and management policy). A program of study is tailored to each student’s needs and career goals. Students are encouraged to engage in publishable research before receiving their doctorates. They also are given the opportunity to teach courses after admission to candidacy.

An integral strength of the Ph.D. in Management program at the Weatherhead School of Management is its attention to the individual. A successful doctoral experience requires more than course work. Frequent one-to-one interaction with faculty in the area of one’s specialization is necessary for developing conceptual and methodological skills. Only a few students are admitted to the doctoral program each year, guaranteeing direct communication with faculty in research, teaching and advanced independent study courses.

The Ph.D. in Management program has been designed so that the student, in cooperation with an advisor, can develop the plan of study that best meets his or her career objectives. Students are encouraged to be eclectic and take course work outside of the Weatherhead School.

Specific requirements for completion of the program are detailed in its rules and regulations; fundamentally, the requirements are:

• A full-time commitment to the program.

• Completion of prerequisite courses deemed essential to the student’s area of specialization.

• Involvement in classroom activities to develop teaching skills.

• A minimum of 12 courses covering the student’s major and minor fields and foundations courses supporting the major field. The foundations courses include a three-course, required sequence in research methods. Some of this work might be fulfilled through courses in the Departments of Operations or Organizational Behavior, or outside of the Weatherhead School of Management in areas such as sociology and computer science.

• Successful completion of written and oral general examinations, typically within two years of admission.

• Completion of a satisfactory dissertation.

Because only a small number of applicants can be admitted each year, selection is limited to those whose credentials are strong and whose interests match well with the faculty’s. Each applicant is required to furnish an official copy of his or her GMAT score, official transcripts, at least three letters of recommendation, and a statement of his or her area of interest. Financial aid is available on a competitive basis, ranging from graduate assistantships to fellowships and lectureships.

For further information and application materials, write or call:
Amy Marino, Admissions Coordinator
Ph.D. in Management Program
Weatherhead School of Management
Case Western Reserve University
Cleveland, Ohio 44106-7235
(216) 368-0335
phd-mgnt@weatherhead.case.edu
PH.D. IN OPERATIONS RESEARCH

This is the world’s first doctoral program in this field. Many graduates have achieved distinguished research careers as faculty members at major universities. The current doctoral program aims to continue this tradition by preparing students for faculty positions in schools of business and engineering at research universities.

Even while taking courses, students are rapidly engaged in research, and, after their second year, they are entirely engaged in research. Research topics are diverse; recent ones include supply chain management, financial engineering, vehicle routing and reverse logistics, scheduling, stochastic optimization, and complexity theory.

For the Ph.D. degree in operations research, a number of required courses in specific areas must be taken. Required and elective courses form a coordinated program of study that provides depth of knowledge of the field as well as a comprehensive understanding of related subjects. The program culminates in a dissertation, which presents new significant research findings.

Contact the Department of Operations for further information (216-368-3845) or e-mail at phd-oper@po.case.edu. You may also visit the Department website at http://weatherhead.case.edu/orom.

PH.D. IN ORGANIZATIONAL BEHAVIOR

The doctoral program offered by the Department of Organizational Behavior focuses on research and helping at the individual, team, organizational, and global system levels. Students also are encouraged to develop the skills necessary to use their knowledge to promote constructive change.

Requests for information should be addressed to:
Richard E. Boyatzis, Chair
Department of Organizational Behavior
Weatherhead School of Management

Case Western Reserve University
Cleveland, Ohio 44106-7235
(216) 368-2055

Weatherhead Centers

The Weatherhead School of Management’s George S. Dively Conference Center provides an ideal setting for executive programs as well as special events of the Weatherhead School. Weatherhead Executive Education creates and maintains educational linkages between the Weatherhead School and regional organizations and executives. Program offerings include The Corporate University, The Weatherhead Affiliate Program, and the Family Business Program for organizations; two degree programs, the Executive M.B.A. and Executive Doctor of Management; and one certificate program – Professional Fellows Program for advanced professionals. (Betty Vandenbosch, Associate Dean: 368-2042).

Center for Regional Economic Issues (REI) improves the quality of information about the regional economy and makes this information available for public and private sector decision making. REI staff monitor economic conditions throughout the Great Lakes region, conduct research on issues of long-term significance to the region, provide policy analyses for organizations and maintain an extensive communications program. (Executive Director, Ed Morrison: 368-5534)

The Health Systems Management Center (HSMC) is an interdisciplinary education, research, and service center jointly sponsored by the Weatherhead School and the School of Medicine. The focus of HSMC activities is on understanding the complex interaction of providers, suppliers, and purchasers in the healthcare system. (Barbara Bolek, Director: 368-2143)

The Mandel Center for Nonprofit Organizations is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law and the College of Arts and Sciences. Among its diverse programs in education, research, and community service, the Mandel Center administers the Master of Nonprofit Organizations degree program and the Certificate Program in Nonprofit Management as well as several dual degree and dual credential options. (Susan Lajoie Eagan, Executive Director 368-2275)

Weatherhead Undergraduate Student Organizations

ALPHA KAPPA PSI

Alpha Kappa Psi is a national professional business fraternity whose objective is to help develop well-trained, ethical, and skilled leaders. Members interact with speakers from the business community, attend conferences with other Alpha Kappa Psi chapters, and organize social events on and off campus.

BETA ALPHA PSI

Beta Alpha Psi is the honorary accounting fraternity. Case Western Reserve is home to one of the oldest chapters in the country, founded in 1930. Professionals from all major accounting and consulting firms come to campus to talk about career opportunities in the management profession. The fraternity also sponsors field trips to accounting firms and corporations. Membership to this fraternity is restricted to accounting, finance, and information systems majors; however, all students can attend meetings and attend the presentations of the guest speakers.

OMICRON DELTA EPSILON

Omicron Delta Epsilon is the international honor society in economics. Students who maintain a high academic record are invited to join the organization. Meetings and activities are held throughout the year and highlighted by the McMyler Memorial Lecture at the end of the school year.
Weatherhead Graduate Student Organizations

GRADUATE BUSINESS STUDENT ASSOCIATION (GBSA)

The GBSA was formed by Weatherhead graduate students to serve as a liaison with WSOM faculty and staff on issues pertaining to student life. The organization’s primary focus is to enhance each student’s experience in and out of the classroom in the areas of professional development, academic achievement, and community involvement. GBSA acts as an umbrella group for all student organizations by facilitating communication with the Advisory Council of Club Presidents, allocating resources to student organizations, organizing social activities, and operating the WSOM Coffee Bar.

Graduate Business Student Association http://www.weatherhead.case.edu/studentlife/gbsa/

Community Service Committee, Dean’s Receptions, the Social Committee, and the Student Learning Management Committee (SLMC).

Subcommittees of the Graduate Business Student Association

Community Service Committee http://www.weatherhead.case.edu/studentlife/wcsc/default.htm , Dean’s Receptions, the Social Committee http://www.weatherhead.case.edu/cslc/studlife/ orgs.htm#social, and the Student Learning Management Committee (SLMC).

BLACK M.B.A. STUDENT ASSOCIATION (BMBASA)

http://www.weatherhead.case.edu/bmbasa/

The Black M.B.A. Student Association provides business, academic, and social support for students at WSOM through sponsored seminars, forums, and social activities.

Business Technology Association (BTA) http://www.weatherhead.case.edu/bta/

The BTA provides supplemental learning and exposure to new technology and innovation across functional business disciplines by sponsoring extracurricular activities related to technology in the workplace and offering opportunities to network with local professionals.

ENTREPRENEUR VENTURE ASSOCIATION

http://www.weatherhead.case.edu/eva/

This club introduces students to opportunities to create new businesses utilizing the resources available in the Case Western Reserve community. In addition to Weatherhead, Case Western Reserve has nationally recognized capabilities in Medicine, Computer Science, MEMS, and Engineering. By linking novel technologies to energetic, capable Weatherhead students, we are working to create opportunities for new businesses with unlimited possibilities.

FINANCE AND INVESTMENT CLUB

http://www.weatherhead.case.edu/financeclub/

This club offers seminars and lectures to introduce students to career opportunities in banking and finance and to innovative concepts in both corporate and personal financial planning.

HEALTH SERVICES AND BIOSCIENCE CLUB

http://weatherhead.case.edu/hsmbc/

The HSBC helps students interested in careers in the health care and biotech/bioscience sectors to learn about the many career opportunities in the field through seminars and meetings with faculty and executives from these areas.

SOCIETY FOR HUMAN RESOURCE MANAGEMENT

http://www.weatherhead.case.edu/shrmob/

Affiliated with the Society for Human Resource Management (SHRM), this club provides excellent opportunities to meet human resource professionals on both an educational and social basis and to broaden members’ exposure the human resource issues and problems at the practical and academic levels.

GLOBAL BUSINESS GROUP (GBG)

http://www.weatherhead.case.edu/gbg

This group provides a forum for the informal exchange of international business ideas and the promotion of cross-cultural awareness. Among other things, activities include topical forums, spears, parties, and field trips. The IBG also serves as a source of information for students about international career opportunities in the U.S.A. and abroad.

J.D./M.B.A. STUDENT ASSOCIATION

http://weatherhead.case.edu/jdmba/

Founded in 1995, the J.D./M.B.A.S.A. is a student organization of the Weatherhead School of Management and the School of Law of Case Western Reserve University. Its purpose is to assist J.D./M.B.A. students in their educational and professional development. The organization serves as a source of information and guidance to students from the time that they manifest interest in becoming a J.D./M.B.A. joint-degree student through the completion of their program and into their respective careers.
NET IMPACT -- STUDENTS FOR RESPONSIBLE BUSINESS

http://www.weatherhead.case.edu/netimpact/

Students for Responsible Business at the Weatherhead School of Management at Case Western Reserve University is a local chapter of the national Students for Responsible Business organization, a national association of graduate students interested in socially-responsible business practices.

WEATHERHEAD CONSULTING GROUP (WCG) HTTP://WWW.WEATHERHEAD.CASE.EDU/WCG/

The WCG provides an educational link between the consulting industry and WSOM students and offers actual consulting experiences to students interested in exploring consulting as a career.

MARKETING CLUB

http://www.weatherhead.case.edu/marketing/

The Marketing Association brings members of the business community to campus to speak about a wide variety of marketing issues and career paths available to marketing students.

WEEKLY WEATHERVANE (STUDENT NEWSPAPER)

http://www.weatherhead.case.edu/cslc/studlife/weathervane.htm

The Weathervane is published on-line each week to inform students on the latest news and events at Weatherhead

SPOUSE/SIGNIFICANT OTHER NETWORK

http://www.weatherhead.case.edu/cslc/studlife/spouse.htm

Weatherhead hosts a brunch for students, their spouses, significant others, and children every fall as a kick-off event for the Spouse/Significant Other Network

SUPPLY CHAIN MANAGEMENT ASSOCIATION

http://weatherhead.case.edu/scma/

Supply Chain Management is all about delivering the right product at the right place, at the right time, and at the right price. Supply Chain Management Association fosters the talent that we have at Weatherhead School of Management to meet the challenge.

ALUMNI ASSOCIATION

http://weatherhead.case.edu/alumni

Members of the Weatherhead School of Management Alumni Association include all alumni of the Weatherhead School's undergraduate, graduate, and professional programs. The Association works to promote the welfare and advance the objectives of the school and sponsors a range of activities and services for alumni and students that encourage professional development, provide for the exchange of ideas, and stimulate social interaction. Each year, the Association selects a graduating student to receive the Student Leadership Award and an incoming M.B.A. student to receive the Weatherhead Alumni Association scholarship.

HONORARY SOCIETIES

Beta Gamma Sigma is a national scholarship honorary society in the field of business administration and commerce. M.B.A. candidates whose academic performance is outstanding (usually in the top 20% of the graduating class) may be elected to membership in the Eta Chapter of Ohio, which was established at Case Western Reserve University in 1958.

Beta Alpha Psi is a national professional honorary accountancy fraternity. The Weatherhead School of Management is home to the Pi Chapter, which was chartered in 1930. The organization's primary purpose is to encourage higher standards in accountancy education and to develop a closer relationship among professional accountants, faculty, and students.

Omega Rho is an international honor society founded in 1975 to honor academic excellence in operations research and closely allied intellectual disciplines. As a founding chapter of Omega Rho, the Case Western Reserve University unit recommends membership for students who have achieved high honors in the graduate program in operations research. The Department of Operations initiates chapter members annually.

TEACHING EXCELLENCE AWARD PROGRAM

Each May, an award for teaching excellence at the undergraduate, master's, and doctoral levels is awarded. The Teaching Excellence Award Committee is composed of student representatives. This committee administers the voting procedure, determines the winner, and presents the award at an awards ceremony and at the graduation ceremony.

STUDENT LEADERSHIP AWARD

The Student Leadership Award is presented each year at commencement to a graduating student who has demonstrated leadership characteristics by providing a model for other students, enhancing student life and atmosphere, promoting the Weatherhead image in a positive way, and contributing to the total community. The recipient of this award is chosen by a selection committee comprising alumni representatives of all Weatherhead programs. Students, alumni, faculty, staff, and friends of the Weatherhead School may make nominations.
Registration and Academic Information

COURSE LOADS

Full-time graduate students must register for at least nine credit hours per semester to maintain full-time status. A typical full-time course load, however, is 15-17 credit hours per semester. Part-time students who are employed full-time generally register for a maximum of six hours per semester and three hours in the summer, which is considered halftime status. Requests for course overloads are approved by the Academic Support Services Coordinators.

COURSE REGISTRATION

The student's Social Security number is the identification number for all university documents and records.

A student may enroll during each registration period through the last day of late registration, as set by the official University calendar. Exceptions will be granted only upon the recommendation of the Dean of the Weatherhead School of Management. A fee of $25 is charged during the late registration period.

To register, students must have a clear balance and submit a completed student schedule form or register on-line. (Students who wish to obtain information on federal loans should contact the Professional Degrees Program Administrative offices to obtain an information packet.)

Course registrations are processed with a 5-digit course registration number (CRN). CRN numbers are produced as follows:

1st digit = department letter (A=Acct or Blaw, B=Bafi, E=Econ, H=Hsmc, U=Law, W=MBAC, G=Mand or Mgmt, S=Mids, K=Mkmr, P=Pcy, T=Opmt, R=Opre, Z=Orbh, Q=Quum)
2nd 4th digit = course number;
5th digit = section number.

For Example: Acct 401, section 2 = A4012; Pcy 418, section 1 = P4181.

Independent study courses will have system assigned CRN numbers. Please indicate course, Professor, and number of credit hours (i.e., Pcy 501 Feldman 3 hrs.) on your course schedule form.

During any semester, students may not register in more than one school or college of Case Western Reserve University. Transfer within the University requires the approval of the deans of the schools or colleges involved. Special arrangements are made for students in joint degree programs. (See the appropriate section of this bulletin for details.)

If at any time a student fails to register in two consecutive semesters, excluding the summer session, he or she must reapply for admission to the Weatherhead School of Management unless a prior arrangement has been made.

Course Changes

Requests for changes in courses and sections may be processed on-line or by the Academic Support Services Coordinator by the last day of the drop/add period.

Withdrawals

To withdraw from all courses in a semester, the student must contact the Academic Affairs Administrative Office in person or by phone before the University deadline for withdrawal to have an official withdrawal form processed. All withdrawals after the official drop/add periods will result in a transcript entry. Failure to attend class, giving notice to the instructor or nonpayment of fees will not be regarded as official notice of withdrawal. A grade of F may be assigned to each course from which the student has not officially withdrawn.

Tuition charges for withdrawals after the drop/add deadline are prorated based upon the week of withdrawal and according to the schedule published in the semester registration materials.

Incomplete Grade

The grade of I is assigned at the discretion of an instructor, provided that two criteria are met:

1. There are extenuating circumstances, explained to the instructor before the assignment of the grade, which clearly justify an extension of time beyond the requirements established for other students in the class. It is the student's responsibility to notify the instructor of the circumstances which prevent completion of the course.

2. The student has been passing the course and only a small segment of the course remains to be completed, such as a term paper, for which the extenuating circumstances justify a special exception.

In order to receive credit for a course marked I, the student must complete the work by the date specified by the instructor and in no event later than the end of the next regular semester (fall or spring).
If the student fails to remove the incomplete within the specified time, he or she forfeits the privilege of completing the course for credit, and the grade becomes a permanent I unless the instructor elects to give the grade of F.

Any student who wishes to petition to extend an I grade beyond the stated university deadline of the next regular semester must obtain approval from the faculty member who assigned the I grade. Student requests must be in writing and convey: (a) extenuating circumstances justifying the extension, and (b) the expected date of completion of the work. If approved, the request should be initiated by the faculty member and delivered by the student to the Professional Degrees Programs Committee.

Withdrawn Grade

The grade of W will be given if a student officially withdraws from a semester-length course by the deadline specified in the official university calendar. A student withdrawing after this date will receive the grade of F unless, in the judgment of the Associate Dean of the Weatherhead School of Management, there are valid reasons for recording the grade of W.

Audit Grade

The grade of AD (audit) will be given when a student has officially registered to audit a course and has satisfied the requirements specified by the instructor for this grade. The instructor may designate that the student has not completed all requirements for auditing the course and that NG (no grade) be recorded on the students transcript. The designation of NG is not available under any other circumstances.

Students will be permitted to change their registration in a course from credit to audit (AD) only if the change is officially made by the deadline specified in the University calendar. Students may audit only with permission of the instructor and may not audit a required course in the M.B.A. curriculum. Any course that has been audited may not be repeated for credit.

Satisfactory Grade

The grade of S indicates passing performance only in designated courses approved by the Professional Degree Programs Committee.

The grade of S is not counted in determining quality average and an S, once entered on the students record, may not be changed. Under no circumstances should some students in a course receive an S while other students receive grades of A, B, C, or D.

No student can receive credit for more than six semester hours of grades of S toward the M.B.A. degree.

Extra Assignments

No student is permitted to do extra assignments beyond the work assigned to all students in a course in order to obtain a higher grade. This policy applies to changing an I grade to a regular grade or changing one regular grade to another. However, faculty may replace or substitute assignments for individual students in a course, depending on extenuating circumstances.

Retention Requirements

For retention in the M.B.A., E.M.B.A., M.S.M. and M.Acc. degree programs of the Weatherhead School, a student must meet the following academic requirements: (1) a quality-point average of 2.25 at the completion of 12 semester hours of graduate study and (2) a quality-point average of 2.4 or higher at the completion of 21 semester hours or more of graduate study. In calculating the quality-point average, all graduate courses for which quality points are given are counted, including courses that may have been repeated. (Refer to the M.N.O. degree information in this bulletin or the School of Graduate Studies section for retention requirements for other degree programs.)

Graduation Requirements

A cumulative quality-point average of 2.50 in all graduate courses taken for credit in the M.B.A., E.M.B.A. M.S.M. or M.Acc. degree programs is required for the award of these degrees. All requirements for each of the professional degree programs must be fulfilled within six years from the date of the student’s initial registration in graduate study in the Weatherhead School of Management.

A candidate for a degree awarded by the Weatherhead School of Management must make an application for the degree in the PDPAO no later than two months before the commencement at which the degree is expected to be awarded. Upon receipt of the student’s application, the PDPAO will verify that the student is eligible to graduate at the time requested. Students are advised to contact the PDPAO if they have any questions regarding the time or the requirements for graduation.

An annual convocation ceremony is held in May. Candidates who are awarded degrees in August or January will be invited to attend the ceremony the following May.

Transcripts

Case Western Reserve University considers grades and other information about students’ performance at Case Western Reserve University to be a private matter and will release such information to students only upon written request. Transcripts will not be issued to or on behalf of students who have not discharged all financial obligations to the University.

Transcripts of work completed at other institutions will not be released to students or other third parties.

Transfer Credit

Six hours of transfer credit may be granted toward the M.B.A. degree in accordance with the following provisions:

- The student registers for and completes a minimum of 36 semester hours of course work in the Weather-
enrollment in courses at another university process is completed prior to a student’s
case western reserve university general bulletin 2004–2006 weatherhead school of management • 469
2. In the M.B.A. program, elective
courses for any joint degree program in
the limits of Item 1 above, with the

Departmental Course Offerings

Department of Accountancy

Peter B. Lewis Building
Timothy J. Fogarty, Chair
Phone 216-368-2073; Fax 216-368-6244

Specified advanced undergraduate major courses, numbered on the 300 level, are open to graduate students. When these courses are taken for graduate credit, the instructor assigns additional work, usually research. Graduate courses are numbered 400 and above. Listed below are all graduate course offerings for the master’s and doctoral degree programs and the certificate programs described earlier in this bulletin.

The Accountancy Department prepares students for professional careers in public accountancy, financial management and academia. The faculty offers course work leading to the Bachelor of Science in Accounting and the Master of Accountancy. The Ph.D. in Accounting degree is also offered. In addition, the faculty provides service courses to M.B.A. students seeking elective course work in financial accounting, managerial accounting, taxation, and business law. University-wide general service courses are also provided for students not enrolled in Weatherhead School of Management or the School of Graduate Studies.

FACULTY

Robert J. Bricker, Ph.D. (Case Western Reserve University), CPA
Ernst and Young Faculty Fellow; Professor of Accountancy; Associate Dean for Graduate Programs

Timothy J. Fogarty, Ph.D. (Pennsylvania State University), J.D. (State University of New York at Buffalo), CPA
KPMG Peat Marwick Faculty Fellow; Professor of Accountancy; Chair, Accountancy Department, Undergraduate Accountancy Program Director

Julia E. S. Grant, Ph.D. (Cornell University), CPA
Associate Professor of Accountancy

Larry M. Parker, Ph.D. (University of Houston), CPA
Associate Professor of Accountancy; Master of Accountancy Program Director

Paul Polinski, Ph.D. (University of Alabama), CPA
Assistant Professor of Accountancy

Gary J. Previts, Ph.D. (University of Florida), CPA
Professor of Accountancy; Associate Dean for Undergraduate and Integrated Studies

Thomas D. Schultz, Ph.D. (Arizona State University), CPA
Assistant Professor of Accountancy

Adjuncts

Leon Blazey, BBA (Western Reserve University), CPA
Senior Lecturer of Accountancy

David Pearson, D.B.A. (Indiana University), CPA
Professor for the Practice of Accountancy

Secondary Appointments

Richard J. Boland, Jr., Ph.D. (Case Western Reserve University), CPA
Professor of Information Systems; Professor of Accountancy

ACCOUNTING (ACCT)

Undergraduate Courses

ACCT 101. Introduction to Financial Accounting (3)
This course covers concepts, principles, and practices including the preparation and interpretation of financial reports, record-keeping procedures, and internal controls.

ACCT 202. Management Accounting (3)
This course focuses on management accounting as a supporting system, helping managers to run businesses and other organizations. The course builds on knowledge of microeconomics, organizational design and behavior, production, and logistics as a foundation to explore how management accounting provides information for management decisions and control activities. Prereq: ACCT 101 and ECON 102.
ACCT 300. Corporate Reporting I (3)
This course covers financial accounting theory, generally accepted accounting principles and reporting practices, including evaluation of current issues and practices related to asset valuation, including receivables, inventory, and fixed assets. It also covers the users and uses of financial statements, the difference between cash-basis and accrual accounting, the determination of income, the financial statements, financial statement analysis, revenue recognition, and the role of financial information in valuation decisions and contracting.
Prereq: ACCT 101 and ACCT 202.

ACCT 301. Corporate Reporting II (3)
This course covers financial accounting theory, generally accepted accounting principles and reporting practices. Areas of focus include: liability determination, long-term debt, derivatives, leases, pensions and other postretirement benefits, accounting for income taxes, earnings per share, stock options, and investments. International aspects also are considered.
Prereq: ACCT 300.

ACCT 302. Survey of Accounting (3)
The course covers the principles of financial and managerial accounting for non-management students, including the framework that underlies financial and manual accounting and how accounting information should be used by: (1) parties external to the firm, i.e., stockholders, creditors, and government, to evaluate the financial performance of an organization; and (2) internal management to fulfill the planning, control and performance evaluation functions. Enrollment is limited to students who are neither management or accounting majors nor enrolled in the Weatherhead School of Management. This course cannot be substituted for ACCT 202 without a waiver from the chairman.

ACCT 304. Advanced Financial Reporting (3)
This course covers partnerships, consolidations, foreign exchange, international aspects of accounting, accounting for state and local governments and not-for-profit organizations, segment reporting and interim reporting. Prereq: ACCT 301.

ACCT 305. Income Tax: Concepts, Skills, Planning (3)
This course covers underlying federal income tax and concepts and law applicable to various entities. May not be taken for credit if ACCT 430 is taken for credit.
Prereq: ACCT 202 or ACCT 401.

ACCT 314. Attestation and Assurance Services (3)
This course covers the role of the auditor, the audit process, the public accounting profession, audit risk and materiality, fraud, audit methods and techniques, audit planning, internal control, the effects of information technology on the audit, auditing revenue, receivables and inventories, professional ethics, legal responsibilities, emerging assurance services, and recent developments in the auditing profession. Prereq: ACCT 301.

ACCT 360. Independent Study (1-18)

Graduate Courses

ACCT 401. Finance and Managerial Accountancy (3)
This course examines the underlying framework of financial and managerial accountancy, focusing on how financial information is used by: (1) parties external to the organization to evaluate financial performance, i.e., stockholders, creditors, and government agencies; and (2) internal management to plan, control, and evaluate the financial results of the organization.

ACCT 403. Survey of Accounting (3)
(See ACCT 303.)

ACCT 405. Advanced Federal Taxes (3)
Corporate income taxes, estate and gift tax, fiduciary income taxes, partnerships, and hybrid forms of organization are covered. Prereq: ACCT 305.

ACCT 406. Accounting Information Systems (3)
(See ACCT 306.)

ACCT 413. Seminar in Financial Management Control Systems (3)
This is an integrative case-oriented course intended to examine the characteristics and elements of planning and control systems and the requirements for the development and implementation of such systems. Planning control systems in service, nonprofit and multinational organizations are analyzed. The course explores the role accounting plays in the development and support of planning and control systems, and the problems and implications for accounting of developing systems for different types of organizations. Prereq: ACCT 401 or MBAC 415.

ACCT 414. Corporate Reporting and Analysis (3)
This course provides a basis for evaluation of traditional and proposed uses of report and information for decision making in investment, credit and internal planning and control. Students are introduced to concepts and analytical techniques that can be used to critique and interpret the financial health of the organization. At a practical and theoretical level, the course integrates research in the areas of accounting, quantitative methods and finance which has proved useful in the financial analysis of organizations. Prereq: ACCT 401 or MBAC 415.

ACCT 415. Accountability for Executives - E.M.B.A. (2)
This course examines the framework that underlies financial and managerial accountancy and how reports and information should be used by: (1) parties external to the firm, i.e., stockholders, creditors and government, to evaluate the financial performance of an organization; and (2) internal management to make proper decisions related to the planning, control, and performance evaluation functions. This course is open only to students in the Executive M.B.A. program. Prereq: E.M.B.A. candidate.

ACCT 418. Fraud and Financial Reporting (1.5)
This course examines managerial fraud, primarily that made possible by the manipulation of accounting. This includes treatments of the motives for fraudulent behavior but focuses primarily upon the techniques of earnings management and the processes of detection. Guest speakers from the forensic industry and legal materials from practice institutes will be employed. Prereq: ACCT 401, ACCT 419.

ACCT 419. Financial Reporting and Capital Structure (1.5)
Corporations require sources of capital, which typically include both debt and equity financing. These different contract forms lead to different financial statement implications due to the rules of accrual accounting. This course covers the detailed financial reporting techniques and procedures related to these contracts that affect the information produced and subsequently used in capital markets. Prereq: MBAC 415 or equivalent.

ACCT 429. Social Ethics and Taxes (1.5)
This course engages students as tax compliance volunteers for lower-income people in the Greater Cleveland area. This “hands-on” experience provides a means for managers to better understand the concerns of “rank-and-file” employees that may be affected by corporate action.

ACCT 430. Taxes and Management Decisions (3)
This course is designed to sensitize students to the importance of tax planning opportunities and pitfalls inherent in management decisions. The course will focus on helping students recognize potential tax opportunities and problems by examining a variety of practical managerial decision contexts. The course is specifically designed for students preparing for careers in management as opposed to accounting or tax.
Prereq: ACCT 401 or MBAC 415 or MAND 425 and MAND 426.

ACCT 431. Tax Research Methods (3)
This course concentrates on the basic nature of the tax research process: identification of pertinent facts, issue definition, determination of appropriate authoritative sources, evaluation of authoritative sources, development of issue resolution alternatives, and communication of research results. The course includes a study of available research sources as well as reviewing the development and hierarchy of those sources. Library research materials are used, including tax services, journal articles, Internal Revenue Code, course cases, and administrative rulings. Tax research cases are employed as the basic methodology for simulating actual tax research problems. Computer applications for tax research are assigned. Prereq: ACCT 405.

ACCT 439. Regulation of Accountancy (3)
This course examines the role and structure of government standard-setting agencies, including the U.S. Securities and Exchange Commission (SEC) and the Public Company Accounting Oversight Board (PCAOB) and related legislative and regulatory aspects as found in the Sarbanes-Oxley Act of 2002, and in studies by the General Accounting Office (GAO) and other regulatory agencies. The 1993 and 1994 securities acts, the notions of full and fair disclosure and auditor independence are addressed as important aspects of securities regulation. Research papers and assignments address technical and disclosure requirements of operating companies and mutual funds. Extensive use is made of web-based information including company and mutual fund sites and databases. Prereq: ACCT 301 or consent of instructor.

ACCT 444. Advanced Auditing Theory and Practice (3)
This course examines auditing concepts and issues in depth. A special focus exists on audit evidence and how auditors make decisions. Some topic areas include ethics, analytical review, fraud, and the role of technology. Prereq: ACCT 314 or permission of instructor.

ACCT 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ACCT 520. Advanced Accounting Theory (3)
This course studies contemporary issues in financial accounting theory and business reporting. Topics are considered from their historical development to contemporary circumstances. Academic and professional literatures are employed to gain a variety of perspectives on current matters. The development of communication skills, written and verbal, and use of support technology for presentations is emphasized throughout. Students are required to make several individual and team presentations, to conduct data base and periodical research and to provide frequent written and oral research reports. Prereq: ACCT 304 or consent of instructor.
ACCT 540. Contemporary Accountancy Policy (3)
This is a seminar on subjects of contemporary concern to the profession of accountancy which are currently being analyzed and debated by professional bodies and the academic community. These subjects involve the role of the profession in society, and the appropriate execution of that role. Some of the potential topics are government oversight in the profession, competitive pressures, independence, scope of services, and education/competency issues. The seminar provides a participative understanding of the press of society on the accounting profession. Prereq: ACCT 405 and ACCT 520.

ACCT 601. Special Problems and Topics (1-18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

ACCT 701. Dissertation Ph.D. (1-18)
ACCT 703. Dissertation Fellowship (1-8)

Department of Banking and Finance
Peter Ritchken, Chair
Tedda Nathan, Department Administrator
(216-368-2040)

FACULTY
Peter Ritchken, Ph.D. (Case Western Reserve)
Chair and Professor of Banking & Finance: Kenneth Walter Haber Professor of Finance: Professor of Operations
Mohsen Anvari, Ph.D. (Case Western Reserve University)
Professor of Banking and Finance
Anurag Gupta, Ph.D. (New York)
Assistant Professor of Banking and Finance
Joonghyuk Kim, Ph.D. (Illinois)
Assistant Professor of Banking and Finance
C.N.V. Krishnan, Ph.D. (Wisconsin)
Assistant Professor of Banking and Finance
Ralitsa Petkova, Ph.D. (Rochester)
Assistant Professor of Banking and Finance
Kasturi Rangan, Ph.D. (Florida)
Assistant Professor of Banking and Finance
J. B. Silvers, Ph.D. (Stanford)
Professor of Banking and Finance; Elizabeth M. & William C. Treuhaft Professor of Health Systems Management
Aja Singh, Ph.D. (Iowa)
Associate Professor of Banking and Finance
Sam Thomas, Ph.D. (Wharton)
Senior Lecturer, Banking and Finance

BANKING AND FINANCE (BAFI)

Undergraduate Courses
BAFI 341. Money and Banking (3)
This course emphasizes the importance of financial markets, the nature and role of the financial system, and the linkages between these—money and banking—and the economy. Emphasis is placed on both theoretical and practical constructs, on major innovations and contemporary changes, and the closely intertwined condition of financial and economic systems with monetary and fiscal policy. Prereq: ECON 103. Cross-listed as ECON 341.

BAFI 342. Public Finance (3)
(See ECON 342). Prereq: ECON 102. Cross-listed as ECON 342.

BAFI 355. Corporate Finance (3)
The basic goals of this course are to familiarize students with the concepts and tools used in financial management at both the corporate and personal levels. They include the notion of present value, securities valuation, risk and return analysis, and other financial analysis techniques. The concepts and techniques are, in turn, used to evaluate and make decisions regarding the firm’s investments (capital budgeting) and the cost of capital. Prereq: ACCT 202.

BAFI 356. Investments (3)
This course is about investing in securities. It provides a comprehensive introduction to security analysis and portfolio management. Investing is a rational decision-making process in which the investor seeks to select a package or portfolio of securities that meets a predetermined set of objectives. Descriptive, institutional and quantitative decision-making methods are arranged in a cohesive framework of analysis of interest to the informed investor. Topics include modern portfolio theory, the relation between risk and return, efficient markets, bonds, and options, among others. Prereq: BAFI 355.

BAFI 357. Financial Modeling, Analysis and Decision Making (3)
This class explores financial problems found in business and reviews several methodologies for analyzing them. The course leverages the foundation learned in corporate finance but applies concepts learned to actual business problems. Students will be exposed to financial analysis of historical and projected financial statements using a variety of methods, including extensive modeling in Excel. In addition, students will be exposed to the case method in solving real-world financial problems. Approximately one quarter of the sessions will be conducted in the computer lab. Prereq: BAFI 355.

BAFI 359. Intermediate Corporate Finance (3)
This is the second course in the undergraduate corporate finance sequence with an emphasis on applications. It is a case-based course that will apply and amplify concepts developed in the first course (BAFI 355 Corporate Finance). The cases selected for BAFI 359 will cover, among other topics, cash budgets and working capital management, financial strategy, capital budgeting, capital structure/dividend policy concepts, public equity valuation/initial public equity offerings, leveraged buyouts, and mergers and acquisitions. Students will develop both conceptual and financial-modeling skills. Prereq: BAFI 355.

BAFI 360. Independent Study (1-18)
This course is offered for candidates undertaking reading in a field of special interest. Permission of department chair required.

BAFI 372. International Finance (3)
(See ECON 372.) Cross-listed as ECON 372.

Graduate Courses
BAFI 402. Financial Management I (3)
In this course, students are introduced to the basics of corporate finance, including the objectives, tasks, and decisions made by corporate financial managers. The course covers discounted cash flows, bond and stock valuation, cost of capital, capital budgeting, asset risk and return, and short-term and long-term financial management. Coreq: MBAC 415 or ACCT 401.

BAFI 403. Financial Management II (3)
This is a continuation of BAFI 402 and serves as a prerequisite for several advanced electives in banking and finance. Its purpose is to familiarize the student with the theory and application of additional models used in financial decision-making by corporations. Issues relating to efficient markets, dividend policy, capital structure, financing decisions, option pricing, leasing, and risk management are among the topics considered. In addition, special topics may include mergers and acquisitions, pension funds, and international financial management. Prereq: ACCT 401, BAFI 402 & QUMM 414 or MBAC 415, MBAC 416 & MBAC 414. Prereq or Coreq: ECON 403.

BAFI 404. Financial Modeling (1.5)
Financial Modeling is the practical skill that combines financial theory, business planning, forecasting, and sensitivity and simulation analysis to produce computer models that are useful for a variety of decision-making purposes. Prominent purposes include project and company valuation, strategic planning, cash planning, credit evaluation, and the tactical implementation of business plans. Financial Modeling is a threshold skill for several careers attractive to M.B.A. graduates, including investment banking, equity analysis and management, and corporate treasury. Financial Modeling is a 1.5 credit hour course designed for M.B.A. students who anticipate either internships or careers in the financial services industry or in corporate financial management. The course aims to develop students’ skills in implementing models that operationalize the core tools and concepts developed in other finance and accounting classes. Coreq: BAFI 403.

BAFI 420. Health Finance (3)
Exploration of economic, medical, financial and payment factors in the U.S. healthcare system sets the framework for the study of decisions by providers, insurers, and purchasers in this course. The mix of students from various programs and professions allows wide discussion from multiple viewpoints. Prereq: ACCT 401 or MBAC 415 or consent of instructor. Cross-listed as HSMC 420.

BAFI 422. Management of Financial Institutions (3)
This course applies the principles of financial management to financial institutions, especially commercial banks. The impact of monetary and fiscal policies and the changing regulatory, legislative, and technological environments are studied. Specific problem-solving techniques and decision-making are emphasized. Prereq: MBAC 416 or BAFI 402 or consent of instructor.

BAFI 423. Managerial Finance - E.M.B.A. (3)
Understanding the basics of valuation is the central organizing principle of this course. This first course in finance introduces the tools and methods employed in valuation of projects and securities like stocks and bonds. Valuation involves determination of (1) cash flows of the firm, project or financial assets and (2) the
discount rates that are used to compute the present values of the cash flows. Asset pricing models provide the underpinnings for the development of the discount rates. The material is synthesized in capital budgeting exercises which are cost-benefit analyses of capital project cash flows to evaluate whether they are value enhancing. We also introduce the basics of capital structure and dividend policy.

BAFI 424. Managerial Finance II-E.M.B.A. (3)
This course emphasizes theoretical and empirical issues pertinent to the fields of investment management, derivative assets, and international finance. The course will span the topics of modern portfolio theory, market efficiency, equity markets, debt markets, derivative assets, financial engineering and risk management, international financial markets, and others.

BAFI 426. Applied Security Analysis (3)
This is a course for those seeking an in-depth examination of equity investment decision. The course is funded by a grant and involves the continuing analysis, review and reinvestment of the funds in an actual portfolio dedicated to this course. There is active involvement with members of The Cleveland Society of Securities Analysts, including attendance at Corporate Investor Relations presentations. The course emphasizes the application of particular analytical models of stock selection. Prereq: BAFI 403, ECON 403, MBAC 414 or QMUM 414.

BAFI 428. Financial Strategy and Value Creation (3)
The intersection between the theory of perfect markets and the reality of market imperfections provides the basis for the exploration of value creation in this course. Opportunities in both product and financial markets are explored using case studies to develop a framework for strategic financial decisions. Prereq or Coreq: BAFI 403.

BAFI 429. Investment Management (3)
This course explores the characteristics of financial investments and markets and develops modern techniques of investment analysis and management. The goal is to help students develop a level of analytical skill and institutional knowledge sufficient to make sensible investment decisions. Topics include: an overview of stock, debt and derivative asset markets, practical applications of modern portfolio theory, equilibrium and arbitrage-based approaches to capital market pricing, the debate over market efficiency, the term structure of interest rates, bond portfolio management, and uses of derivative assets in investment portfolios. Coreq: BAFI 403.

BAFI 430. Options and Futures (3)
This course is intended to give students an understanding of options and futures markets both in theory and practice. The emphasis is on arbitrage and hedging. The course concentrates on listed common stock and index contracts as well as commodity markets. Various theories for trading strategies are studied. Coreq: BAFI 403.

BAFI 431. Fixed Income Markets and Their Derivatives (3)
This class is concerned with fixed income securities, interest rate risk management, and credit risk. Fixed income securities account for about two thirds of the market value of all outstanding securities, and hence this topic is important. The course covers the basic products of fixed income markets, including treasury and LIBOR products, such as interest rate swaps. Risk management and hedging strategies are covered as well as selected topics in credit risk models and mortgage-backed securities. Prereq: BAFI 430.

BAFI 432. Risk Management and Financial Engineering (3)
This is a risk management course aimed at developing an understanding of the risks faced by financial and nonfinancial firms, learning techniques to identify and measure these risks, and understanding how financial engineering (especially derivatives) can be used to manage these risks and advance the strategic goals of the firm. Main topics include Value-at-Risk (VaR) techniques and implementation of VaR systems (RiskMetrics, Delta-normal, Historical Simulation, Structured Monte-Carlo); financial risk measurement and management using forwards, futures, options, swaps, and exotics; and credit risk management, including implementing various credit risk and credit VaR models, estimating capital at risk, and using credit derivatives for managing credit risk. Several classes are devoted to discussing recent risk management debacles and relating them to theory. Prereq or Coreq: BAFI 430.

BAFI 440. Advanced Corporate Finance (3)
This course exposes the students to a more in-depth treatment of some of the topics covered in BAFI 403 and introduces them to new topics. Topics include investment decisions, financing decisions, payout decisions, contracting decisions and performance metrics, internal control systems, risk management, real options, diversification and valuation. Topics covered may vary from semester to semester. Prereq: BAFI 403.

BAFI 441. Global Banking (3)
Financial institutions currently operate in a ‘global’ market place owing to recent changes in regulation, market integration and political action. This course will provide an understanding of the role banks play in the financial system and thus facilitate a comparative analysis of banking systems across the globe (Japan, Korea, Latin America, South Asia and United States). The effect of recent changes in the banking environment on the provision of services like loan origination, underwriting, insurance, and asset management will also be covered. The final part of the course will focus on the anatomy of financial crises, their origins and their effects. In particular, the recent crises in East Asia and Argentina will be used as case studies. Prereq: BAFI 402 or MBAC 416. Coreq: BAFI 403.

BAFI 445. Money and Capital Markets (3)
This course provides an examination of the current structure, pricing, competition and financial innovations in money and capital markets. Theory is coupled with contemporary events to study the impact of the secular rise and cyclical variability of interest rates, the proliferation of financial instruments, deregulation and the wider competition in financial markets. Individual segments of the money market such as the commercial paper and acceptances markets are examined, as are capital market segments such as the various bond markets, mortgages and derivative instruments. Prereq: ACCT 401 or MBAC 415, MBAC 416 or BAFI 402, ECON 403 or MBAC 426 and QMUM 414 or MBAC 414.

BAFI 450. Mergers and Acquisitions (3)
This course examines the economic rationale and motivation for the different merger and acquisition and recapitalization activity undertaken by firms and individuals in the U.S. market. Emphasis is on the comparable publicly traded proxy company, comparable “change of control” transaction, and discounted cash flow methods of valuing a firm. The class will also review the different types of debt and equity capital employed to fund mergers and acquisitions and recapitalizations, how senior lenders and equity investors structure their loans and/or investments, and how investors realize the gains through different exit strategies. The legal and tax ramifications of various forms of M&A activity are also discussed. The course gives the student an excellent understanding of the role that senior commercial banks, insurance companies, pension funds, LBO funds, investments banks, and venture/growth capital investors play in mergers and acquisitions and will strengthen the student’s ability to value a business enterprise. Prereq: BAFI 403.

BAFI 460. Investment Banking (3)
This course covers the role of the investment banker as a strategic financial advisor, primarily to corporate clients. The course is divided into three sections, roughly equal in length: (1) industry structure, key players, services and strategies, (2) the capital acquisition process, with a particular focus on initial public equity offerings, and (3) mergers and acquisitions, with a focus on advising financial and strategic buyers and financing these transactions. Students will gain extensive experience in applying financial models that support valuations in various markets. Prereq: BAFI 403 or permission of instructor.

BAFI 470. Finance, Law and Corporate Governance (3)
Motivated by recent financial crises and by countries’ attempts to remake their financial systems, financial economists and legal systems for the development of securities markets, banking systems, accounting standards, dispersed share ownership, and even economic growth. Some of the research shows directly how law, ownership, boards and management compensation all play interconnected roles in corporate governance. Other strains of this research examine the importance of law for specific financial outcomes related to corporate governance, including venture capital, takeovers and corporate control securities trading, and the value added (or destroyed) by business lawyers’ activities. This seminar will use readings, presentations, discussion, and writing to learn about these matters. Prereq: BAFI 402 or MBAC 416 or LAWS 293. Coreq: BAFI 403 (fall). Cross-listed as LAWS 074.

BAFI 480. International Financial Management (3)
This course introduces students to international finance and foreign exchange risk management by corporations. Topics include foreign exchange markets and international financial institutions; FX contracts; exchange rate risk and corporate risk management; and international aspects of long-term financing. Prereq: BAFI 403.

BAFI 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

BAFI 601. Special Problems and Topics (1-18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

(BIOS)

BIOS 424. Innovations, Markets, and Organization in Pharmaceutical Industry (3)
(See ECON 424.) Cross-listed as ECON 424.

BIOS 445. Business Development in the Bioscience Sector (1.5)
(See ENTP 445.) Cross-listed as ENTP 445.
BIOS 446A. Venture Law (2.5)
This course will provide an overview of the legal issues associated with venturing in the life sciences. The course will cover the legal aspects of company formation, management of intellectual property, strategic alliances, compensation, and securities laws. Prereq: Full time M.B.A. status. Cross-listed as ENTP 446A.

BIOS 446B. Venture Law (3)
This course will provide an overview of the legal issues associated with venturing in the life sciences. The course will cover the legal aspects of company formation, management of intellectual property, strategic alliances, compensation, and securities laws. Prereq: Evening M.B.A. status. Cross-listed as ENTP 446B.

BIOS 447. Regulatory Affairs for the Biosciences (1.5)
(See IIME 447.) Cross-listed as IIME 447.

BUSINESS LAW (BLAW)

Undergraduate Course
BLAW 331. Legal Environment of Management (3)
This course is designed as a survey course in the area of basic business law. It covers the fundamental legal principles and laws that underlie any business decision. The major topics include: contracts, the Uniform Commercial Code (sales), torts, real and intellectual property, business organizations, Securities Regulation and Agency.

Graduate Courses
BLAW 417A. Legal Environment for Managers - E.M.B.A. (2)
This course will provide an overview of the legal environment in which business transactions take place. Through coverage of a number of topical areas, the student will be given a broad understanding of how the law impacts upon the daily decisions of managers. More specifically, the student will be better able to identify and understand how the legal issues facilitate or hinder the conduct of business. Topics covered will include contracts, property, products' liability, employment law, and corporate law. Special emphasis is placed on those regulatory areas of greatest interest to modern business.

BLAW 417B. Legal Environment for Managers - M.B.A. (3)
This course will provide an overview of the legal environment in which business transactions take place. Through coverage of a number of topical areas, the student will be given a broad understanding of how the law impacts upon the daily decisions of managers. More specifically, the student will be better able to identify and understand how the legal issues facilitate or hinder the conduct of business. Topics covered will include contracts, property, products' liability, employment law, and corporate law. Special emphasis is placed on those regulatory areas of greatest interest to modern business.

Department of Economics

Peter B. Lewis Building
James Rebitzer, Chair
Phone 216-368-5537; Fax 216-368-5039

Faculty

Eric Bettinger, Ph.D. (Massachusetts Institute of Technology)
Assistant Professor of Economics
Bo Carlsson, Ph.D. (Stanford University)
E. Mandel DeWinds Professor of Industrial Economics; Director of Ph.D. Programs and Research,
David J. Cooper, Ph.D. (Princeton University)
Associate Professor of Economics
Avi Dor, Ph.D. (City University of New York)
John R. Mannix Blue Cross & Blue Shield Associate Professor of Health Care Economics
Robin Dubin, Ph.D. (Johns Hopkins University)
Associate Professor of Economics, University Marshal
Asim Erdilek, Ph.D. (Harvard University)
Professor of Economics
Susan Helper, Ph.D. (Harvard University)
Professor of Economics
James B. Rebitzer, Ph.D. (University of Massachusetts)
Frank Tracy Carlton Professor of Economics, Chair of Economics Department
Mari Rege, Ph.D. (University of Oslo, Norway)
Assistant Professor of Economics
Scott Shane, Ph.D. (University of Pennsylvania)
Professor of Economics
Robert L. Slonim, Ph.D. (Duke University)
Associate Professor of Economics
Marcus Stanley, Ph.D. (Harvard University)
Assistant Professor of Economics
Mark Votruba, Ph.D. (Princeton University)
Assistant Professor of Economics

Secondary Appointments

Dennis Young, Ph.D. (Stanford University)
Professor of Nonprofit Management, Mandel School of Applied Social Sciences; Professor of Economics

Bachelor of Arts in Economics

Economics is concerned with the problems of allocating scarce resources to meet human needs. Students who study economics gain an understanding of how consumers (households), producers (firms), and governments make decisions affecting the allocation of resources and, therefore, a society’s economic performance. Economics also involves an examination of how the interaction of these decisions in markets and in the political process produces certain outcomes and how legal and institutional arrangements can influence these outcomes. Finally, the study of economics leads to a better appreciation of the ways in which trade, investment and the movement of people and information across national boundaries tie the global economy together.

An undergraduate major in economics provides an excellent preparation for a variety of professional careers, such as management, law, and government service. A major is essential for those wanting to pursue graduate work in economics.

Major (for B.A. degree)
A major in economics consists of 33 hours. It leads to the Bachelor of Arts degree.

Degree Requirements

Core Theory
ECON 102 and 103
STAT 207 or STAT 243
ECON 307
ECON 308 or 309
ECON 326

Electives
15 ECON credits (at least 6 credits in each of two concentrations)

Senior Capstone (0-6 credits)
Required, to be chosen from a menu of options and in coordination with your major advisor

Economics Concentrations

Resources & Markets
ECON 255 - Economic History of the United States
ECON 332 - Economics of Labor Markets
ECON 341 - Banking and Finance
ECON 368 - Environmental Economics

Industrial Organization
ECON 328 - Experimental Economics
ECON 329 - Game Theory
ECON 361 - Managerial Economics
ECON 369 - Economics of Technological Innovation and Entrepreneurship

Public Economics
ECON 342 - Public Finance
ECON 343 - Economics of State and Local Governments
ECON 345 - Public Choice
ECON 377 - Economics of Nonprofit Organizations
ECON 378 - Health Care Economics
ECON 386 - Urban Economics

International Economics
ECON 372 - International Finance
ECON 373 - International Trade
ECON 375 - Economics of Developing Countries

Minor (for B.A. or B.S. degree)
A minor in economics consists of 15 hours, as follows:
ECON 102, ECON 103, and three additional economics courses (9 hours) selected in consultation with the minor advisor, with at least two of the courses in one concentration.

Social Science Sequence (for B.S. based upon Engineering Core Curriculum)
The sequence requirement is satisfied by taking ECON 102, ECON 103, and one other 200- or 300-level ECON course.

Social Sciences/Social Institutions Requirement (for B.A. or B.S. degree based on Arts and Sciences General Education Requirements)
The three-credit minimum may be satisfied by taking any one of the courses below. The six-credit sequence may be satisfied by taking any two of the courses listed below:
ECON 102, ECON 103, or ECON 205.

ECONOMICS (ECON)

Undergraduate Courses
ECON 102. Principles of Microeconomics (3)
This course is an introduction to microeconomic theory, providing a foundation for future study in economics. It addresses how individuals and businesses make choices concerning the use of scarce resources, how prices and incomes are determined in competitive markets, and how market power affects the prices and quantities of goods available to society. We will also examine the impact of government intervention in the economy.

ECON 103. Principles of Macroeconomics (3)
While Microeconomics looks at individual consumers and firms, Macroeconomics looks at the economy as a whole. The focus of this class will be on the business cycle. Unemployment, inflation and national production all change with the business cycle. We will look at how these are measured, their past behavior and at theoretical models that attempt to explain this behavior. We will also look at the role of the Federal Government and the Federal Reserve Bank of the United States in managing the business cycle.

ECON 205. Economic Perspectives (3)
This course examines important contemporary and historical issues from an economic perspective. It enables students to think about the world "like an economist." Possible topics of current interest include the transformation of Eastern Europe, ethnic and racial strife, environmental policy and sustainable development, and professional sports.

ECON 255. The Economic History of the United States (3)
(See HSTY 255.) Cross-listed as HSTY 255 and PLCY 255.

ECON 307. Intermediate Macro Theory (3)
Macroeconomics studies aggregate indicators of the performance of an economy, most commonly measured in terms of GDP, unemployment rate and inflation rate. An important goal of macroeconomic researchers is to develop a model of an economy that is simple, yet powerful enough to explain the historical trends of these aggregate economic indicators. Needless to say, coming up with a good model has remained a very difficult task. So far, there is no single model that is good enough to coherently explain even the most prominent historical trends of aggregate economic indicators. But several models have been built, each offering insight into a certain aspect of the economy. Throughout the course model building is motivated by real world cases from the American economy. Prereq: ECON 103.

ECON 308. Intermediate Micro Theory (3)
This class will give you an overview of microeconomic theory, which forms a basis for much of economic analysis. The main focus of the class will be theoretical, in order to give you a solid foundation for future study in virtually any other field of economics. This includes the theory of how consumers decide what to consume and how firms decide when to stay in business, and how much to produce at what price. Note: a student cannot receive degree credit for both ECON 308 and ECON 309. Prereq: ECON 102.

ECON 309. Intermediate Micro Theory: Math Based (3)
This course will cover the same topics covered in Economics 102: theory of the consumer, theory of the firm, markets and government intervention in the mar-ket. However, we will cover these topics in more detail and we will use calculus in our analysis. You should come away from this course with a greater understanding of how consumers and firms make their decisions and how they interact in the market place. Note: a student cannot receive degree credit for both ECON 308 and ECON 309. Prereq: ECON 102; MATH 121 or MATH 125.

ECON 326. Econometrics (3)
Econometrics is the application of statistics to empirical economic analysis. One way of testing the validity of economic theories is to gather data and apply statistical tests to see if the data support the theory. These data are usually gathered by observing actual economies, firms and consumers, rather than by performing experiments in a laboratory. Because economic analysts lack the precision and control of the laboratory, they must compensate by adjusting their statistical procedures. In this class, we will concentrate on regression analysis, which is the basic tool of the economic researcher. We will study the assumptions commonly made in the application of this technique, the consequences of violating these assumptions, and the corrections that can be made. Students will have a chance to formulate and test their own hypotheses using econometric software available for personal computers.

ECON 328. Experimental Economics (3)
This course introduces students to the methods of studying Economics using laboratory experiments and to examine some of the major insights that have been gained through experiments and to examine some of the major insights that have been gained through experimental economics. Students will examine the three related branches of experimental economics: market institutions, game theory, and individual choice problems. The course presents known robust findings from the past 50 years of experimental economics, some of which conform tightly with economic theory while others have led to significant modifications in the way economists view markets and behavior. Prereq: ECON 102.

ECON 329. Game Theory: The Economics of Thinking Strategically (3)
The term "game theory" refers to the set of tools economists use to think about strategic interactions among small groups of individuals and firms. The primary purpose of this course is to introduce students to the basic concepts of game theory and its applications. The class will stress the use of game theory as a tool for building models of important economic phenomena. The class will also include a number of experiments designed to illustrate the game theoretic results, and to highlight how reality may depart from the theory. The course will stress the value of thinking strategically and provide students with a framework for thinking strategically in their everyday lives. Rather than ap-proaching each strategic situation they encounter as a unique problem, students will be taught to recognize patterns in the situations they face and to generalize from specific experiences. Prereq: ECON 102.

ECON 332. Economic Analysis of Labor Markets (3)
This course is about the economics of work and pay. We will take a comprehensive look at labor markets in the U.S. and other advanced countries and examine related social policy issues. This will include the effect of unions on wages, the underpinnings of the income distribution of the U.S., issues of poverty and welfare, discrimination and wage differential by gender and
race, the relationship between work and family, education as a determinant of wages, and the way firms use wage and employment practices to motivate their employees to work productively. What makes labor economics special is that the commodity we examine is human labor, something that is central to the organization of our lives and the functioning of the economy. Labor economics thus applies the standard neoclassical model of demand, supply, and equilibrium to many areas that also have a profound human dimension. Prereq: ECON 102.

ECON 341. Money and Banking (3)
(See BAFI 341.) Prereq: ECON 103. Cross-listed as BAFI 341.

ECON 342. Public Finance (3)
Government intervention is a pervasive feature of every modern economy. The goal of this course is to develop the economic tools for understanding and evaluating a wide range of government behaviors such as taxation and redistribution policy, the public provision of goods and services, and the regulation of private markets. ECON 342 begins by considering "market failures" that justify government intervention in a market economy. To respond to such failures, governments must raise revenues through taxation. Using the tools of microeconomic theory, we will develop a framework for thinking about the positive and normative effects of alternative forms of taxation. Particular attention will be paid to the individual income tax in the U.S., allowing students to understand the efficiency, distributional and behavioral implications of recent changes in the tax code. We will then turn to the expenditure side of the public sector. The economic principles used to evaluate public expenditures will be discussed and exemplified through the analysis of significant public programs. Of particular interest will be the effect of public programs on the incentives faced by workers and families. Prereq: ECON 102. Cross-listed as BAFI 342.

ECON 343. Economics of State and Local Governments (3)
This course uses economic analysis to gain insight in the U.S. system of state and local governments. In the case of local governments, unlike the familiar case of the U.S. government, people often display their displeasure with the government's actions by leaving rather than by voting against the incumbents. A careful consideration of the circumstances under which people will choose "exit" (moving out) over "voice" (voting) is central to the course. We'll also examine economic theories of why people vote and how people vote. We consider a broad range of policy issues. Among them are school finance, zoning, local government economic development policies, lotteries, and affordable housing policy. Of course, we also analyze the full range of state and local government taxes, including the property tax, personal income tax, and sales tax. Prereq: ECON 102 or consent of instructor.

ECON 345. Public Choice (3)
This course covers economic theory and empirical analysis of the behavior of politicians, bureaucrats, and voters based on the assumption of rational pursuit of self-interest. Comparison with other approaches to the study of political behavior, and implications of alternative collective decision procedure. Prereq: ECON 102 and ECON 103.

ECON 361. Managerial Economics (3)
This course explores the economic principles that underlie strategic decisions in firms. Topics include the determination of vertical and horizontal boundaries of firms, strategic positioning and the sources of competitive advantage. Prereq: ECON 102.

ECON 364. Competition and Public Policy (3)
This course covers alternative market structures and their performance in terms of profit, prices, and productivity, as well as antitrust laws and regulations and their importance to industrial organization. Prereq: ECON 102.

ECON 368. Environmental Economics (3)
This course will use economic theory as an aid to understanding environmental problems and their solutions. We will start with a study of the firm. Once we have developed an understanding of firms' incentives to pollute and overexploit natural resources, we will learn how various economic policies can change these incentives and thus prevent environmental degradation. Thereafter, we will evaluate the efficiency of these economic policies. Finally, we will apply our theoretical analysis to specific environmental problems. Prereq: ECON 102.

ECON 369. Economics of Technological Innovation and Entrepreneurship (3)
This course is designed to help students identify, evaluate, and obtain control over technological opportunities so they may successfully understand the challenges of starting new companies. The course focuses on four themes: 1) the source, discovery and evaluation of technological opportunities; 2) the process of organizing a new firm to produce new technology that satisfies the needs of customers; 3) the acquisition of financial and human resources necessary to exploit technological opportunities; and 4) the development of mechanisms to appreciate the returns from exploitation of technological opportunities. Prereq: ECON 102.

ECON 372. International Finance (3)
This course deals with open-economy macroeconomics and international financial markets, covering open-economy national income analysis, international macroeconomic policy coordination, exchange rate determination, foreign portfolio investment, and global financial crises. Prereq: ECON 102 and ECON 103. Cross-listed as BAFI 372.

ECON 373. International Trade (3)
This course deals with international trade theories and policies, covering gains from and patterns of trade, immigration, foreign direct investment, protectionism, multilateral trade liberalization, regionalism and the costs and benefits of globalization within as well as among nations. Prereq: ECON 102 and ECON 103.

ECON 375. Economics of Developing Countries (3)
This course focuses on international aspects of economic development. The term "developing country" is often defined as a country that exhibits low per capita income, high poverty level, low level of industrialization, or low life expectancy. In terms of size, the developing countries make up at least three-fourths of the world population. Why do we study those countries' economies separately from the industrialized economies? In fact, low economic growth, high unemployment, or high poverty rates also exist in many developed countries. The differences lie not in the types of problems but in the causes of these problems. In addition, differences in the kind of institutions that prevail in developing countries also lead to different policy prescriptions. Among developing countries, differences in historical experience, cultural practices, political institutions and economic conditions are also enormous. Illustrations and explanations of those differences are provided from a wide range of developing countries. Prereq: ECON 102; ECON 103.

ECON 377. Economics of Nonprofit Organizations (3)
The purpose of this course is to familiarize students with the private nonprofit sector of the U.S. economy, with economic theory contributing to our understanding of this sector, and with the policy and management issues affecting nonprofit organizations. Topics include understanding the different types of nonprofit organizations; the size, scope and economic significance of the nonprofit sector; the different parts of the economy in which nonprofits operate; economic theories of why nonprofit organizations exist and how they behave; analysis of important trends such as commercialization and globalization of the sector and its changing relationships with government, and how the U.S. nonprofit sector compares with the third sector in other countries. Prereq: ECON 102.

ECON 378. Health Care Economics (3)
The health care industry is the fastest growing sector of the U.S. economy, with expenditures on health care now accounting for over 14% of total GDP. Because of its complexity and sheer size, the health care industry affects virtually every facet of the economy including labor productivity, income distribution and international competitiveness. The goal of ECON 378 is to apply the tools of economic analysis to develop students' understanding of health care markets and related public policy issues. The course begins with an overview of the health care system in the U.S. with attention to disturbing statistics that have inspired calls for reform. The remainder of the course is approximately divided between analysis of the consumer side of the health care market and analysis of the provider side. Throughout the course, proposals for reforming the health care system will be described and discussed. Prereq: ECON 102.

ECON 386. Urban Economics (4)
Microeconomic theory as taught in principles (and even intermediate) does not usually take into account the fact that goods, people, and information must travel in order to interact. Rather, markets are implicitly modeled as if everyone and everything is at a single point in space. In the first part of the course, we will examine the implications of spatial location for economic analysis. In the second part of the class, we will use microeconomic tools to understand urban problems. Topics that we will cover include urban growth, suburbanization, land use, poverty, housing, local government, transportation, education, and crime. Prereq: ECON 102.

ECON 397. Honors Research I (3)
ECON 398. Honors Research II (1-3)
Prereq: ECON 397.

ECON 399. Individual Readings and Research (1-6)
Intensive examination of a topic selected by the student.

Graduate Courses

ECON 403. Economics for Management (3)
This course surveys the basic principles of micro and macroeconomics. Topics covered in microeconomics include supply and demand, the theory of production and costs, market structures and factor markets. Macroeconomics topics are the national incomes accounts, the determination of national income, employment and inflation, fiscal and monetary policies and international trade.
ECON 415. Economic Analysis for Managers-E.M.B.A. (2)
This course, which is limited to students in the Executive M.B.A. program, explores the basic elements of the economic system which the executive needs to know in order to understand how the firm interacts with the system and how economic factors affect decision making.

ECON 421. Health Economics and Strategy (3)
This course has evolved from a theory-oriented emphasis to a course that utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and hospital mergers, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in health systems management. Prereq: ECON 403 or MBAC 426. Cross-listed as HSMC 421 and MPH 421.

ECON 424. Innovations, Markets, and Organization in the Pharmaceutical Industry (3)
The global pharmaceutical industry is one of the most profitable and fastest growing industries in the world. While the industry is dominated by a few large firms, smaller biotech startups are competing aggressively with new product development and management issues governing the industry. In addition to examining how pharmaceutical companies respond to competitive pressures, we will explore the role of government regulation in the development process and the role of insurance as a demand driver. Topics were chosen to benefit those wishing to gain a general familiarity with a view to consulting, as well as those seeking to enter the industry. Students taking this course may not receive credit for ECON 464 and ENTP 441. Open to Undergrads with permission. Cross-listed as HSMC 424, BIOS 424, and MPH 424.

ECON 431. Economics of Negotiation and Conflict Resolution (3)
Students frequently enroll in a negotiation class with one thought in mind—negotiating a better job offer from an employer. They soon learn, however, that negotiation skills can do far more than improve a pay check. Negotiations occur everywhere: in marriages, in divorces, in small work teams, in large organizations, in getting a job, in losing a job, in deal making, in decision making, in board rooms, and in court rooms. The remarkable thing about negotiations is that, wherever they occur, they are governed by similar principles. The current wave of corporate restructuring makes the study of negotiations especially important for M.B.A.s. Mergers, acquisitions, downsizing and joint ventures call into question well established business and employment relationships. Navigating these choppy waters by building new relationships requires negotiation skills.

ECON 436A. Economics of Organizations-E.M.B.A. (2)
Dramatic changes in technology, work force demographics and economic competition are forcing firms to rethink their internal organization. Implementing new internal strategies is remarkably hard for organizations and managers to do. This class is designed to provide the economic tools that managers need to understand why their organizations are the way they are and why change can be as difficult as it is important. This course focuses on two elements of a firm's internal strategy: structuring incentives and investing in relationships. In the incentives section, we analyze how organizations allocate decision rights, evaluate performance, and implement motivation strategies. In the relationships section, we analyze how organizations sustain functional, long-term relationships in competitive or conflictual environments. A small number of surprisingly simple economic models, it turns out, offer important insights into incentive design and investments in long-term relationships.

ECON 436B. Economics of Organizations-M.B.A. (3)
Dramatic changes in technology, work force demographics and economic competition are forcing firms to rethink their internal organization. Implementing new internal strategies is remarkably hard for organizations and managers to do. This class is designed to provide the economic tools that managers need to understand why their organizations are the way they are and why change can be as difficult as it is important. This course focuses on two elements of a firm’s internal strategy: structuring incentives and investing in relationships. In the incentives section, we analyze how organizations allocate decision rights, evaluate performance, and implement motivation strategies. In the relationships section, we analyze how organizations sustain functional, long-term relationships in competitive or conflictual environments. A small number of surprisingly simple economic models, it turns out, offer important insights into incentive design and investments in long-term relationships.

ECON 441. Economics of Financial Intermediation (3)
Institutions such as commercial banks, investment banks, insurance companies, and mutual funds perform important financial intermediation roles in an economy. This course provides a conceptual framework that allows the exploration of how these financial institutions perform their intermediation role through their different activities, such as loan origination, underwriting, insurance, and asset management. This framework also lends itself to the study of how and why regulation can be critical in ensuring the safety and soundness of the financial system. Prereq: ACCT 401, MBAC 416 or BAFT 402, ECON 403 or MBAC 426, and QM 414 or MBAC 414.

ECON 461. Managerial Economics (3)
This course explores the economic principles that underlie strategic decisions in firms. What determines their boundaries - i.e., Which activities do they expand, acquire and divest? What are the sources of competitive advantage, and how do firms position themselves strategically? Prereq: ECON 403 or MBAC 426.

ECON 462. E-Business and the New Economy (3)
This new economy course focuses on the following questions: What is this phenomenon variously called the digital economy, the global information economy, the new economy, or the networked society? How is it related to E-business or E-commerce? What are its most important features? What impact will it have on competition, business organization, and business strategy? What does it mean for businesses in Cleveland (U.S. vs. other countries)? Why is the stock market valuation of Procter and Gamble lower than that of companies that have been around for only a couple of years and never made a profit? Prereq: ECON 403 or MBAC 426.

ECON 464. Economic Perspective of Technology and Entrepreneurship (3)
This course is designed to help students to identify, evaluate, and obtain control over technology opportunities that they can successfully exploit by starting new companies. The course focuses on four themes: (1) the source, discovery, and evaluation of technological opportunities, (2) the process of organizing innovation to produce new technology that satisfies the needs of customers, (3) the different mechanisms available to appropriate the returns from the exploitation of technological opportunities, and (4) the differences between opportunities and approaches that are valuable and sustainable for independent entrepreneurs and large firms. Prereq: May not receive credit for ECON 424 and ENTP 441. Cross-listed as ENTP 464.

ECON 472. The World's Regions and Strategic Advantage (3)
This course will focus on business decisions in an increasingly complex regional and global economic environment and the significance of place in business success. Every company decision involves location—relocating, locating headquarters or an R&D lab, choosing where to invest, evaluating a merger, evaluating the investment portfolio of a bank, locating a new facility, and marketing your product. Topics include: high technology development, interpreting business climate indexes, the business location decision, sources of regional advantage, case studies of the world’s important cities, geographic clustering of industries, and business partnerships for improving regional economies. Prereq: ECON 403 or MBAC 426.

ECON 474. International Trade (3)
This course deals with the causes and effects of international trade and investment. Its coverage includes the global and regional commercial agreements and institutions that affect the international business environment. The European Union, the North American Free Trade Agreement, and the World Trade Organization are treated extensively. Prereq: ECON 403 or MBAC 426.

ECON 475. International Finance (3)
This course covers the global financial markets that multinational corporations, government agencies, and banks use in conducting business. These financial markets include the market for foreign exchange, the Eurocurrency and related money markets, the Eurobond and global equity markets, the commodity markets, the markets for forward contracts, options, swaps, and other derivatives. Prereq: ECON 403 or MBAC 426.

This course deals with the fundamentals of business activities that cross national boundaries. It focuses on not only exports and imports, but all other issues, such as foreign direct investment, international technology transfer, organizational structure, and financial management, that required a corporate strategy in establishing and maintaining global competitiveness.
It covers the basic international business activities within an interdisciplinary framework, drawing from economics, finance, accounting, marketing, organizational behavior, political science, and history. Its aim is not only to enable an understanding of such technical issues as how the effects of tariffs and quotas differ or how foreign exchange rates are determined, but also to provide a systemic view of how government policies and corporate strategies interact in changing the environment of international business. The basic premise of the course is that to formulate successful global corporate strategies, we must comprehend and cope with the political, cultural, and economic environment of international business.

ECON 482. High-Tech Regions and Business Strategy (3)
Many regions of the world seek to emulate Silicon Valley’s success as a high-tech center. These include Taiwan, Israel, India, Britain, Cote d’Azur (“Europe’s California”), Pyramid Technology Park of Egypt, and Malaysia. A region’s innovation system serves as both a source of strategic advantage for high-tech companies and as a critical infrastructure for supporting the development and use of new technology by a region’s companies and industries. In this course we look at what makes Silicon Valley so successful as a high-tech region, and whether it can be used as a model for high-tech development in other countries and regions. We examine alternative systems of innovation in other regions of the world and the U.S., including older industrial regions. Countries and regions will be selected depending on class composition. The class will focus on the critical ingredients that form a regional innovation system and their effect on the performance of companies and industries. Prereq: ECON 403 or MBAC 426 or equivalent.

ECON 486. Value Creation through Real Estate (3)
Introduction to economic analysis of real estate markets, with focus on development of urban land. Introduction to financial instruments used in development, and to the role of government in facilitating and constraining the use of real property. Prereq: MBAC 426 or ECON 403 or equivalent.

ECON 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ECON 525. Advanced Microeconomic Theory (3)
This course will give students an introduction to microeconomic theory at the Ph.D. level. Topics to be covered include consumer theory, the theory of the firm, general equilibrium (in other words, the theory of competitive markets), imperfect competition (models of Cournot oligopoly, Bertrand oligopoly, etc.), information economics (with focus on principal-agent problems), and auction theory. Students in the course will be expected to have a working knowledge of calculus. Some knowledge of constrained optimization and real analysis will be useful as well, although this is not required. While this is not a course in game theory, basic game theoretic concepts will be introduced to the extent they are necessary to understand the material. No previous background in economics will be assumed. Prereq: Ph.D. standing.

ECON 526. Advanced Econometrics (3)
This course focuses on the theoretical underpinning of multivariate regression analysis. The course also develops practical applications of econometric analysis. The course also introduces students to more advanced topics including discrete choice analysis, instrumental variables, and time-series methods.

ECON 601. Special Problems and Readings (1-18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

ECON 701. Dissertation Ph.D. (1-18)

ECON 703. Dissertation Fellowship (1-8)

Department of Marketing and Policy Studies

ECON 485. Special Problems and Readings (1-18)
This course offers, with permission, to students undertaking reading in a field of special interest. This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

ECON 701. Dissertation Ph.D. (1-18)

ECON 703. Dissertation Fellowship (1-8)

Division of Labor and Human Resource Policy

ECON 486. Value Creation through Real Estate (3)
Introduction to economic analysis of real estate markets, with focus on development of urban land. Introduction to financial instruments used in development, and to the role of government in facilitating and constraining the use of real property. Prereq: MBAC 426 or ECON 403 or equivalent.

ECON 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ECON 525. Advanced Microeconomic Theory (3)
This course will give students an introduction to microeconomic theory at the Ph.D. level. Topics to be covered include consumer theory, the theory of the firm, general equilibrium (in other words, the theory of competitive markets), imperfect competition (models of Cournot oligopoly, Bertrand oligopoly, etc.), information economics (with focus on principal-agent problems), and auction theory. Students in the course will be expected to have a working knowledge of calculus. Some knowledge of constrained optimization and real analysis will be useful as well, although this is not required. While this is not a course in game theory, basic game theoretic concepts will be introduced to the extent they are necessary to understand the material. No previous background in economics will be assumed. Prereq: Ph.D. standing.

ECON 526. Advanced Econometrics (3)
This course focuses on the theoretical underpinning of multivariate regression analysis. The course also develops practical applications of econometric analysis. The course also introduces students to more advanced topics including discrete choice analysis, instrumental variables, and time-series methods.
MGMT 413L). The focus is on enhancing individual as well as organizational performance and competitive advantage through “principled negotiation,” “win-win” bargaining; and collaborative approaches to bargaining. Concepts, strategies, and models of negotiation are drawn from social psychology, economics, labor, relations, and legal literature. Students will also be introduced to mediation (both as mediators and negotiators); to the complex art of advocacy and to the latest alternative dispute resolution (ADR) techniques. There is heavy reliance on role-play and simulations to introduce the main ideas developed in the course. There is no prerequisite for the course. The first week of the course is devoted to a review of concepts introduced in the 1.0 credit hour Negotiations Lab for students who have not taken it.

LHRP 435A. International Human Resources Management (1.5)
This course examines the unique challenges of managing Human Resources globally. Particular emphasis is on cultural and other contextual differences, and their influence on other HR practices such as selection, training, performance management, compensation, and union relations. The course establishes a conceptual foundation in cross-cultural cognitive and behavioral differences. Heavy emphasis is on case analysis. There is no formal prerequisite, but it is recommended that students have either completed, or are taking concurrently, the Human Values in Organizations course (MBAC 413 or MGMT 413) or LHRP 421.

LHRP 435B. International Human Resources Management (2)
Same as LHRP 435A except that students enrolling in the 2.0 credit version of the course will select a particular region or country (other than the one where they hold citizenship) and develop an independent analysis of particular advantages and challenges facing the human resource manager assigned to this country or region. The instructor may approve alternative projects.

LHRP 440. Human Resources Policy for Executives-E.M.B.A. (2)
This course focuses on managing human resources from the viewpoint of the general or line manager. It considers strategic, practical and legal aspects of hiring, performance appraisal, grievance systems, pay systems, worker participation and unions. Some emphasis is given to the enhancement of negotiating skills to improve outcomes for all organizational participants. This course is limited to students in the Executive M.B.A. program.

LHRP 445. Compensation and Benefits (3)
Strategic management of compensation and benefits for effective motivation of managers and employees is introduced through the use of cases and student development of a wage and salary system based on a live organization. Since government-mandated and voluntary benefits comprise a third of compensation, as well as organizational performance and competitive advantages, and their influence on other HR practices such as selection, training, performance management, compensation, and union relations. The course establishes a conceptual foundation in cross-cultural cognitive and behavioral differences. Heavy emphasis is on case analysis. There is no formal prerequisite, but it is recommended that students have either completed, or are taking concurrently, the Human Values in Organizations course (MBAC 413 or MGMT 413) or LHRP 421.

LHRP 451. Alternative Dispute Resolution (2)
(See LAWS 351.) Cross-listed as LAWS 351.

LHRP 501. Special Problems and Topics (5-18)
This course is offered, with permission, to students undertaking individual reading or research projects in a field of special interest.

LHRP 601. Special Problems and Topics (1-18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

LHRP 701. Dissertation Ph.D. (1-18)
LHRP 703. Dissertation Fellowship (1-8)

Division of Management Policy
Robert D. Hisrich, Head
Phone 216-368-5354; Fax 216-368-4785

FACULTY
John D. Aram, Ph.D. (Massachusetts Institute of Technology)
Professor of Management Policy; Director, Executive Doctor of Management Program
Sayan Chatterjee, Ph.D (University of Michigan)
Associate Professor of Management Policy
David L. Deeds, Ph.D. (University of Washington)
Associate Professor of Management Policy and Entrepreneurship
Steven P. Feldman, Ph.D. (The Wharton School, University of Pennsylvania)
Associate Professor of Management Policy
Robert D. Hisrich, Ph.D. (University of Cincinnati)
Professor of Management Policy; Mizra M. Chair of Entrepreneurship
Moren Levesque, Ph.D. (University of British Columbia)
Assistant Professor of Management Policy and Entrepreneurship
Leonard H. Lynn, Ph.D. (The University of Michigan)
Professor of Management Policy
Richard L. Osborne, M.S. (Case Western Reserve University)
Professor for the Practice of Management
Simon I. Peck, Ph.D. (University of Leeds)
Assistant Professor of Management Policy
Ernesto J. Poza, M.B.A., M.S. (Massachusetts Institute of Technology)
Professor for the Practice of Management
Vasudevan Ramanujam, Ph.D. (University of Pittsburgh)
Associate Professor of Management Policy

William S. Schulze, Ph.D. (University of Colorado at Boulder)
H.R. Horvitz Professor of Family Business; Assistant Professor of Management Policy and Entrepreneurship

Secondary Appointments
Peter Gerhart, J.D.
Professor of Law, Professor of Management Policy

MANAGEMENT POLICY (PLCY)

Undergraduate Courses
PLCY 200. Social and Political Environment of Management (3)
This course is concerned with the relationship between business activities and the broader social environment. Business is a part of society and has responsibilities and obligations beyond mere profit maximization. These responsibilities and obligations are those that fall on all citizens: to contribute to the health and well-being of our democracy and civil society. In this course, we will explore and debate these responsibilities and obligations in the context of a broad array of ideas and cases. Our goal will be to make some progress toward answering the question: “What is the right ethical responsibility of business, both inside and outside the organization, and how is it correctly implemented?”

PLCY 255. The Economic History of the United States (3)
(See HSTY 255.) Cross-listed as ECON 255 and HSTY 255.

PLCY 360. Independent Study (1-18)
Prereq: Consent of instructor.

PLCY 399. Business Policy (3)
This course uses case analysis to develop perspective and judgment on business problems through the integration of functional areas. Formulation, development, and implementation of organization goals and policies, the development of strategy in relation to the competitive environment, and applications of quantitative and behavioral decision-making techniques are examined. Prereq: Senior standing.

Graduate Courses
PLCY 401. SME Management in Europe (3)
The objective of the course is to develop understanding of SMEs and their institutional environment, particularly in the European context, to inspire entrepreneurial thinking and behavior, to enhance the ability to create and manage SMEs successfully.

PLCY 418. New Enterprise Development (3)
This entrepreneurship course teaches how to start and manage one’s own business. Valuation, capital acquisition, turnovers and growth strategies are featured, utilizing successful entrepreneurs and their companies to assure a real world learning experience. Cross-listed as ENTP 418.

PLCY 419. Entrepreneurship and Personal Wealth Creation (3)
Course explores the accumulation of personal wealth utilizing entrepreneurial strategies. The underlying competencies of successful entrepreneurs are identified and applied to individual lives of students. Active
entrepreneurs will be studied, and original case studies of start-ups and acquisitions provide the basis for class exercises. Cross-listed as ENTP 419.

PLCY 420. Managing the Family Firm (3) The vast majority of U.S. firms are family controlled and present special problems in strategic management including the interaction of family and firm objectives, executive succession, management development and motivation, finance, estate planning, etc. This course explores solutions to these problems in the context of guiding the firm’s growth through the threshold between personal and professional management. The course pedagogy is participative and experiential. Cross-listed as ENTP 420.

PLCY 422. Managing an Emerging Growth Enterprise (3) Students are exposed to what it is like to work in an emerging growth company with sales under $100 million. Prospective students might be individuals who are considering employment with middle market company, entrepreneurs who may start a company, or business persons who may buy a middle market company. The learning experience will stem from participating in an actual semester-long project. In-class discussions include: business planning, selling, managing technology transfer, and creativity/innovation, and guest presentations by CEOs from middle market companies. PreReq: ACCT 401 and BAFI 402 and MKMR 403 and MIDS 409 and consent of instructor. Cross-listed as ENTP 422.

PLCY 424. Advanced Principles of Entrepreneurship (3) This course will provide students with in-depth information on the entrepreneurial process by cross-cutting the stages of venture development with key functional business areas including marketing, operations, strategic planning, finance, and human resources. Each student will complete a practicum with a host company that consists of a weekly time commitment (work schedules will be set and agreed to by the course instructor, the host company and the student). PreReq: Approval of Robert Hisrich. Cross-listed as ENTP 424.

PLCY 425. Chief Executive Officer (3) This course is designed for students who aspire to become a chief executive officer. The unique role, responsibilities, and requirements of the CEO will be explored. Students will benchmark CEO best practices through exposure to leading chief officers, study the paths to and preparation for the top job, and develop a personal career strategy to increase their chances of becoming a CEO.

PLCY 426. International Entrepreneurship (3) This course introduces the area of international entrepreneurship by focusing on various aspects of this area. Topics to be covered include: conditions making small, medium-sized, and new ventures increasingly important in international business; information sources relevant to international entrepreneurship; critical steps in deciding on doing international entrepreneurship; strategic planning and methods in conducting international entrepreneurship; and benefits and problems of going international as a new venture. Cross-listed as ENTP 426.

PLCY 427. Entrepreneurial Strategy (3) This course focuses on the entrepreneurial process from a behavioral perspective by defining and developing the skills and behaviors necessary to be entrepreneurial in both the start-up and in the established firm setting.

From the readings, case material and from interviews, you will develop a definition of the skills and competencies of entrepreneurs. You will also focus on developing your own competencies through exercises and a personal assessment of your entrepreneurial strategy. Finally, you will acquire strategies that will promote innovative thinking, idea championing, and change in established firms. Cross-listed as ENTP 427.

PLCY 428. Small Enterprise Consulting (3) Student teams will apply their expertise and experience to solve a strategic problem for a small enterprise selected by COSE (Council of Small Enterprises). Teams are expected to meet with their client, manage the project workload, and provide a case report with recommendations. Cross-listed as ENTP 428.

PLCY 429. New Venture Creation (3) This course focuses on all aspects of creating a new venture from both an entrepreneurial as well as an intrapreneurial perspective. The primary focus of the course will be understanding all the aspects of the business plan both at start-up as well as growing the venture. This will involve understanding: sources of capital, the financial plan, the marketing plan, the organization of the venture, and the production plan all within the business plan framework. (Full) XLIST: ENTP 429.

PLCY 439. Intrapreneurship - Entrepreneurship within the Corporation (3) (See ENTP 439.) Cross-listed as ENTP 439.

PLCY 440. Entrepreneurial Finance (3) This course explores the financing of entrepreneurial new ventures. The primary focus for the course will be the various financing methods and mechanisms available to entrepreneurs. This will involve understanding: estimation of capital requirements, bootstrap financing, angel investors, venture capitalists, private placements, firm valuation and initial public offerings. Cross-listed as ENTP 440.

PLCY 441. Technology-Based Entrepreneurship (3) This course seeks to equip students with the skills and factual information they need to create viable businesses in the face of such dynamism and uncertainty. We will develop skills to assess the viability of technology-based opportunities. We will also examine the elements of strategic analysis and positioning for competitive advantage in dynamic markets. Finally, we explore how entrepreneurs can create and structure the internal resources of the firm in order to exploit market opportunities and grow. While technology-based entrepreneurs often focus on technology and product-related issues, lack of attention to the creation, organization, and protection of internal resources can be a key inhibitor of growth. PreReq: May not receive credit for ECON 424 and ECON 464. Cross-listed as ENTP 441.

PLCY 445. Business Development in the Bioscience Sector (1.5) (See ENTP 445.) Cross-listed as ENTP 445.

PLCY 446. Business Development in the Healthcare Sector (1.5) Cross-listed as ENTP 446.

PLCY 450. Challenges to U.S. Management from East Asia (3) Examination of the Japanese, Chinese, and other East Asian business systems. Looks at how the business systems relate to broader social, economic, and political contexts. Compares the different systems with each other and with that of the United States. Inquires into the reasons for the past successes and recent problems of these systems.

PLCY 451. Development and Implementation of Global Strategy (3) World events have radically altered the business environment as well as the structure and decision making of business throughout the world. Businesses today must increase their awareness of the influence of international events and activities on their future and establish and conduct transactions in other countries. While businesses become international for such reasons as a desire for continued growth, domestic market saturation, the opportunity to exploit some new technological advantage, the dominant reason relates to performance, as there is a correlation between improved performance and the degree of internationalization and the extent that this internationalization is focused through a well-formulated global strategy, the substance of this course.

PLCY 471. Innovation and Intrapreneurship (3) This course is designed to acquaint students with the ongoing innovation process in an organization. Through in-depth participation and observation of an innovation in an area organization, students develop an understanding of what leads to entrepreneurial activity and the analytical skills to evaluate and design managerial processes for innovation. Cross-listed as ENTP 471.

PLCY 472. Strategic and Organizational Issues in the Management of Technology (3) This course addresses a wide variety of strategic and organizational issues that confront firms in technology-intensive environments. Although the emphasis is on firms in the private sector, public policy issues will be covered where appropriate. The course covers five broad themes: (1) managing firms in technology-intensive industries, (2) linking technology and business strategies, (3) using technology as a source of competitive advantage, (4) organizing the firm to achieve these goals, and (5) implementive technology in organizations. Case studies and participation in class discussions are stressed. In addition, students analyze actual situations in organizations and summarize their findings and recommendations in an in-depth term paper. PreReq: BAFI 402 and ECON 403 and MKMR 403.

PLCY 473. E-Business Strategies (3) This course will develop a basic understanding of how e-commerce firms have developed a strategy for providing value to both suppliers and businesses. The course will build on the basic strategy frameworks that the students have learned in their course strategy classes. The pedagogy will involve short lectures and case discussions. Pre Req: MBAC 411 and MBAC 421.

PLCY 480. Management Policy and Strategic Planning I-E.M.B.A. (2) This course places the functional areas covered in the first year in the Executive M.B.A. program in a context of corporate objectives and works on problems involving the interaction of functional areas. This course is limited to students in the Executive M.B.A. program.

PLCY 481. Strategic Planning - E.M.B.A. (2) This course develops an understanding of the long-term strategic view of the firm. The ability to analyze types of business strategies and capabilities is emphasized. Readings and cases examine alternatives, including internal growth, acquisitions, divestitures, and other emerging forms of corporate development. This course is limited to students in the Executive M.B.A. program.
PLCY 490. Corporate Strategy (3)
This course is an advanced strategy course that explores the determinants of successful corporate strategy. In Strategy Issues and Applications you were exposed to the basic frameworks for developing successful competitive or business level strategy. Corporate strategy takes you to the next level and provides the framework you need to be able to be successful in multiple businesses. At its core corporate strategy constitutes any and all decisions that change the core business model of a firm. Examples are vertical integration, new but related product lines, entering new markets with existing products and entering new or existing markets with unrelated products. The fundamental premise of the course is that successful corporate strategy is rooted in competitive advantage arising from capabilities residing at the business unit level. Starting from analyzing business level strategies of very simple firms, the course successively builds frameworks towards more complicated business level strategies. Next, the course develops frameworks to discuss corporate strategy based around the concept of core competencies and market entry strategies. Finally, the course develops the concepts that are useful in the context of business issues and market entry strategies. Reading, debate and written analysis of cases is stressed. The course tends to be more varied and open-ended than functional area courses. Prereq: Completion of all other required M.B.A. courses.

PLCY 491. Strategy Issues and Applications (3)
This course focuses on the work of top managers in their roles as creator of value in organizations and society. The multiple skill requirements of top managers are stressed, particularly their leadership ability and their ability to develop and implement strategies for the long term in the face of environmental changes and domestic and global competitive threats and opportunities. The integration of functional areas such as marketing, finance, manufacturing and human resource management into a coherent and comprehensive analysis of the total organization is emphasized. Course requirements vary, but exercises such as computer simulations of whole industries, field projects involving contact with local organizations, and strategic analysis of firms or industries using in-depth library research are frequently used. The course is taught through the case method, and learning by discussion, reading, debate and written analysis of cases is stressed. Prereq: SIA MBAC 411 or its part-time equivalent MGMT 499.

PLCY 492. Business Strategy (3)
This course introduces methods of industry and competitive analysis. Industry structure and firm competitive behavior are studied with a view to develop business strategies for securing and preserving competitive advantage. Emphasis is placed on understanding industry dynamics and the processes by which industries undergo change and evolution. Emphasis is also placed on firms’ capabilities and core competencies and their capacity to implement major strategic changes in their industries. Readings and cases are the principal pedagogical tools utilized in this course. Students are required to analyze an industry of their choice in small project teams and present their analyses in class.

PLCY 498. Corporate Strategy: Marketing (3)
This course introduces the principal tools of strategy implementation, namely the design of organization structures, the use of formal planning and control systems, and the design of measurement and reward systems. The importance of organizational context (small vs. large, for profit vs. not-for-profit, manufacturing vs. service, etc.) and the need to tailor systems to the context of the organization are emphasized. New and emergent organizational forms and their role in strategy development and implementation are reviewed. Cases and readings are the principal pedagogical methods utilized. Students work in small project teams, study the operation and effectiveness of systems for strategic control in organizations, and present the results of their analysis in class presentations.

PLCY 499. Management Policy (3)
This course focuses on the work of top managers in their roles as creator of value in organizations and society. The multiple skill requirements of top managers are stressed, particularly their leadership ability and their ability to develop and implement strategies for the long term in the face of environmental changes and domestic and global competitive threats and opportunities. The integration of functional areas such as marketing, finance, manufacturing and human resource management into a coherent and comprehensive analysis of the total organization is emphasized. Course requirements vary, but exercises such as computer simulations of whole industries, field projects involving contact with local organizations, and strategic analysis of firms or industries using in-depth library research are frequently used. The course is taught through the case method, and learning by discussion, reading, debate and written analysis of cases is stressed. The course tends to be more varied and open-ended than functional area courses. Prereq: Completion of all other required M.B.A. courses.

PLCY 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

PLCY 502. Special Problems and Topics (1-18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

PLCY 701. Dissertation Ph.D. (1-18)

PLCY 703. Dissertation Fellowship (1-8)

Division of Marketing

N. Mohan Reddy, Head
Phone 216-368-2038 Fax 216-368-4785

FACULTY

Stanton G. Cort, D.B.A. (Harvard University)
Associate Professor of Marketing

Ellen Garbarino, Ph.D. (Duke University)
Assistant Professor of Marketing

Detelina Marinova, Ph.D. (University of Cincinnati)
Assistant Professor of Marketing

N. Mohan Reddy, Ph.D. (Case Western Reserve University)
Associate Professor of Marketing; Interim Associate Dean for Executive Education; Nancy and Joseph Keithley Professor in Technology Management

Jose Antonio Rosa, Ph.D. (University of Michigan)
Assistant Professor of Marketing

Jagdip Singh, Ph.D. (Texas Tech University)
Professor of Marketing

MARKETING (MKMR)

Undergraduate Courses

MKMR 301. Marketing Management (3)
This course covers key concepts and practices of marketing with emphasis on analysis and development of integrated marketing plans and programs that create customer value and competitive advantage in the world-wide marketplace. Prereq: ACCT 102.

MKMR 360. Independent Study (1-3)
This course is offered, with permission, to students undertaking reading and research in an area of their special interest.

Graduate Courses

MKMR 403. Managerial Marketing (3)
This course focuses on managing marketing as a process of creating value and mutually desirable exchanges of values. That is the foundation of a customer orientation and a central theme of market-driven management. Methods for strategic marketing planning, understanding buyer behavior, market analysis, segmentation and devising integrated marketing programs are introduced. Creating customer value and competitive advantage in worldwide markets is the central theme. Prereq: ACCT 401.

MKMR 405. Industrial/New Technologies Marketing (3)
This course focuses on concepts and practices of business-to-business marketing of products and services. It also examines how rapid technological change impacts industrial markets. Topics covered include: buyer-seller relationship building, competitive bidding, developing markets for new materials and value-based pricing strategies. Marketing to the government, marketing of intellectual property and marketing-R&D-manufacturing interface issues will also be explored. Prereq: MKMR 403 or MBAC 424.

MKMR 406. Sales Force Management (3)
The best laid plans of marketing managers must be implemented in the trenches by the field sales force. This course provides a conceptual framework and analytical tools to profitably manage a firm’s field sales force. It first focuses on assessing key sales force outcomes: productivity of investment in the sales force, performance of individual salespeople, and turnover. Students then examine how to structure, deploy, motivate and compensate the sales force to maximize individual performance, manage turnover and provide a solid return on sales force investment. Specific issues covered include design and management of selling teams and independent agents, national account management, and managing the relationship between the marketing department and the sales force. Prereq: MKMR 403 or MBAC 424.

MKMR 407. Supply Chain Management (3)
If you’re not on the shelf, you’re not in business. This course addresses managing the processes of getting products and service to market. It focuses on strategic and tactical management of the supply chain and distribution channels as value-adding networks. Topics include assessing the value creation potential of network members (suppliers, producers, distributors, dealers, and retailers), which of them should make key decisions and how they relate to each other. Emphasis is on communication throughout the marketing network to coordinate activity, provide appropriate compensation, and ensure the marketing program is implemented effectively at the customer level. Prereq:
MKMR 403 or MBAC 424 or MIDS 456. Cross-listed as OPMT 407.

MKMR 410. Marketing Research for Decision Making (3)
This course stresses the generation and use of marketing information for a range of managerial decisions, including identifying and defining marketing performance and improving understanding of marketing as a process. This course discusses contemporary approaches for defining marketing information needs, designing methods for information collection and making sense of obtained results. The course utilizes lecture/discussion, case analysis, and a field project to develop skills in defining and solving marketing problems. Prereq: Evening MBA students: QUMM 414 and MKMR 403. For full-time MBA students: MBAC 414 and MBAC 424 (or MBAC 424 as a coreq).

MKMR 411. Consumer Behavior (3)
This course addresses micro and macro issues in consumer behavior which are essential for managers seeking to analyze and influence consumer decision making. The course focuses on how consumer behavior analysis can be used to develop effective marketing strategies. This involves developing an understanding of consumer behavior from a variety of perspectives, identifying the major factors that influence how consumers process and learn, marketing communications, managing consumer satisfaction, and developing an understanding of purchase decision making and its implications for marketing strategy. Emphasis is placed on designing persuasion strategies, enhancing brand memory, consumer profiling, analyzing consumer trends, and customer relationship management. Prereq or Coreq: MKMR 403 or MBAC 424.

MKMR 411K. Marketing (3)

MKMR 412. E-Marketing (3)
Using a combination of lectures, cases, and hands-on projects, the course examines how the Internet influences all the key aspects of marketing, including marketing strategy, pricing, advertising, segmentation, marketing research, retailing, distribution channels, and international marketing. Additionally, the course will cover more Internet specific topics such as privacy, wireless web, sales force automation, and emarketplace models. The course incorporates both business-to-business and business-to-consumer outlooks.

MKMR 413. Services Marketing (3)
The service sector contributes to greater than 50% of the U.S. GNP and total employment. By all accounts, global markets are experiencing a strong surge in demand for services and there is increasing competitive intensity among service organizations. In contrast to consumer and industrial products, managing and marketing services pose unique challenges to managers and the service organization. These include understanding service customer needs, managing internal service quality, creating effective organizational blueprints for service delivery, and building organization and brand equity to create sustainable competitive advantages. These challenges are best overcome through a systematic and thoughtful study of services marketing and developing frameworks to guide strategy development and implementation. Prereq: MKMR 403 or MBAC 424.

MKMR 415. Managerial Marketing-E.M.B.A. (2)
This course focuses on the analysis, planning, and implementation of marketing strategies from middle and upper management perspectives. Key concepts and methods for the development of integrated marketing programs are introduced. This course is limited to students in the Executive M.B.A. program.

MKMR 420. Health Systems Marketing (3)
This course stresses the practical applications of marketing techniques to health care products and services. The major components of the industry and the interrelationships among health care customers, payers, providers and equipment suppliers are examined. Also addressed are ethical issues of health care marketing. Prereq: MKMR 403 or MBAC 424 or consent of instructor. Cross-listed as HSCM 422.

MKMR 421. Product and Brand Management (3)
Established products and brands typically provide the majority of firms’ earnings. If carefully managed, these products also are a significant source of growth and future earnings. This course focuses on the role of a Product/Brand Manager in profitably managing a firm’s existing offerings. Students identify areas for growth (or decline) within a firm’s mature product lines, devise ideas to capitalize on growth potential or address decline, develop and assess concrete marketing initiatives, and determine the financial impact of alternative plans. The course uses a combination of case analysis, lecture/discussion and guest speakers, allowing students to develop their repertoire of quantitative and qualitative marketing decision skills. Prereq: MKMR 403 or MBAC 424.

MKMR 425. Global Marketing (3)
This course addresses the process of marketing across political and cultural boundaries, within trade groups like the EC, NAFTA and ASEAN and under global trade systems like the WTO or GATT. Emphasis is on planning, programming and managing profitable marketing strategies for exporting, importing or in-country production. Topics include: comparative opportunity analysis, identification of key points where value is added, market entry strategies, in-country competition after entry, and worldwide strategies for various stages of multinational marketing involvement. Prereq: MKMR 403 or MBAC 424.

MKMR 430. Marketing Problem-Solving (3)
The objective of this course is to build skills for effective problem solving in practical, real-world marketing situations. Utilizing case studies, online databases and secondary data, the course focuses on contemporary analytical approaches that provide insights into, and clarify the underlying dynamics of marketing phenomenon. Marketing decisions discussed cover consumer and industrial marketing problems. This course is intended for students who are interested in data-based decision-making tools for solving marketing problems.

MKMR 450A. Entrepreneurial Marketing-E.M.B.A. (2)
This course addresses the entrepreneurial/intrapreneurial process of commercializing an idea for a market opportunity. Students select an opportunity and develop a deployable, one-year market entry program and a five-year strategic marketing program. Emphasis is on the entrepreneurial marketing decision process, including defining the business, defining the market, specifying customer perceived value, assessing competitive capability and advantage, identifying and properly using secondary and primary information, and deploying marketing programs throughout the organization and the supply chain. Prereq: Open to only E.M.B.A. students.

MKMR 450B. Entrepreneurial Marketing-M.B.A. (3)
This course addresses the entrepreneurial/intrapreneurial process of commercializing an idea for a market opportunity. Students select an opportunity and develop a deployable, one-year market entry program and a five-year strategic marketing program. Emphasis is on the entrepreneurial marketing decision process, including defining the business, defining the market, specifying customer perceived value, assessing competitive capability and advantage, identifying and properly using secondary and primary information, and deploying marketing programs throughout the organization and the supply chain. Prereq: MKMR 403 or MBAC 424. Cross-listed as ENTP 450.

MKMR 460. Marketing Communications Management (3)
This course provides a sound understanding of management of an organization’s total marketing communications. The focus is on identifying appropriate strategies and tactics for effectively communicating with end consumers and other stakeholders/publics, in order to manage the firm’s brand equity and its market, industry and societal positioning. Students examine the roles of advertising, sales promotion, point-of-purchase efforts, and public relations, and emerging direct marketing technologies. They work with developing and managing these elements as part of an overall, synergistic communications strategy. Marketing communications for ongoing as well as crisis situations are developed. Multiple perspectives on evaluation of the effectiveness of marketing communications are introduced. Topics addressed include: integrated marketing communications, brand equity management, corporate communications strategies, public relations management, and crisis management.

MKMR 475. Logistics/Physical Distribution Management (3)
(See OPMT 475.) Prereq: OPMT 405. Cross-listed as OPMT 475.

MKMR 476. Purchasing/Materials Management (3)
(See OPMT 476.) Cross-listed as OPMT 476.

MKMR 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading or a project in a field of special interest.

MKMR 601. Special Problems and Topics (1-18)
This course is offered, with permission, to Ph.D. candidates undertaking reading or a project in a field of special interest.

MKMR 701. Dissertation Ph.D. (1-18)

MKMR 703. Dissertation Fellowship (1-8)

Department of Information Systems
Peter B. Lewis Building
Fred Collopy, Chair
Phone 216-368-2144; Fax 216-368-4776

FACULTY
Michel Avital, Ph.D. (Case Western Reserve University)
Assistant Professor of Information Systems

Case Western Reserve University General Bulletin 2004–2006

Weatherhead School of Management • 481
Richard J. Boland, Jr., Ph.D. (Case Western Reserve University)
Professor of Information Systems, Department of Information Systems; Professor of Accountancy

Fred Collopy, Ph.D. (The Wharton School, University of Pennsylvania)
Professor of Information Systems and Chair

Matt Gersmynprez, Ph.D. (University of Colorado)
Assistant Professor of Information Systems

Kalle Lylytinen, Ph.D. (University of Jyväskylä)
Professor of Information Systems

Julie Renneker, Ph.D. (Massachusetts Institute of Technology)
Assistant Professor of Information Systems

Betty Vandenbosch, Ph.D. (University of Western Ontario)
Associate Professor of Information Systems

Youngji Yoo, Ph.D. (University of Maryland)
Assistant Professor of Information Systems; Collaborative technology, the role of

Adjunct Faculty
Alan F. Dowling, Jr., Ph.D. (Massachusetts Institute of Technology)
Adjunct Professor of Information Systems

INFORMATION SYSTEMS (MIDS)

Undergraduate Courses

MIDS 307. Computer Programming and Problem Solving Using Java (3)
The objective of this course is to help students gain proficiency in computer programming using an object-oriented programming language. Emphasis is placed on a modular, structured approach to developing programs; the use of workbench tools (IDE, dynamic debuggers, etc.) for increasing productivity in the development and testing of programs; and the use of the various packages in Java to facilitate rapid application development including JDBC and Swing. UML will be presented as a modeling tool and interfaces, thread management, and exception processing will be covered. Applications will be developed using classes, applets, servlets, and JavaBeans. Prior experience or course work with procedural programming is recommended.

MIDS 308. Development of Information Systems (3)
The purpose of this course is to provide students with a basic understanding of human information exchange within an organizational context and how technology can be used to support various information exchange activities and gain competitive advantage. Topics include shortcomings of human decision making, decision support systems, information technology-enabled new organizational forms, strategic use of information technology, e-commerce, and ethical issues involved in

the use of information technology. Through analysis of case studies and group projects, students explore the central management issues concerning the effective use of information technology in today's globally competitive organizations. Prereq: Proficiency in Excel.

MIDS 309. Management of Information Systems (3)
This course is designed to familiarize students with some important issues in the design and development of information systems. Topics include: using information technology as a tool to redesign organizations, managing the information system development process, managing the implementation of new information systems, and designing databases. Students will develop the interpersonal, analytical and technical skills needed to analyze an organization as a system and to design and develop an information system. Working in teams, students deal with real-world organizations to analyze their information requirements and design systems that meet the requirements. Prereq: MIDS 308 and proficiency in Access.

MIDS 310. Technology of Information Systems (3)
Review of present day computing systems and function of modern computer technology. Computer systems architecture, file structures, operating systems, compilers and assemblers, and telecommunications. Prereq: MIDS 309.

MIDS 315. Multimedia Systems (3)
Current practices and future directions of multimedia systems are discussed. Special attention is given to management issues involved in specifying, designing, developing, and assessing multimedia systems and to design principles that can be used to improve the quality of multimedia. This is a project-based course in which students gain experience in developing web sites, CD-ROMs, and films. Prereq: Not open to first-year students.

MIDS 326. Systems Analysis and Design (3)
This course investigates concepts and techniques for analyzing organizational systems in order to identify opportunities for redesigning the organization, its work practices and/or its information systems. It emphasizes creativity in diagnosing organizational problems and opportunities. You will learn consultation and intervention strategies for moving to a consensus on problem definition and a vision of desired changes. You will learn both soft and structured object-oriented methods for performing systems analysis. In addition you will learn the process of documenting new organizational and information system requirements in a form suitable for detailed system design and implementation. Prereq: MIDS 309.

MIDS 327. Database Management (3)
Technical and managerial issues of database management, especially the features of database management systems (D.B.M.S.) and the role of the database administrator (D.B.A.). D.B.M.S. using the three major data models are presented. Techniques for database designs at the logical and physical level are discussed. Students will have hands-on experience in using a D.B.M.S. Prereq: MIDS 309 and MIDS 310.

MIDS 329. Design of Object-Oriented Systems (3)
This course provides an opportunity to gain an understanding of the concepts and technology of object-oriented systems and learn system design techniques that take full advantage of this technology. Students also develop competence in programming in an object-oriented language. Prereq: Ability to program in Pascal or C, or consent of the instructor.

MIDS 360. Independent Study (1-18)

MIDS 385. Web Systems Integration (3)
This course focuses on using standards-based technology to help solve the complex information problems present in modern business organizations. It brings together component-based development approaches in the context of doing business on the global Internet and on corporate intranets. Our enabling technologies are based on published and de facto Internet standards including HTTP and HTML, CGI/SAPI and Perl, CSS, JavaScript, XML, and SSL/SET.

Graduate Courses

MIDS 401. Leadership Dialogues: The CIO’s Perspective (1)
The purpose of this course is to engage M.B.A. students in issues facing today’s technology leaders. The course will be facilitated by Lev Gonick and will bring technology executives from industry into each session. The issues will focus on such things as technology vision and planning, change management, assessing emerging technologies, economics of technologies, personnel and contractor issues, and the strategic use of information technology. The course is designed to prepare students to take on a proactive role in managing information technology, to understand the importance of technology to the overall competitive positioning of the firm, and to understand how technology and systems permeate every aspect of the organization.

MIDS 404. Management Information Systems- E.M.B.A. (2)
This course investigates the strategic and operational use and value of information technology in organizations. Its objectives are to enable students to assess both the opportunities and the challenges resulting from information technology and to become fluent with and comfortable addressing the issues relating to the management of the IT function and its resources. This course is limited to students in the Executive M.B.A. program.

MIDS 407. Computer Programming and Problem Solving Using Java (3)
The objective of this course is to help students gain proficiency in computer programming using an object-oriented programming language. Emphasis is placed on a modular, structured approach to developing programs; the use of workbench tools (IDE, dynamic debuggers, etc.) for increasing productivity in the development and testing of programs; and the use of the various packages in Java to facilitate rapid application development including JDBC and Swing. UML will be presented as a modeling tool and interfaces, thread management, and exception processing will be covered. Applications will be developed using classes, applets, servlets, and JavaBeans. Prior experience or coursework with procedural programming is recommended.

MIDS 409. Information Design and Management (3)
Organizations are technology-and-knowledge-intensive systems. All their functions are driven by the flow and use of information. This course will enable students to develop the models, analytic techniques, and critical attitudes needed to design effective, adaptable organizations. Students will learn to employ information technologies and new organizational forms to improve a firm’s functions and strategies.

MIDS 410. Information Technology Architectures (3)
Just as a craftsman needs an intimate understanding of the tools of a trade, the information professional must understand the architecture of hardware,
telecommunication facilities, operating systems, applications and networks. This course covers how prioritization, security, sharing and distribution can be improved by parallelism and how required synchronization can be safely and efficiently implemented across an essentially layered architecture that extends from the chip to the user-friendly application. Prereq: MIDS 409 or MBAC 423.

MIDS 411. Advances in Information Systems Technology (3)
This course examines advanced and emerging information technologies, and evaluates their potential uses. Topics include: advanced computer architectures, massively parallel computers, networking, graphics, machine learning, and new programming paradigms. Prereq: MIDS 409 or MBAC 423.

MIDS 415. Multimedia Systems (3)
As information becomes more abstract and therefore more difficult to perceive directly with one's sense, sonic and visual presentation become more important than ever. Designing systems that take advantage of people's aesthetic sensibilities is an area wide open to the enterprising and inventive entrepreneur. This course will interest those who think that artists have a say about how sound and graphics and words might be put together. The course examines aesthetic issues that arise in the development of multimedia. It focuses on creative integration of video, audio, and graphics particularly for the web, interactive CDs, and virtual reality.

MIDS 418. Intelligent Support Systems (3)
Information systems should be active partners in the work group with responsibility for pattern recognition, task coordination and memory. This course provides students with an understanding of the factors influencing individual and group processes of creating, communicating, using and distributing information. Through case studies and hands-on use of data analysis, group decision and AI tools, students learn how increased levels of intelligence can be built into both work flow systems and decision support systems. Prereq: Instructor approval required if student has already completed MIDS 414 and/or MIDS 422.

MIDS 426. Designing Successful Systems (3)
One of the greatest challenges organizations face is creating information systems that work. Not only must you be able to diagnose problems, envision new possibilities, and design solutions, you must also be able to communicate your ideas to the technologists who will build and support the systems you need. In this course we will investigate concepts and techniques for analyzing systems and processes in order to identify opportunities for improving the organization, its work practices and its information systems. We will emphasize creativity in diagnosing organizational problems and opportunities. We will explore consultation and intervention strategies for moving to a consensus on problem definition and a vision of desired changes. We will investigate strategies for documenting organizational and information system requirements that will allow managers and information technology professionals can understand and act on. Finally, we will discuss project management approaches that keep development efforts in time and under budget.

MIDS 427. System Development and Data Management (3)
This course presents principles of system development using both relational and object-oriented databases. State-of-the-art tools are employed for developing both client and server system components. Object orienta-

tion is stressed as a design philosophy. Both prototyp-
ing and more conventional life-cycle methodologies are studied.

MIDS 429. Design of Object-Oriented Systems (3)
This course provides an opportunity to gain an understanding of the concepts and technology of object-oriented systems, and to learn system design techniques that take full advantage of this technology. Students develop competence in programming in an object-oriented language. Prereq: Ability to program in Pascal or C or consent of instructor.

MIDS 432. Health Care Information Systems (3)
This course covers concepts, techniques and technologies for providing information systems to enhance the effectiveness and efficiency of health care organizations. Cross-listed as HSMC 432.

MIDS 433. Managing Electronic Teams in Global Economy (3)
This course covers technical, behavioral, and managerial bases that are necessary to build and manage high-performance global teams whose members are communicating primarily through electronic channels. Students will be working with students at other countries (or other schools) to learn various aspects of cross-functional “electronic” teams via various communication technologies, including electronic mail, groupware, and desktop videoconferencing. Fundamental group processes such as leadership, negotiation, communication, and decision-making will be revisited in the context of electronic teams.

MIDS 438. Digital Business and Law (3)
The course provides M.B.A. and Law students an understanding of legal issues that need to be addressed in the development of digital business at the level of web site management and transactions. The course also highlights the critical role of technology as a source of new legal requirements and also as a means to address and enforce legal requirements that are critical in conducting on-line business (e.g., demand for authenticity, or non-repudiation). The course is organized as a series of topics that focus on critical aspects of e-business development and its legal enforcement and regulation. Covered topics include: web site development and contractual issues related to it, business transactions and their enforcement, security, privacy, intellectual property rights, consumer protection, international juridical issues, and e-business regulation. Cross-listed as LAWS 458.

MIDS 442. Management of Information Systems (3)
Examines information technology issues facing senior information management, including the role of information technology in supporting organization strategy; relationships with other senior managers and with end users; technology and applications architectures; funding information technology; managing in distributed technology environments; managing a global information technology activity; technology forecasting; and operational issues such as staffing and procurement.

MIDS 444. Managing Scientific and Technical Knowledge as a Corporate Asset (3)
This course explores the role of technology in the successful enterprise. It examines the interaction of technical knowledge and systems with strategic enterprise management, with emphasis on managing scientific and technical capabilities as a strategic asset. Students will learn to analyze and assess the value of technical capabilities and to improve their written and oral skills for communicating about technology management decisions. Prereq: MIDS 409.

MIDS 445. Technologies of E-Business (3)
Emerging concepts and principles in the practice of electronic commerce are presented in a hands-on, experience based approach. Topics covered include: the role of e-commerce in the global economy, key underlying technologies, business-to-business and business-to-consumer applications, knowledge management, security, electronic payments and privacy. Strategic and policy-level implications will be emphasized. Students will complete a team-based e-commerce design and development project. This course complements electives in Multimedia Management and E-Marketing. Prereq: MIDS 409 or MBAC 423.

MIDS 446. Managing E-Business Technologies (3)
The course covers managerial issues to the design, development, and implementation of electronic business sites. It emphasizes aspects of these technologies most important to managers and includes topics such as financial transaction and payment mechanisms, security and control issues, and the use of innovative technologies such as collaborative filtering.

MIDS 450. Case Studies in Electronic Commerce (3)
This course will enable students to understand and evaluate the opportunities and limitations associated with e-commerce when viewed from a global perspective. Students will analyze case studies to identify the management action required to develop solutions in an e-commerce context that are both technologically and culturally feasible. Cases will cover e-commerce issues related to technology, strategy, enterprise resource planning, and computer-supported collaborative work. The course requires written reports synthesizing case analysis findings as well as an oral presentation. Prereq: MIDS 409 or MBAC 423.

MIDS 454. Models of Management (6)
Case studies are used extensively in this course in order to strengthen a student's ability to diagnose deficiencies and propose the redesign of core organizational processes. Students develop a working knowledge of process flow models, accounting models, and cycle models of the firm, as well as basic principles of quality management and financial analysis. Students will also develop an understanding of the structure and process of the firm and its industrial, national, and global markets. Economic and policy models of firms, industries, and markets are presented along with models of marketing as a value creating relationship with customer. Focus is on the competitive performance of the firm and its relation to marketing and strategy formulation and execution, including the financial analysis of technology strategy.

MIDS 456. Models of Management: Firm and Its Environment (3)
Students develop an understanding of the structure and process of the firm and its industrial, national and global markets. Economic and policy models of firms, industries and markets are presented along with models of marketing as a value creating relationship with customers. Focus is on the competitive performance of the firm and its relation to marketing and strategy formulation and execution, including the financial analysis of technology strategy. Preference given to M.S.M.-1S candidates.

MIDS 457. Models of Management: Dynamics of the Firm (3)
Mathematical representations add clarity and precision to the analysis of a firm and its information requirements. This course covers the important theory and methods of modeling an enterprise, emphasizing
Managing Corporate Knowledge (3) Knowledge management has emerged as an important management practice in organizations and many firms use advanced information technology to support effective knowledge creation and sharing. This course covers technical, behavioral, and organizational bases for effective management of knowledge in organizations. Topics that are covered include: knowledge management systems, knowledge creation, knowledge transfer, communities of practice, managing mobilized knowledge, knowledge management and corporate strategy, and knowledge management in multinational corporations. Prereq: MIDS 409, MBAC 423 or enrollment in MISM-1S program.

Software Engineering (1.5) This course presents process activities necessary for supporting highly effective software development. Software systems in organizations still fail at highly unacceptable rates. By attending to the details of risk evaluation, documentation, quality assurance, and version control, we can create high quality systems that will not fail. And by using robust methodologies that take advantage of the economics of reuse, we can do so on time and under budget. We also discuss issues of ethics and professionalism that systems professionals are likely to encounter as they progress in their careers. Prereq: Enrollment in MISM-1S or MIDS 409 or MBAC 423.

Communication and Negotiation (1.5) Through a combination of lectures, discussions, simulations and projects, students develop their communication and negotiation skills. Topics include: facilitation, interviewing, report writing and presentation, meeting management, negotiation, making demands and persuasion. This course is taken for one and a half credit hours per semester and is integrated with projects and materials being covered in the other courses.

Communication and Negotiation (1.5) Through a combination of lectures, discussions, simulations and projects, students develop their communication and negotiation skills. Topics include: facilitation, interviewing, report writing and presentation, meeting management, negotiation, making demands and persuasion. This course is taken for one and a half credit hours per semester and is integrated with projects and materials being covered in the other courses. Prereq: MIDS 460A.

Change Management (3) Change is an inherent dimension of organizational life-new policies, regulations, technologies, people, products, competitors, markets, processes, physical facilities...the list goes on. Consequently, the abilities to adapt to and manage technical and organizational changes are critical managerial competencies. This course aims to provide a framework for planning, analyzing, and managing those changes over which you as a manager will have some control. Though our discussions will focus on technology-enabled and technology-related change, the intention is to equip you with a process model, tools, and guiding principles that can be applied more generally to other change processes.

Analyzing Mobility and Mobile E-Business (3) Pervasive digital services and mobile computing applications, and intelligent and ubiquitous computing environments will change the landscape of organizational computing and business applications in the next decade. They will also change how we work and how business is conducted. There are technological, business, and regulatory challenges that must be addressed in shifting organizational approaches and technological solutions to this new environment. The goal of this course is to examine state-of-the-art solutions to this new arena, explore business opportunities and analyze research themes and issues that are emerging in this new arena. The course is meant for Ph.D. students studying pervasive computing, advanced M.S.M. students who are interested in this new area, technologically savvy M.B.A. students who want to explore and expand their knowledge in the leading edge technologies and for students in the engineering school who want to study business applications of telecommunications and agent-based technologies.

Webs Systems Integration (3) Standards-based technology is used to solve complex information system problems in modern organizations. This course brings together component-based development approaches in the context of doing business on the global Internet and on corporate intranets. Enabling technologies are based on published and de facto Internet standards including HTTP and HTML, CGI/API and Perl, CSS, JavaScript, ActiveX, XML, CORBA/DCOM, and SSL/SET. Students are encouraged to contribute to a team effort to design, implement, and integrate an appropriate solution to a selected business problem in electronic commerce or distance learning. They will also develop competency in the foundation technologies.

Special Problems and Topics (1-18) This course is offered, with permission, to students undertaking reading in a field of special interest.

Seminar in MIDS (3) This seminar addresses topics of current interest with a strong emphasis on research. It is intended primarily for the faculty and doctoral students of the MIDS Department.

Special Topics in MIDS (1-18) This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

Undergraduate Courses

OPRE 201. Introduction to Operations Research I (3)
This course covers philosophy, concepts, methods, and techniques of operations research, several classical problems and some contemporary case studies. Topics include linear programming, the transportation and assignment problems, integer programming, PERT/CPM, inventory models, simulation, and the use of analytical techniques in portfolio management. Prereq: Introductory statistics.

OPRE 300. Undergraduate Projects in Operations Research (1-18)
Individual operations research projects are carried out by qualified students. Prereq: Consent of instructor.

OPRE 345. Decision Theory (3)
(See OPRE 445.)

OPRE 348. Personal Investment Strategies (3)
This course is an introduction to the world of personal investing. In the framework of personal investment objectives and alternatives, topics included are: stocks, bonds, convertibles, warrants, options and mutual funds. Discussions of contemporary factors driving stock and bond prices such as international currency and interest rate implications are also discussed. Practical money management programs to meet different investment objectives and levels of wealth are explored. Prereq: ACCT 102 or consent.

Graduate Courses

OPRE 402. Stochastic Models with Applications (1.5)
This course surveys fundamental methods and models in operations research and operations management that incorporate random elements. Topics discussed will include basic results from the theory of stochastic processes, especially Markov chains; an introduction to stochastic dynamic programming; and models in the control of queues and inventories. Prereq: OPRE 425A and OPRE 425B.

OPRE 404. Data Analysis (3)
This course presents selected topics in applied data analysis focusing on the fundamentals of time series analysis, categorical data analysis and experimental design. The course emphasizes what the statistical process is all about: how to conduct studies, what the results mean and what can be inferred about the whole from pieces of evidence. Modules include the analysis of data from designed experiments through the analysis of variance and covariance, fundamental models for the analysis of time series data, including smoothing techniques, classical decomposition, and Box-Jenkins ARMA, and the analysis of categorical responses through measures of association, log-linear models, and logistic regression. Prereq: OPRE 405 or OPRE 428B or MBAC 414/QUMM 414 or consent of instructor.

OPRE 405. Regression Models in Management (1.5)
This course is for students interested in the problems of business and management. A wide variety of applications, drawn from the spectrum of business disciplines, drive our treatment of regression. The focus is on understanding and forecasting in a variety of data settings. Students will learn how to summarize relationships and measure how well these relationships fit data, and how to make meaningful statistical inferences when the usual assumptions do not hold. Students should achieve a working knowledge of multiple regression, and will be encouraged to become critical consumers of statistical information. OPRE 428B covers much of the same material, with a higher assumed knowledge of mathematical statistics. Prereq: MBAC 414 or consent of instructor.

OPRE 410. Math Foundations for Advanced Studies (1.5)
This course enhances the ability to use mathematics in advanced studies. In addition to learning such elementary ideas as the difference between closed-form and numerical-method solutions, a systematic approach is used to learn how to read, understand, think about, and do proofs. Specifically, it is shown how all proofs, regardless of subject area, can be explained as a sequence of individual proof techniques. The following mathematical skills are also taught: translating visual images to symbolic form using quantifiers; classifying mathematical objects into groups having similar properties; creating and working with mathematical definitions; unification; generalization. Prereq: Linear Algebra (equivalent of 1 semester undergraduate course) and Calculus (equivalent of 3 semesters of undergrad studies) or consent of instructor.

OPRE 411A. Linear Programming (1.5)
The objective of this course is to enable the student to formulate deterministic (linear, nonlinear, integer and network) models. The simplex algorithm for solving linear programming problems is presented geometrically, algebraically and economically. The role of duality theory is also discussed. Case studies are used to teach the student how to interpret computer output obtained from the simplex algorithm and how to use that output to answer “What happens if...” questions. Prereq: One semester of undergraduate linear algebra or consent of instructor.

OPRE 411B. Deterministic Models with Applications (1.5)
Case studies are used to teach the student how to formulate, use computer packages, and prepare managerial reports for solving deterministic (linear, nonlinear, integer, network, and goal programming) problems that arise in business operations as well as project management problems (using PERT/CPM techniques). Conceptual and mathematical ideas of the various methods for solving such problems are presented. Prereq: OPRE 411A or MBAC 414/QUMM 414 or consent of instructor.

OPRE 412A. Theory of Linear Programming (1.5)
This course presents the theory of linear programming, including the formal development and proofs of (a) the geometry of linear programming problems (convex sets, extreme points and extreme rays), (b) the steps of the simplex algorithm and their relationship to the geometry, and (c) duality theory and its uses in sensitivity and post-optimality analysis. Prereq: OPRE 410 and OPRE 411A or consent of instructor.

OPRE 412B. The Theory of Nonlinear Programming (1.5)
This course presents the algorithms and theory for solving nonlinear programming problems. Problems that do not have constraints include: (a) solving nonlinear systems of equations with Newton’s method, (b) finding fixed points of functions using the Brouwer and contractive fixed-point theorems, and (c) optimizing nonlinear functions of a finite number of variables using gradient and conjugate-gradient algorithms with line searches. Problems that have constraints include: (a) solving the linear complementarity problems, (b) solving optimization problems with methods of feasible directions that use the Karush-Kuhn-Tucker conditions and also with methods that use penalty functions. Throughout, the role of convexity in establishing convergence of algorithms is explained. Prereq: OPRE 412A or consent of instructor.

OPRE 413. Business Applications of Decision Models (3)
The objective of this course is to expose the students to situations from various business disciplines (e.g., Finance, Marketing, Information Systems, Supply Chain Management, etc.) where quantitative models effectively address the decision problems. This course will also integrate these business disciplines. The course will also prepare students for action learning projects where quantitative tools may be appropriate. The course will apply tools and techniques learned in MBAC 414. Other quantitative tools will be introduced “just-in-time” in context to particular application area. Prereq: MBAC 414 or QUMM 414. Coreq: MBAC 425 or OPMT 405.

OPRE 419. Game and Decision Theory (1.5)
Most of this course is an introduction to game theory; the remainder is a brief introduction to Bayesian analysis of decision problems including decision trees and conjugate pairs of distributions. The game theory portion consists of an axiomatic approach to utility theory, noncooperative solution concepts emphasizing equilibrium points, and cooperative solution concepts. Examples are drawn from economics, marketing, and operations research. Prereq: Linear Algebra and Calculus. Coreq: Linear Programming.

OPRE 424. Scheduling Theory (3)
Combinatorial and implicit search techniques are developed and applied to scheduling problems, including sequencing on a single and parallel processors, scheduling in flow shops, open shops and general job shops, and resource-constrained project scheduling, to satisfy various objectives. Topics in the complexity of algorithms and worst-case analysis of heuristics are discussed. Stochastic extensions, manpower scheduling or other special topics may be considered. Prereq: OPRE 425A.

OPRE 425A. Probability Applications (1.5)
This course introduces the basic tools of probability. Topics include combinatorial analysis, basics of random variables and distributions, and correlation. Emphasis is placed on business applications in production and inventory planning, reliability and maintenance and finance. Prereq: A semester of calculus or consent of instructor.

OPRE 425B. Probability II (1.5)
This course introduces the fundamental concepts of probability theory. Topics include probability spaces and events, conditional probability and Bayes theorem, joint distributions of random variables, moment generating functions, laws of large numbers and the central limit theorem. Prereq: OPRE 425A or consent of instructor.

OPRE 426. Stochastic Processes (3)
This course develops probability models for systems that evolve dynamically over time and display uncertain behavior. The models studied include discrete and continuous time Markov processes, with several important special cases including the Poisson Process and other birth-and-death processes, branching processes, and Brownian motion. Other models include renewal, regenerative, and semi-Markov processes. Applications include production and manufacturing, supply
with the help of popular simulation software(s). Some of a simulation mode and how to build such models.

OPRE 428B. Regression and Experimental Design (1.5)
This course covers the fundamentals of statistical analysis, with an emphasis on applications of confidence intervals and hypothesis testing for a wide array of experimental designs. Topics include: descriptive statistics, sampling, comparison of means, medians and proportions through interval estimation and hypothesis testing, and an introduction to the design of experiments. Prereq: OPRE 428B or MBAC 414/QUMM 414 or consent of instructor.

OPRE 428B. Regression and Experimental Design (1.5)
This course covers the fundamentals of statistical analysis and generalized linear models, emphasizing understanding and forecasting relationships between variables in a variety of settings. Heavy use of case studies is supplemented by more technical material, as students learn to summarize relationships and measure how well these relationships fit data, and how to make meaningful statistical inferences when the usual assumptions do not hold. Prereq: OPRE 428A or consent of instructor.

OPRE 432A. Simulation Models with Applications (1.5)
This course covers the modeling and analysis of business systems using computer simulation. The focus of the course is the introduction of simulation as a modeling tool with emphasis on understanding the structure of a simulation model and how to build such models with the help of popular simulation software(s). Some fundamental statistical concepts behind simulation modeling will also be discussed. Coreq: A course in basic statistics (QUMM 414 or MBAC 414, or OPRE 428A and OPRE 428B) or consent of instructor.

OPRE 432B. Simulation Design (1.5)
This course covers the statistical design and analysis of simulation models. The topics include random number generation, input data analysis, statistical analysis of simulation outputs, variance reduction techniques, and design of simulation experiments. Prereq: OPRE 432A. Coreq: OPRE 428A and OPRE 428B or consent of instructor.

OPRE 435A. Computer Programming (1.5)
The objective of this course is to provide the student with the ability to write object-oriented computer code in C++ for solving problems that do not involve complex data structures. Topics include the use of variables and pointers, built-in functions, input and output, selection statements, loops, functions, and classes. Prereq: Programming experience with one of the following programming languages: Pascal, FORTRAN or C, or permission of the instructor.

OPRE 435B. Integrated Problem Solving in OR and OM (1.5)
This project-oriented course uses a variety of software to involve the student in the complete problem-solving process in OR and OM. This process includes problem definition and formulation, data collection, and storage in a database, connecting the database to the solution algorithm, designing and implementing an appropriate user interface, and presenting the final solution. Prereq or Coreq: OPRE 411B or consent of instructor.

OPRE 435C. Data Structures (1.5)
The objective of this course is to provide the student with the data structures (arrays, files, linked lists, trees, and so on) and the numerical methods (differentiation, integration, and solving linear equations) needed for implementing algorithms that solve operations research and applications management problems. These topics are illustrated with C++ and object-oriented programming. Emphasis is given to ensuring that the programs are robust and usable by nontechnical people. Prereq: OPRE 435A or consent of instructor.

OPRE 445. Decision Theory (3)
This course provides an understanding of the principles, basic concepts, and methodology of engineering economics. It develops proficiency with these methods and with the process for making rational decisions regarding situations likely to be encountered in professional practice.

OPRE 448. Personal and Institutional Money Management (3)
This course is an introduction to contemporary portfolio management. In addition to introductory material on securities, options and security markets, topics include contemporary equity and debt management models, hedging strategies, program trading, portfolio insurance, arbitrage programs, mergers and acquisitions, international investing and intermarket influences, and other contemporary factors driving stock and bond prices. Prereq: BAFI 402 or equivalent or consent.

OPRE 454. Analysis of Algorithms (3)
This course presents and analyzes a number of efficient algorithms. Problems are selected from such problem domains as sorting, searching, set manipulation, graph algorithms, matrix operations, polynomial manipulation, and fast Fourier transforms. Through specific examples and general techniques, the course covers the design of efficient algorithms as well as the analysis of the efficiency of particular algorithms. Certain important problems for which no efficient algorithms are known (NP-complete problems) are discussed in order to illustrate the intrinsic difficulty which can sometimes preclude efficient algorithmic solutions. Prereq: OPRE 435A, OPRE 435C and OPRE 410. Cross-listed as EECS 454.

OPRE 490. Independent Study in Operations Research (1-15)
This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

OPRE 501. Special Problems and Topics (1-36)
This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

OPRE 504A. Research in Mathematical Finance I (1.5)
The course introduces the basic principles of discrete time financial markets. The focal points are the method of no arbitrage asset pricing, its relationship with equilibrium investment strategies of individuals in a market of financial securities, and its applications in valuation of contingent claims. Specific topics include basic utility theory, single and multiple period investment models, complete and incomplete markets, risk neutral probability measures, pricing of European and American stock options, and introduction to bonds and interest rate derivative models. Prereq: OPRE 411A. OPRE 425A, and OPRE 425B.

OPRE 504B. Research in Mathematical Finance II (1.5)
The course introduces the mathematical models of financial analysis in continuous time. Topics include diffusion processes, stochastic differential equations and Itô’s lemma martingales, equivalent martingale measures for risk neutral valuation, Girsanov’s theorem, the Black-Scholes model of European option pricing, American options in continuous time, and introduction to the Heath-Jarrow-Morton model of interest rate claim valuation. Prereq: OPRE 504A.

OPRE 512. Large Scale Problems in Mathematical Programming (3)
This course deals with the computational theory of solving large problems in mathematical programming by exploiting the many special structures that arise in real-world problems. Prereq: OPRE 411A and OPRE 411B and OPRE 412A is recommended.

OPRE 513. Stochastic Optimization (3)
This course concerns optimization of stochastic models, it emphasizes models of sequential decisions, and it includes some topics in stochastic processes. It includes the formulation of Markov decision processes and their optimization with various algorithms (often called dynamic programming). Other topics include stochastic order relations and other aspects of lattice programming, adaptive control, and stochastic programming. General results are employed to elicit the structure of optimal policies in areas such as inventory, finance, maintenance, and queueing. Prereq: OPRE 411A. Coreq: OPRE 426.

OPRE 515A. Combinatorial Optimization (1.5)
This course provides the ability to recognize, formulate, and solve (or determine how difficult it is to solve) combinatorial optimization problems. Mathematical programming and network/graph-theory problems are used to illustrate the art of problem formulation. The individual components of combinatorial optimization are identified and presented in a unified framework. The two standard search strategies for finding an optimal solution—namely, the greedy approach and the finite-improvement approach—are illustrated with numerous examples. Conditions are presented under which these search strategies provide an optimal solution. Prereq or Coreq: OPRE 410 or consent.

OPRE 515B. Graph Theory (1.5)
This course provides the ability to use graph theory as a problem-solving tool. The student is taught to recognize, formulate, and solve graph theory problems. Numerous examples from Operations Research, Computer Science, and related areas are used to illustrate the art of problem formulation. Appropriate theory and algorithms are then developed for solving these problems using the two basic search strategies of the greedy algorithm and the finite-improvement algorithms. Prereq: OPRE 515A or consent.

OPRE 516. Discrete Optimization (3)
This course is an introduction to optimization problems involving a finite number of alternatives. Applications include problems in network flows (distribution systems, project scheduling, production planning, routing etc.) and integer programming (scheduling, location, sequencing, capital budgeting, etc.). Numerous algorithms and heuristics are presented for solving these problems (shortest path, maximum flow, cutting plane, enumerative and partitioning algorithms). Computational complexity of these algorithms is also emphasized. Prereq: OPRE 411A. OPRE 412A or consent.
If you’re not on the shelf, you’re not in business. This course addresses managing the processes of getting products and service to market. It focuses on strategic and tactical management of the supply chain and distribution channels as value-adding networks. Topics include assessing the value creation potential of network members (suppliers, producers, distributors, dealers, and retailers), which of them should make key decisions, and how they relate to each other. Emphasis is on communication throughout the marketing network to coordinate activity, to provide appropriate compensation, and to ensure the marketing program is implemented effectively at the customer level. Prereq: MKM 403 or MBAC 424 or MIDS 456. Cross-listed as MKM 407.

OPMT 420. Managing Quality in Organizations (3)
This course provides an introduction to managing quality in both manufacturing and service settings. It begins with the development of a customer-centered approach through the concepts of quality function deployment. Representative programs which may be covered are: the Juran trilogy, Deming’s approach, Crosby’s approach, Kaizen or continuous process improvement, quality teams and vendor relationships and certification. Broad managerial considerations in managing quality, such as education and training of organizational personnel, commitment to quality, and administration of the quality function are also covered. Students may work in teams on case or real world projects in order to apply the concepts introduced in the course. Prereq.: OPMT 405 or MBAC 425.

OPMT 422. Service Operations Management with E-Commerce (3)
This course concerns the management of operations in e-commerce and other kinds of services. E-commerce absorbs more course time than any other type of service, but we also examine other settings such as financial services, health care, information systems, and transportation. There are modules on the similarities and differences of operations in e-commerce versus other service industries, structures of service industries, design of services, profitably utilizing service capacity, enhancing the quality of services, and managing service projects. Topics in capacity management include revenue management, queuing models, and simulation. A recurring theme is the integration of service operations with marketing, finance, and information systems. Prereq.: MBAC 425 or OPMT 405 or equivalent.

OPMT 423. Operations Management-E.M.B.A. (2)
Participants study the processes by which goods and services are supplied, produced and distributed in organizations, with emphasis on systems and tools for improving the production/operations function. This course is limited to students in the Executive M.B.A. program.

OPMT 450. Project Management (3)
Project management is concerned with the management and control of a group of interrelated tasks required to be completed in an efficient and timely manner for the successful accomplishment of the objectives of the project. Since each project is usually unique in terms of task structure, risk characteristics and objectives, the management of projects is significantly different from the management of repetitive processes designed to produce a series of similar products or outputs. Large-scale projects are characterized by a significant commitment of organizational and economic resources coupled with a high degree of uncertainty. The objective of this course is to enhance the ability of participants to respond to the challenges of large-scale projects so that they can be more effective as project managers. We study in detail up-to-date concepts, models, and techniques useful for the evaluation, analysis, management, and control of projects. Prereq: MBAC 414, QUMM 414 or consent of instructor.

OPMT 475. Logistics/Physical Distribution Management (3)
Effective management of the distribution of goods and services as they flow from plants/ports/vendors to customers is the focus of this course. Concepts and methods, some computerized, are presented that can lead to improved physical distribution customer service and/or to lower costs in a variety of manufacturing and service company settings. Key topics include transportation, inventories, warehousing, materials handling, order processing, packaging, pricing, customer service standards, and warehouse and retail location. (A companion course to OPMT/MKM 476.) Prereq: OPMT 405 or MBAC 425. Cross-listed as MKM 475.

OPMT 476. Purchasing/Materials Management (3)
Effective management of the physical supply of goods and services to manufacturing and service companies is the focus of this course. The course is designed to provide an overview of the management problems associated with acquiring and maintaining the flow of material supplies to a firm, and to sharpen decision-making skills as related to materials supply within the broader scope of logistics and the firm as a whole. Topics include purchasing, inventory control and supply scheduling. (A companion course to OPMT/MKM 475.) Prereq: OPMT 405 or MBAC 425. Cross-listed as MKM 476.

OPMT 477. Enterprise Resource Planning (3)
Enterprise resource planning (ERP) includes the application of various concepts to plan proper resource utilization for an enterprise. Concepts including forecasting, material requirements planning, operations scheduling (aggregate and detailed), capacity planning, and activity control are central to ERP. Both quantitative modeling and managerial analysis for these subjects are included in this course. Prereq: MBAC 425, OPMT 405, or OPMT 423 or consent of instructor.

OPMT 478. Operations Design and Quality Control (3)
The primary thrust of this course is statistical applications in manufacturing. The areas of acceptance sampling, process control, total quality control and an introduction to industrial research are included in the course. Methods engineering is introduced as an important underpinning of the quality control system. Prereq: OPMT 405 or MBAC 425 or consent.

OPMT 479. International Operations Management (3)
The main objective of this case-based course is to help prospective operations managers to overcome national and cultural myopia, identify cultural and contextual differences in operations management practice, describe successful operations management approaches in other countries and examine reasons for their success as well as the viability of transferring them to significantly different operating environments, and finally address the impact of the global scope of operations on the usual operating decisions (production planning, quality control, etc.). Topics to be covered include organization of global operations, production strategies in entering foreign markets, development of a global manufacturing strategy, international facilities location,
offshore manufacturing, global sourcing and logistics, global transfer of technology, risk management on global operations, cultural and national comparisons of operations management practices, and successful global service operations. Prereq: OPMT 405 or MBAC 425.

OPMT 480. Operations Strategy and Technology (3) This course discusses the process of developing an operations strategy for competitive advantage. A number of strategic issues are studied from a manufacturing perspective, including: product development, introduction of new technologies, managing multiple plant operations, flexibility, and financial control systems. Coreq: OPMT 405 or MBAC 425.

OPMT 490. Independent Study in Operations Management (1-15) This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

OPMT 501. Special Problems and Topics (1-18) This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

OPMT 504A. Research in Operations Management I (1.5) The material in this introduction to the research literature in operations management consists of several research papers on supply chains for goods and services. Although specific topics and papers vary from year to year, representative topics include manufacturing, logistics, design of service networks, and revenue management. Prereq: OPRE 412A, OPRE 419, OPRE 426, OPRE 513A or consent.

OPMT 504B. Research in Operations Management II (1.5) Seminar continuation OPMT 504A's introduction to the research literature in supply chains for goods and services. Specific topics and papers vary from year to year, but representative topics include manufacturing, logistics, service networks, and revenue management. Prereq: OPMT 504A or consent.

OPMT 601. Special Problems and Topics (1-18) This is a course of flexible design in which a student, with the agreement of an instructor in operations management, may pursue a special topic or problem. M.B.A. students should enroll in OPMT 501. Prereq: Consent of instructor.

ORBH 303. Leadership and Personal Development (3) This is an experience-based course designed for increased integration of cognitive and emotional processes, greater awareness of one’s behavior and impact on others, and greater opportunity for behavioral choice in interpersonal relations. Several Saturday classes.

ORBH 304. Advanced Workshops in Personal Development (3) This is an experience-study course offered for groups of interested and qualified individuals. This course concentrates on an affective theme: conflict and power, intimacy, aggression, etc. There is an effort to combine experience-based learning with conceptual understanding. Prereq: ORBH 303.

ORBH 390. Special Topics (1-18) This course is offered for candidates undertaking reading in a field of special interest.

Graduate Courses
ORBH 403. Developing Interpersonal Skills for Managers (3) This course is intended to sharpen students’ skills in the art of relating successfully to other individuals and
groups. The course uses an intensive group experience to make students more aware of how their actions affect others, more capable of giving and receiving interpersonal feedback, and more cognizant of processes through which groups work. Several Saturday classes.

**ORBH 412. Organizational Analysis (3)**
This course studies organizational analysis through appreciative inquiry. It explores multiple frameworks for understanding the complexity of organizational life. Students form teams and conduct appreciative studies across industries. This course also addresses questions of organizational change (how to move from theory/ideal to practice). Learning is experiential in nature.

**ORBH 415. Residency Periods-E.M.B.A. (2)**
The primary objective of the residency periods is to create and maintain relationships among the E.M.B.A. participants and faculty that enable and accelerate learning throughout the program. This includes the formation, maintenance and development of effective Study Groups. Another primary objective is to develop behavioral management skills in leadership, teamwork, conflict negotiation, decision making and problem management that are best studied through sustained periods of experiential learning, simulations and exercises available in a residential setting. This course is limited to students in the Executive M.B.A. Program.

**ORBH 417. Managing Organizational Change (3)**
This course focuses on change as an inescapable fact for organizations and societies of the present and future. Given the existence of such change, how may individuals charged with managing or facilitating an organization's response to change deal with their task, and what conceptual or technical tools will help them cope with the challenges of the unpredictable? The course examines social and organizational change to provide a base for considering the future and the demands it is likely to pose. Strategies and tactics used in organizational and social developments in the past are critically examined for their relevance to the future.

**ORBH 418. Systems Thinking and Sustainability (3)**
This course offers an opportunity for students working in teams to consult in action research mode to a local business engaged with sustainability. Sustainability refers to the effort to create financial value by responding to environmental and related social issues. Students will learn to diagnose and manage the organizational complexities of sustainability using systems thinking tools and methods.

**ORBH 425. Developing Emotional Intelligence (3)**
Although helping or stimulating individuals to change, learn, and develop is considered a responsibility of the human resource function in an organization, every professor, manager, consultant, and helping professional spends most of their time trying to provoke, evoke, or catalyze a change in others. This course will examine the processes by which individuals change and the methods often used to facilitate this change. How and what a person chooses to change (i.e., select their change goals) will be explored, as well as factors affecting the extent to which he/she changes. The efficacy and ethics of various approaches to individual change as part of human resource and organization development efforts will be discussed. Prereq: MGMT 493 and MBAC 413.

**ORBH 432. Understanding and Enhancing Human Systems (4)**
This is an introduction to organizational behavior and development. The twin objectives are to increase awareness of the many ways in which behavior in organizations can be explored and to develop basic skills in understanding, diagnosing and intervening in organizational life. Classroom activities combine experiential exercises with homework assignments that focus on participants' current jobs, leadership responsibilities and career plans. Limited to candidates for the MSODA program.

**ORBH 435. Practice in Intervention Skills (3-4)**
This course develops participants' consultative skills. Competence in role entry and development, data collection, intervention and evaluation is gained through class exercises and field projects. The focus is on developing a problem-centered approach to intervening in organizations that minimizes reliance on programmed techniques and maximizes collaborative innovation and learning between client and consultant. This course is limited to candidates for the MSODA program.

**ORBH 436. The Role of the Executive - E.M.B.A. (2)**
This course surveys past and present research on the unique contributions of the executive role in organizations and how leadership, decision and problem management, change management, and strategic planning are enacted from the executive perspective. Participants' historical analysis of leadership in their organizations provides the basis for applying the concepts presented. This course is limited to students in the Executive M.B.A. Program. Prereq: E.M.B.A. only.

**ORBH 438. Design of Organizational Development and Analysis Projects (4)**
This course has two objectives: (1) to learn to design and deliver training workshops; and (2) to plan and execute organizational change and/or analysis projects that are consistent with their current skills, career plans and developmental needs, and with the opportunities, strategic needs and organizational problems of their client organizations. This course is limited to candidates for the MSODA program.

**ORBH 439. Individual Field Project (4)**
Participants design, execute and formally present problem-solving projects in their organizations. Each project is supervised by appropriate faculty and organization members. This course is limited to candidates for the MSODA program.

This course is an introduction to concepts for understanding the organization as a complex social system, with emphasis on the behavioral aspects of strategy and structure, including recruitment, reward systems, staffing, and social and technical aspects of special arrangements. This course is limited to students in the Executive M.B.A. degree program. Prereq: E.M.B.A. only.

**ORBH 450. Executive Leadership (3)**
This course explores answers to questions such as: Who are leaders? Are they different than managers, heroes and heroines? How do the effective ones think and act? What situations create leaders, foster their emergence or provide opportunities? What makes us want to follow them? What are the personal pits of being a leader (i.e., sex, drugs, alcohol, insomnia, ulcers, etc.)? How are leaders developed? Case studies, self-study and at-work projects will be the primary methods used in the course.

**ORBH 460. Women in Organizations (3)**
This course addresses important leadership and management issues concerning women in organizations. The course provides complex understandings of issues pertinent to professional women and work such as sex role typing, sex-based discrimination, equal pay, sexual harassment, work-family balance, women's leadership and women's career issues and development. The course helps students increase self-knowledge about their own values and practices as well as enhance their capabilities as leaders and managers. We will examine the opportunities, challenges, trade-offs, and organizational dynamics experienced by women in work settings, as well as the interpersonal, organizational, and societal structures and processes impacting women in organizations. Through a variety of course methods, students gain greater awareness of the gendered nature of work and organizations and learn effective strategies for women's career progress and effective participation in organizations.

**ORBH 478. Organization and the Environment (3)**
This course focuses on ways of looking at the interface between organizations and their environments that have important implications for organizational development activities and the people who design and implement them. The first part of the course reviews several conceptual approaches to assessing this interface. The second part involves the application of these approaches to a series of organizational/environmental problems that members of the class perceive their organizations as currently experiencing. Limited to MSODA candidates.

**ORBH 488. Leadership and the Global Agenda (3)**
This course will attempt to develop leadership values and competencies in Organization (OD) within the global arena. Objectives for the course include: (1) developing an executive view of the state of the world; (2) building skills in appreciative inquiry for researching best practices of organizations to maintain sustainable economic development; (3) learning how to build organizational capacities for responding to the global agenda for change; and (4) developing a global consciousness to a larger set of global values to provide a vision for a better world and the potentials of our organizations to assist in realizing such a vision.

**ORBH 490. Special Topics (1-18)**
This is a seminar course led by a member of the faculty of the Department of Organizational Behavior. Specific topics are announced at the start of each semester. This course is intended also for independent study. Prereq: Consent of instructor.

**ORBH 491. Diversity, Innovation, and Organizational Change (3)**
This course addresses workforce diversity issues from individual, group, and organizational perspectives. The focus is on innovative ways of utilizing today's culturally expanding workforce. Emphasis is on the "what and how" for managers in developing a corporate culture that embraces diversity, helping them in learning to work with, supervise and tap the talent of diverse employees within their organizations. Included are methods for modifying systems to attract, retain, develop, and capitalize on benefits of the new workforce demographics. A retreat experience is part of this course and is required of all participants.

**ORBH 496. Leadership, Executive Assessment, and Development-E.M.B.A. (3)**
The purpose of this course is to learn a method for assessing a participant's knowledge, abilities, values and interests relevant to leadership and executive management so that the person will be able to develop and implement a plan for enhancing leadership and executive capability throughout career and life. The
enabling objectives are: (a) to construct a view of current and desired capability (i.e., knowledge, abilities, values, and interests); (b) to develop an individualized learning agenda and plan for the next 3-5 years; and (c) to explore techniques to assist others in doing the same. This course is limited to students in the Executive M.B.A. program.

**ORBH 497. Development of Executive Leadership Skills (3)**

The objective of this course is the development of skills in effective human interaction, with emphasis on the pragmatics of working with people in organizations. The focus is on learning by doing through the use of applied behavioral science methods of simulation, role plays and structured exercise. Leadership topics covered include decision management, problem management, motivation, planned change, teamwork, and the language of leaders. Designed for MSODA students. M.B.A. students admitted upon consent of instructor.

**ORBH 501. Special Problems and Topics (1-18)**

This course is offered, with permission, to students undertaking reading in a field of special interest.

**ORBH 510. Foundations of Organizational Thought (3)**

Learning some of the foundations of organizational thought can stimulate a vision for creating organizations for the twenty-first century. This course is intended to prepare future scholars for understanding, creating and intervening in future organizational life. Preparation will include study of the classics in organizational literature, contemporary writings and historical analyses of seminal thought in organizational behavior. Preparation will include the process of historical and appreciative inquiry, roots in organizational thought, contemporary roots of organizational thought and some organizing principles. Prereq: Consent of instructor.

**ORBH 520. Group and Interpersonal Analysis (3)**

This course is a review of major concepts and research in group dynamics and interpersonal relations. Topics concern face-to-face social interaction such as communication patterns, power, hierarchy, leadership, norms, goals, productivity, social theories of personality, and personal change through group methods. The course combines cognitive emphasis and personal experience-based learning. Prereq: Consent of instructor.

**ORBH 525. Developing Emotional Intelligence (3)**

This course will examine the process by which individuals change and the methods often used to facilitate this change. How and what a person chooses to change (i.e., select their change goals) will be explored, as well as factors affecting the extent to which he or she changes. The efficacy and ethics of various approaches to individual change as part of human resources and organization development efforts will be discussed.

**ORBH 530. Social Analysis (3)**

This course is an introduction to major themes and concepts in sociology that influence the field and to sociological analysis as it relates to the careers of behavioral science practitioners. Students are exposed to major theoretical orientations as well as to summaries of current thinking in several major topic areas in sociology. The studies of sociology, sociologists and the self are combined to help students develop a sociological perspective of their own potential roles in the applied behavioral sciences. Prereq: Consent of instructor.

**ORBH 541. Organizational Systems (3)**

This course covers the use of general systems theory as a conceptual base for examining organizations from the macro-perspective. The course examines organizational structure and technology, organizations and interorganizational networks in interaction with their societal environments, and large-scale problems of organizational and social power, conflict and change. It is designed to present a large-scale perspective on organization theory and behavior that is complementary to the micro-perspective of organizational behavior. Prereq: Consent of instructor.

**ORBH 560. Research Methods I (3)**

This course concerns itself with issues associated with the conduct of social research. The primary focus is on learning the "craft" of research and its associated technologies. Among the topics that are addressed are: scientific method; research terminology and definitions; search design; laboratory experiments; simulations; field experiments; field studies; measurement; reliability and validity; and sampling. This course is intended to help students acquire the skills necessary in undertaking dissertation-related research. Prereq: Consent of instructor.

**ORBH 561. Research Methods II: Theory Building (3)**

This course is designed as a methodological practicum in theory building through qualitative methods. The process of good theory construction is portrayed as the discovery of theory from data, resulting in the construction of knowledge of consequence. The course asserts, in Lewinian fashion, that "there is nothing so practical as good theory." It then focuses on the methods, personal disciplines, and perspectives needed to bring this dictum alive. Individual research proposals are developed throughout the semester.

**ORBH 565. Research in Gender and Diversity in Organizations (3)**

Examination of full range of feminist research methods exploring relationship between feminism and methodology involving a plurality of perspectives for conducting research and creating knowledge with an emphasis on collecting and interpreting qualitative materials. Particular attention is paid to understanding gender- and diversity-related phenomenon that occur in the workplace. Classic feminist research from a variety of historical, societal, economic, interpersonal, and organizational paradigms are incorporated.

**ORBH 570. Learning and Development (3)**

This course provides an exploration of the learning and development paradigm underlying the human potential development approach to human resource development. The origins of this approach in the natural epistemologies of John Dewey's pragmatism, Kurt Lewin's gestalt psychology, the work of James, Follett, Emerson, Piaget, Maslow, Rogers, and others and current research in adult development, biology and brain/mind research, artificial intelligence, epistemology, moral philosophy and adult learning will be considered. The course will focus on applications of these ideas to current issues in human resource development such as adult learning in higher education, advanced professional development, and large system learning and development. Prereq: Consent of instructor.

**ORBH 572. Thematic Analysis (3)**

This course will help students develop the abilities to sense themes or patterns, to apply coding systems in a reliable manner, to develop a coding system, and to design research studies for developing or using codes. Participants will develop and practice three abilities on four types of data: conscious and unconscious thought; an individual’s behavior; interaction among people; and historical documents such as speeches, myths, ballads, etc. Assignments will involve reading, practicecoding of material provided, developing preliminary code from materials selected, and completing a research project in which the development and/or use of a code is required. This course is appropriate for doctoral students in the behavioral or social sciences. Prereq: Consent of instructor.

**ORBH 575. Theory and Research in Small Groups (3)**

The course is designed to provide doctoral students with broad exposure to the theoretical foundations of research in the area of groups and teams in organizations, and to current and emerging trends in the research within this area. The ultimate objective is to enable students to conduct independent research on topics relevant to groups and teams within organizations. The primary focus will be on task-oriented groups and teams, and in the organizational context. It will draw from basic research in social psychology and sociology in addition to organizational behavior.

**ORBH 601. Special Problems and Topics (1-18)**

This course is offered, with permission, to candidates undertaking reading in a field of special interest.

**ORBH 660. Methods of Applied Behavioral Science (3)**

This course includes laboratory methods of learning, techniques of design and operation in human relations training, and trainer behavior in group settings. The course is aimed at conceptualizing learning and influence processes in training laboratory settings as well as providing opportunities for the practice of design and operating skills. Prereq: Consent of instructor.

**ORBH 701. Dissertation Ph.D. (1-18)**

**ORBH 703. Dissertation Fellowship (1-8)**

### Other Course Offerings

**FULL-TIME M.B.A. CORE COURSES (MBAC)**

**Note:** MBAC courses with an “A” designation indicate core courses in the accelerated M.B.A. program.

**MBAC 404. Executive Dialogues (1)**

Credit/pass/fail option only. Students will engage in dialogues with leaders of regional organizations on issues related to leadership, organizational development and success, and community activism/social responsibility. Each class will begin with remarks from the invited guest on a topic related to the course, and the remainder of the class time will consist of a dialogue among the students and the speaker. Students are expected to prepare for each session by reading materials about the speaker’s organization and articles related to the topic to be discussed in class. The pass/fail grade will be based on individual class attendance and participation, as well as on the performance of each team in preparing for its assigned speaker.

**MBAC 410. Leadership Assessment and Development (2)**

The Leadership Assessment and Development course is the cornerstone of the Weatherhead M.B.A. program that offers students an opportunity to take an active role in shaping their learning experience in the pro-
The objective of the course is to have students learn a method for assessing and developing the knowledge and abilities relevant to management throughout their careers. This is accomplished through helping students develop an individualized learning plan to enhance their abilities and knowledge areas as well as to help achieve their career objectives. Students engage in a number of assessment activities, then receive feedback and interpret it. These activities take place in the context of an Executive Action Team where students collaboratively help each other assess their current capability and future development needs.

MBAC 410A. Leadership Assessment and Development (2)
The Leadership Assessment and Development course is the cornerstone of the Weatherhead M.B.A. program that offers students an opportunity to take an active role in shaping their learning experience in the program. The objective of the course is to have students learn a method for assessing and developing the knowledge and abilities relevant to management throughout their careers. This is accomplished through helping students develop an individualized learning plan to enhance their abilities and knowledge areas as well as to help achieve their career objectives. Students engage in a number of assessment activities, then receive feedback and interpret it. These activities take place in the context of an Executive Action Team where students collaboratively help each other assess their current capability and future development needs.

MBAC 410B. Management Skill Building Lab (1)
The course helps develop interpersonal and team management skills. The course is interactive and has recommended readings and extensive in-class participation in groups.

MBAC 410L. Management Skill Building Lab (0.5)
The course helps develop interpersonal and team management skills. The course is interactive and has recommended readings and extensive in-class participation in groups.

MBAC 411. Strategic Issues and Applications I (2.5)
The first two weeks of this course are an initial introduction to the full range of issues managers confront in the process of creating value in organizations and to the multiple skills required to deal effectively with them. This course also addresses in detail the issues and skills involved in strategic thinking and management, including analyzing industry and competitive environments, developing organizational objectives and strategies for the long term, integrating functional activities into implementable action programs, and structuring and leading the organization. Other managerial issues and skills introduced in the first two weeks of the course will be addressed in detail throughout the first year in the M.B.A. functional core courses.

MBAC 411A. Strategic Issues and Applications (3)
Student EAT teams are introduced to a comprehensive case study to discover the broad range and integrative aspects of management issues confronting organizations today. Functional teachers in the accelerated core courses will provide “just-in-time” coaching as students break down the complexities of the case.

MBAC 412. Managing Your Career and Action Learning Preparation (1.5)
This course is designed to build the skills necessary for a successful job search, personal career development, and business etiquette. The course sessions are interactive and require extensive classroom participation.

MBAC 412A. Management and Career Skills (1)
The course explores communication skills, team building, and negotiation; classes are interactive. There will be recommended readings and extensive in-class participation in groups.

MBAC 412L. Career Development Skills (1)
This is a seminar course designed to build skills necessary for a successful job search and future career development. The course sessions are interactive and require extensive classroom participation.

MBAC 413. Human Value in Organizations (2.5)
Examines the behavioral sciences relevant to the effective management of people and the effective design of human resource systems, structure, and policies. Topics include leadership, change management, motivation and pay systems, team dynamics, staffing, decision making, organizational communications, employee participation, performance appraisal, conflict management, negotiation, work design, organizational design, and organizational culture. A variety of methods, including experiential and interactive learning methods, are used to study these topics.

MBAC 413A. Human Values in Organizations (1)
Classes will explore research in the fields of organizational behavior and human resource management and apply this knowledge in actual situations and cases. They will learn about how to learn from experiences they have in class and in their EATs. Students will be able to directly apply skills learned in class to leadership, project management, task force management, team development, staff meetings, decision making, problem solving, interpersonal relations, environmental analysis, job redesign, organizational change, and labor and human resource policy.

MBAC 413B. HVO Laboratory: Negotiation Skills (1)
This course is designed to build negotiation skills with recommended readings and extensive in-class participation. Available only to full-time M.B.A. candidates.

MBAC 413L. HVO Laboratory: Negotiation Skills (0.5)
This course is designed to build negotiation skills with recommended readings and extensive in-class participation. Available only to full-time M.B.A. candidates.

MBAC 414. Statistics and Decision Modeling (2.5)
This course provides quantitative foundations for modern business decision making. It begins with an introduction to probability and data analysis, covering such topics as methods for estimation, comparison and hypothesis testing, and regression models. The second part of the course introduces management science techniques, including mathematical programming models, simulation and project management. Computer software is heavily used throughout.

MBAC 414A. Statistics and Decision Modeling (1)
This course provides a brief look at management science and selected key tools and applications. Topics include modeling, linear programming, simulation and linear regression. Students should have a background in statistics and college-level algebra. Just-in-time statistics review workshops will be available at the beginning of the semester.

MBAC 415. Financial Reporting and Control (2.5)
This course examines the framework that underlies financial and managerial accounting, and how the information produced by these functions can be used by (1) parties external to the firm, i.e., stockholders, creditors, and government, to evaluate the financial performance of an organization; and (2) internal management to fulfill planning and control requirements.

MBAC 415A. Financial Reporting and Control (1)
The accounting component will cover the use and application of basic financial statements, the basic cost structures in a firm, and decision making using accounting information. We will discuss usage and analysis of information from the annual report, focusing on the balance sheet, income statement, cash flow statement, and related notes. The course will also cover internally generated accounting information about the cost structure of the firm. We will discuss use of this information in decision making. You are expected to be comfortable with definitions of basic accounting terms, and you should be familiar with the accounting structure and the financial statements.

MBAC 416. Managerial Finance I (2.5)
Understanding the basics of valuation is the central organizing principle of this course. This first course in finance introduces the tools and methods employed in valuation of projects and securities like stocks and bonds. Valuation involves determination of (1) cash flows of the firm, project or financial assets and (2) the discount rates that are used to compute the present values of the cash flows. Asset pricing models provide the underpinnings for the development of the discount rates. The material is synthesized in capital budgeting exercises which are cost-benefit analyses of capital project cash flows to evaluate whether they are value enhancing.

MBAC 416A. Managerial Finance (1)
This module reviews knowledge and refreshes core skills in managerial finance, especially those related to financial statement analysis, discounted cash flow valuation, and risk and return in the capital markets. Teaching methods include lectures, discussions, cases, and extensive exercises. (Summer).

MBAC 421. Strategic Issues and Applications II (2)
This course wraps up the M.B.A. core by providing an integrative experience of applying the full range of managerial skills addressed throughout the core in a comprehensive case exercise. Students develop, document and present comprehensive, implementable strategic and tactical actions programs in groups. Prereq: MBAC 411.

MBAC 423. Information Design and Management (2.5)
Organizations are technology- and knowledge-intensive systems. All their functions are driven by the flow and use of information. This course will enable students to develop the models, analytic techniques, and critical attitudes needed to design effective, adaptable organizations. Students will learn to employ information technologies and new organizational forms to improve a firm’s functions and strategies.

MBAC 423A. Information Design and Management (1)
Organizations are technology- and knowledge-intensive systems. All their functions are driven by the flow and use of information. This course will enable students to develop the models, analytic techniques, and critical attitudes needed to design effective, adaptable organizations. Students will learn to employ information technologies and new organizational forms to improve a firm’s functions and strategies.

MBAC 424. Marketing (2.5)
This course is designed to enhance student familiarity with fundamental concepts in marketing management, and with how those concepts are applied to solve realistic business problems. The course exposes students...
to basic marketing theory in the areas of consumer behavior and decision making (both individual consumers and organizational buyers), pricing strategies, channel management and its importance to marketing strategy, new product development and management, and promotion management. The principal goals of this course are to help students understand: 1) The context in which they, as managers, will function; the options they have for careers in management based on their own aptitudes and orientations; and how they can develop the skills they need for success in their chosen fields; and 2) How the effective strategic management of people contributes to organizational performance and the production of value, and that for many organizations, the effective management of people has been the driver of competitive advantage.

This is the first course in a two course sequence.

MGMT 251. Managing Organizations and People II (3)
The principal goals of this course are to help students understand: 1) The context in which they, as managers, will function; the options they have for careers in management based on their own aptitudes and orientations; and how they can develop the skills they need for success in their chosen fields; and 2) How the effective strategic management of people contributes to organizational performance and the production of value, and that for many organizations, the effective management of people has been the driver of competitive advantage.

This is the second course in a two course sequence. Prereq: MGMT 250.

MGMT 360. Special Topics and Issues in Management (1-9)
This course option is available to qualified students who are undertaking special projects in a management related field.

MGMT 395. Advanced Seminar (1)
This seminar, for undergraduate students with junior class standing or above, provides an opportunity to consider topics of importance in the community of ideas and activities related to the professional and managerial world. The development of writing and communication skills and in-depth discussion are expected attributes of seminar activity. The topics and scope of the coverage will be defined by the course instructor as consistent with the seminar approach to learning of the university.

Graduate Courses

MGMT 403. Leadership Assessment and Development (3)
This course is designed to increase competitive attractiveness in the marketplace and maximize the added value of the M.B.A. program. The objective of the course is to have students learn a method for assessing and developing in themselves the knowledge and abilities relevant to management throughout their careers. This is accomplished by helping students develop an individualized learning plan to enhance their level of knowledge in 11 fields and 22 abilities. Students engage in a number of assessment activities, then receive feedback and interpret it. This occurs in the context of an Executive Action Team (i.e., students and a facilitator) in which students help each other assess their current capability and future development needs. This course is limited to students in the M.B.A. program.

MGMT 413. Human Value in Organizations (3)
Examines the behavioral sciences relevant to the effective management of people and the effective design of human resources system, structure and policies. Topics include leadership, change management, motivation and pay systems, team dynamics, staffing, decision making, organizational communications, employee participation, performance appraisal, conflict management, negotiation, work design, organizational design, and organizations culture. A variety of methods, including experiential and interactive learning methods, are used to study these topics.

MANAGEMENT COURSES (MNGT)

Undergraduate Courses

MGMT 001. Supervised Professional Practicum - Semester 1 (0)
A professional practicum is a workplace experience, the primary goal of which is the intellectual, personal and professional growth of the student. It occurs under the supervision or supervision of a mentor in the workplace who is committed to seeing that it is an educational as well as a work venture. It requires skills appropriate to the student’s year in college and provides students with new skills, insights and experiences that are transferable back to the academic setting and/or to a future position in the workplace. (Only available to declared Weatherhead Accounting or Management majors.)

Prereq: Junior standing.

MGMT 002. Supervised Professional Practicum - Semester 2 (0)
A professional practicum is a workplace experience, the primary goal of which is the intellectual, personal and professional growth of the student. It occurs under the sponsorship or supervision of a mentor in the workplace who is committed to seeing that it is an educational as well as a work venture. It requires skills appropriate to the student’s year in college and provides students with new skills, insights and experiences that are transferable back to the academic setting and/or to a future position in the workplace. (Only available to declared Weatherhead Accounting or Management majors.)

Prereq: Junior standing.

MGMT 250. Managing Organizations and People I (3)
The principal goals of this course are to help students understand: 1) The context in which they, as managers, will function; the options they have for careers in management based on their own aptitudes and orientations; and how they can develop the skills they need for success in their chosen fields; and 2) How the effective strategic management of people contributes to organizational performance and the production of value, and that for many organizations, the effective management of people has been the driver of competitive advantage.

This is the first course in a two course sequence.

MBAC 426A. Marketing (1)
This course is designed to refresh and enhance student familiarity with fundamental concepts in marketing management, and with how those concepts are applied to solve realistic business problems. The course exposes students to basic marketing theory in the areas of consumer behavior and decision making (both individual consumers and organizational buyers), pricing strategies, channel management and its importance to marketing strategy, new product development and management and its importance to marketing strategy, new product development and management, and promotion management. Equal emphasis is given to analyzing business cases that deal with realistic situations where the theories described above can be applied. Considerable emphasis is also given to learning analysis techniques and back-of-the-envelope calculations that can be applied to case data (financial, market research results, industry reports, etc.) to gain further insights. Prereq: ACCT 401.

MBAC 426. Economics (1)
This course serves as a review of economic principles and an introduction to the use of economics in the management setting. Basic economic concepts will be demonstrated by analyzing economic issues and policies relating to the environment in which organizations function. Economic analysis will be demonstrated with reference to particular decisions confronted by firms, including game theory.

MBAC 440. Leadership Assessment and Development (1)
In the outcome assessment, M.B.A. students reassess their management abilities and knowledge areas and measure the progress they have made during their learning experience at the Weatherhead School. This documentation of individual strengths is applied to students’ job search strategies and/or their postgraduate learning plans.

MBAC 498. Action Learning (6)
This course allows teams of students to integrate functional core knowledge from the first year of the M.B.A. program and apply analysis and strategic management skills in a real-world setting. Students will be evaluated by the instructor and the project managers at the client organizations. Prereq: Second year full-time M.B.A. status.
MGMT 419. Corporate Field Research (1)
This course is intended for the graduate business student who wishes to gain applied/practical business experience based on his/her intended career path and/or with an organization. This course will assist building required skills and bridge the gap between the classroom and real world application. Prereq: Permission of the instructor.

MGMT 441. Planning for Personal Learning (3)
This course is designed for mid-life, mid-career professionals (health care, law, science and technology, management and the like) who may be moving toward new levels of leadership in their fields or organizations or who may be undergoing significant life or career transitions. Two three-day workshops (in August and January) plus three all day Saturday sessions in between are planned, along with individual follow-up in February or March. No M.B.A. credit.

MGMT 442. Seminar: Contemporary Management Issues I (3)
This is a two course sequence where a variety of current topics on leadership and management issues are presented in a seminar format. Specific topics for the year are selected in consultation with the participants. Previous topics have included re-engineering the corporation, marketing opportunity analysis, reinventing government, quality management, leadership and governance structures, and conflict management in organizations. In addition, each participant selects a subject for research. Proposals are prepared and reviewed by the faculty and class. Faculty guidance is offered. No M.B.A. credit.

MGMT 443. Planning for Personal Learning II (3)
This course is the second of a two-part sequence on personal and professional assessment, learning, and development. Part II includes a three-day residential retreat in January; a two-day retreat in May; and six half-day weekend sessions (February, March, April) for goal setting and action planning. Executive coaching is provided. An individualized development plan and an organizational project are completed. Prereq: MGMT 441.

MGMT 452. Japanese for Managers II (3)
Japanese for Managers II continues the introduction of fundamental Japanese grammar, pronunciation, and vocabulary essential for everyday business in Japan. In addition to language skills needed for specific situations (such as visiting, making appointments, extending invitations, business lunches, etc.), the course will present, through discussion, video, and guest lecture, elements of Japanese society and culture relevant to conducting business in Japan. As the course emphasizes the development of productive oral and aural Japanese language skills, a major portion of each class meeting is devoted to the performance of dialogues and applied situational conversation. Prereq: Permission of instructor.

MGMT 453A. Working Spanish I (3)
Instruction in Spanish language and culture for managers with intensive study in Mexico.

MGMT 453B. Working Spanish for Managers II (3)
Continuation of MGMT 453A.

MGMT 455. Issues in Public Policy (3)
This course will introduce students to the primary frameworks and tools of public policy analysis. Such skills have become essential to business managers, who are increasingly called upon to perform quasi-public functions, especially at the CEO and vice-presidential levels. The course will begin by presenting analyti-
cal frameworks, drawn mostly from political science and economics. It will proceed to illustrate these frameworks using three public policy cases. Current plans are to discuss telecommunications regulation, urban development policy, and conflicts in the arts. This course is required for students enrolled in the M.B.A. certificate in public policy. It will also be open to graduate students from throughout the university, on the theory that a classroom with diverse professional backgrounds will better simulate the public arenas in which managers must increasingly operate.

MGMT 460. Managing in a Global Economy (3)
Managers need new skills to enable them to manage effectively in what is increasingly a global economy. They need a deeper understanding of cultural differences and how these differences may influence communications with foreign employers, employees, customers, suppliers or partners. They need a better understanding of the economic and political mechanics of the world business system. They need to learn how to find out more about potential opportunities and threats that lie outside the United States. This course is designed to address these needs.

MGMT 460A. Managing in a Global Economy (3)
Managers need new skills to enable them to manage effectively in what is increasingly a global economy. They need a deeper understanding of cultural differences and how these differences may influence communications with foreign employers, employees, customers, suppliers or partners. They need a better understanding of the economic and political mechanics of the world business system. They need to learn how to find out more about potential opportunities and threats that lie outside the United States. This course is designed to address these needs.

MGMT 460E. Managing in a Global Economy—E.M.B.A. (3)
This course is open for enrollment by E.M.B.A. students only. The course is designed to present first-hand issues in international management. It accomplishes this by means of readings, a written assignment and, most importantly, an international trip designed to witness different management cultures, styles and environments for business in the international community. The course is offered during the Spring semester of the second year (referred to as Semester V in the program). Faculty responsibility rests with the Faculty Director of the E.M.B.A. Program as well as a “Resident-Faculty” specific to each field trip. Such faculty are drawn from the Weatherhead community and vary by the design and destination of the trip. In addition, the course is staffed by an administrative assistant from the complement of Dively CMDR staff. Occasionally and where appropriate, there is also “in-tourist” assistance in some of our foreign locations. This course is part of our overall management offerings and is designated as MGMT 460, Section E.

MGMT 460K. Managing in a Global Economy (3)
Managers need new skills to enable them to manage effectively in what is increasingly a global economy. They need a deeper understanding of cultural differences and how these differences may influence communications with foreign employers, employees, customers, suppliers or partners. They need a better understanding of the economic and political mechanics of the world business system. They need to learn how to find out more about potential opportunities and threats that lie outside the United States. This course is designed to address these needs.

MGMT 460P. Managing in a Global Economy (3)
MGMT 461. Development of American Business (3)
The major theme of this course traces the development of concepts relating to business structures and capital markets and workplace values in the United States and other countries. Attention is given to the emergence of the professional manager and the exploration of current business issues from a societal and historical perspective.

MGMT 462. Technology and Society: Progress and Problems (3)
Rapid technological change has markedly transformed business and society. Managers operate in an environment where consequences of new technologies need to be understood from an economic and social perspective. Given the broad context within which technologies emerge and evolve, this course seeks to create an awareness of how technology is a driving (but sometimes subtle) force that (1) shapes nearly all aspects of our experiences, opportunities, satisfactions, and problems; (2) influences and is influenced by the network of increasingly governmental and private sector organizations and interests; (3) drives the emergence of social and ethical issues and, in dealing with these issues, shows the strengths and limitations of political and economic institutions; and (4) is a significant determinant of corporate strategy in a world where economic, political, and social considerations coexist.

MGMT 462A. Technology and Society: Progress and Problems (1.5)
Summer offering.

MGMT 462B. Technology and Society: Progress and Problems (1.5)
Fall offering. Prereq: MGMT 462A.

MGMT 464. Business Ethics (3)
This course is built around two core learning tracks. The first is extended analyses of case studies, which identifies ethical problems, diagnoses import, and develops strategic programs to address them. The second learning track uses short pieces of fiction to explore issues of ethical character, leadership, and organizational responsibility. Each student keeps an ethics journal over the course of the semester to reflect on ethical issues, both inside and outside the classroom. In addition, small student groups are formed to write case studies focusing on a business ethics problem.

MGMT 465. Perspectives in European Management (3)
The European Summer Institute provides an introduction to international business through a unique combination of class meetings on campus and a two-week excursion to central Europe. While in Europe, students meet with local business people, consulate officials, and university professors to learn the prerequisites for doing business in the region. The trip features a number of site visits to local companies. (This course may be used for perspective course credit.) Prereq: Permission of instructor.

MGMT 466. Seminar in International Business (3)
This course is a continuation of MGMT 465 and includes an independent study component. (Approval for course credit in the student’s area of concentration may be approved by the instructor at the time of registration.) (Summer only) Prereq: Permission of instructor.

MGMT 498. Process Improvement Consulting (3-6)
This course is highly recommended to students who are planning to pursue post-M.B.A. careers in consulting firms or as an in-company process improvement
or quality management consultant. At the start of the course, students will be organized as five-member consulting teams and will be assigned a consulting project and a project manager from a major Cleveland organization. Students will be expected to spend at least one day a week at the organization facility. The student consulting teams will be taught to use several tools for process improvement, project management, and communication with clients. Faculty member will act as a “consulting partner” during the course to provide guidelines and advice during challenging periods of the projects and to keep the progress of the projects on schedule. Student consulting groups will be evaluated on the quality of their analysis, reports and presentations and on the significance of the cost-savings or profits which they have identified for the firm through their analysis. Prereq: Second-year status.

MGMT 499. Strategic Issues and Applications (3) This course wraps up the M.B.A. core by providing an integrative experience of applying the full range of managerial skills addressed throughout the core in a comprehensive case exercise. Students develop, document, and present comprehensive, implementable strategic and tactical actions programs in groups. Prereq: ACCT 401 and BA4 402.

MGMT 501. Special Problems and Topics (1-18) This course is offered, with permission, to students undertaking reading in a field of special interest.

MGMT 560. Theoretical Perspectives in Management (3) This seminar exposes students to management theories from a variety of disciplines. The goal of the course is to help students learn to synthesize and contrast theories to develop hypotheses of their own. Prereq: Ph.D. standing or consent of instructor.

MGMT 570. Research Theory and Method (3) This seminar explores pertinent issues in the philosophy of social sciences and in the use of quantitative and qualitative research methods. It seeks to clarify pivotal issues in scientific enterprise like the nature of scientific knowledge, the nature of scientific methods, their grounding, issues of ontology and epistemology, rhetoric, and how scientific knowledge relates to the organization of scientific communities. The seminar’s objective is to prepare students to think critically about the underlying assumptions and their day-to-day research practices. Prereq: Ph.D. standing.

MGMT 571. Measurement Theory and Method (3) This doctoral seminar focuses on the theoretical and methodological issues involved in social science measurement. Specifically, the course will cover topics in basic principles of measurement including Classical Test Theory, Reliability, Validity, and Item Response Theory, as well as related tools for measurement analysis including Exploratory and Confirmatory Factor analysis. In addition, the course will expose students to analytical methods that model measurement error in simultaneous equations including models with mediation and moderation effects. This course involves extensive use of statistical packages including SPSS, LISREL, and EQS. Prereq: Ph.D. standing.

MGMT 573. Applied Multivariate Data Analysis (3) The objectives of the seminar are to provide students with an understanding of the substantive and methodological issues involved in applied multivariate data analysis. The seminar aims to expose students to the assumptions, principles and applications of a selected set of multivariate techniques including Logistic Regression, MANOVA/Discriminant, Profile, Multilevel and Latent Growth Model analysis. This course involves extensive use of statistical packages including SPSS, LISREL, and EQS. Prereq: Ph.D. standing.

MGMT 575. Doctoral Research Project (3) This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

MGMT 602. Advanced Topics (1-18) This is a course of flexible design to meet advanced theoretical and/or methodological needs of doctoral students. Approval is needed from the instructor, and it requires a letter grade.

HEALTH SYSTEMS MANAGEMENT COURSES (HSMC)

HSMC 420. Health Finance (3) (See BAFI 420.) Prereq: ACCT 401 or permission of instructor. Cross-listed as BAFI 420.

HSMC 421. Health Economics and Strategy (3) (See ECON 421.) Cross-listed as ECON 421 and MPHP 421.

HSMC 422. Health Systems Marketing (3) (See MKMR 420.) Prereq: MKMR 403 or MBAC 244 or consent of instructor. Cross-listed as MKMR 420.

HSMC 424. Innovations, Markets, and Organization in Pharmaceutical Industry (3) (See ECON 424.) Cross-listed as ECON 424.

HSMC 427. Health Law (3) (See LAWS 227.) Cross-listed as LAWS 227.

HSMC 432. Health Care Information Systems (3) (See MIDS 432.) Cross-listed as MIDS 432.

HSMC 446. Models of Health Care Systems (1.5) (See IIME 446.) Cross-listed as IIME 446.

HSMC 447. Regulatory Affairs for the Biosciences (1.5) (See IIME 447.) Cross-listed as IIME 447.

HSMC 456. Health Policy and Management Decisions (3) This seminar course combines broad health care policy issue analysis with study of the implications for specific management decisions in organizations. This course is intended as an applied, practical course where the policy context is made relevant to the individual manager. Cross-listed as MPH 456.

HSMC 501. Special Problems and Topics (1-18) This course is offered, with permission, to students undertaking reading in a field of special interest.

HSMC 501G. Medical School Electives (1-3) Students complete requirements for three six-week electives offered by the Medical School and complete a paper to receive 3 hours of credit. For detailed information about this course, contact the Health Systems Management Center adviser in 443 Peter B. Lewis Building (368-6403).

HSMC 502. Health Care Executive Education Series (1-3) Students may choose six out of eight all day Friday seminars in the Health Care Executive Education Series, plus completion of a paper covering an aspect of the management of health care systems. Registration is 1 credit for Fall semester and 2 credits for the Spring Semester as seminars begin in the Fall and continue through the Spring semester. Limited to students ad-mitted to the Health Systems Management Certificate program and those with approval from Barbara Bolek (barbara.bolek@case.edu; 216-368-6403).

HSMC 601. Special Problems and Topics (1-18) This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

EXECUTIVE DOCTOR OF MANAGEMENT (EDMP)

EDMP 610. Culture and World Politics (3) Religion, ethnicity, and nationalism are assuming increasing significance as defining factors in the post cold war period. These developments call for analysis of how culture affects domestic, regional, and international integration and disintegration. They raise questions about how culture and social structure are interrelated with economic development. The seminar will examine ideas of political democracy and economic liberalism in relation to different cultural and religious ideas and explore relationships among social values, political structures, and economics.

EDMP 611. Theory and Practice of Collective Action (3) The dominant model of business behavior assumes that organizational actions are solely individualistic, autonomous and competitive. Recently, the importance of collective action, within and across industries and communities, has been recognized. This seminar will address the theory and practice of collective action in the business environment and examine problems and solutions in local, national and global contexts. Case studies of collective action problems, such as waste recycling, technology development and community revitalization, will be discussed.

EDMP 612. Identifying a Personal Research Domain (3) The first course in the E.D.M. inquiry sequence provides an introduction to practitioner scholarship and an opportunity for participants to identify and develop their personal research domains. Participants gain skills in inductive, interpretive modes of research, in literature searching and synthesizing, and in conceptualizing. These skills are put to use by interacting with practitioners and literature in order to conceptualize a research question or issue. This work specifies an “action” or “practice” problem to be addressed during the three years of the program, and it serves as a first draft of a more thorough conceptual model to be completed in the second semester of the first program year. The preliminary conceptual model includes rich narratives and the identification of casual relationships among relevant constructs.

EDMP 613. Leadership to Create Human Value (3) Leadership will be examined by studying a number of topics and applying them to two major case studies: 1) a CEO and 2) yourself. This course will explore answers to questions, such as: Who are the great leaders? How do the effective ones think and act? What is emotional intelligence and how does it enable people to be great leaders? What makes them inspirational? How are leaders developed?

EDMP 614. Business as a Dynamic System (3) This seminar examines the evolution of large-scale business firms as a result of technological and organizational change. It deals with the role of history, culture, and finance in generating business organizations in different countries. The seminar also studies technological
EDMP 615. Conceptualizing a Personal Research Topic (3)
Continuation of the prior semester course, Identifying a Personal Research Domain, this class explores ways to conceptualize an object of study, and it supports formulation of students' conceptual work and their research reports at the end of the first program year. The seminar conveys how to generate research ideas by critically reviewing literature, and it develops ideas about contributions to the problem or issue of interest by working with theory and extending previous research. The practicality of conducting certain kinds of research is evaluated and the length, intensity, and ethical constraints of different research efforts are examined. The course engages with faculty conducting research in areas similar to students' interests. Each student produces a report at the end of the semester communicating and supporting a conceptualization of the phenomenon of interest involving independent, mediating, and dependent variables. This paper defines a problem or issue for research and presents, both visually and in narrative form, the concepts shaped by field experiences and by prior writing for understanding the problem.

EDMP 616. Global Economic Systems and Issues (3)
This seminar examines recent structural changes occurring in the world economy and how countries and international institutions are responding. Evolving patterns of global investment and trade are analyzed, especially the emergence of regional trade links and investment blocs, and the changing roles of international economic institutions, such as the World Bank, the International Monetary Fund, and the World Trade Organization.

EDMP 617. Technology and Social System Design (3)
Intensification of electronic technology, especially communication and computing technology, generates issues of technology assessment and social system design. Technology assessment concerns broad questions of how managers can anticipate and evaluate the potential consequences of existing and emerging technology, including social, economic, and political implications. As technologies intensify, questions of social system design will replace parochial concerns with organization design. Interorganizational networks, citizen action networks and financial government structures will become primary management concerns. This seminar will draw on historical studies of communication technologies and their impact on society.

EDMP 620. Synthesis and Application of Knowledge (3)
This capstone seminar focuses on how different methodological techniques complement and conflict with each other and how they may be used in concert. The seminar emphasizes understanding findings from a variety of studies and translating them into common language, thus permitting decision making and action.

EDMP 621. Applied Research I (3)
The Applied Research component of the E.D.M. Program integrates conceptual analysis with managerial and social policy. This seminar is dedicated to writing the proposal for students’ applied research projects, which are undertaken as independent work during the third year.

EDMP 622. Thematic Elective I (1-3)
Participants in the E.D.M. Program take a selected sequence of two coordinated elective courses that provide opportunities for advanced study in topical-sector-specific areas. Sequences will be designed according to the shared interests of participant groups. For example, a sequence for participants with special interest in Nonprofit Management may consist of courses in Constitutional Issues, Nonprofit Organizations in the Marketplace, or The International Nonprofit Sector. A sequence designed for participants interested in Technology Management may include Foundations for Technology Management Leadership plus an additional course that integrates topics in Information Systems, Management Policy, Operations Management, and Organizational Behavior.

EDMP 623. Thematic Elective II (1-3)
(See EDMP 622.)

EDMP 624. Applied Research II (1-4)
(See EDMP 621.)

EDMP 625. Thematic Elective III (1-6)
(See EDMP 622.)

EDMP 626. Applied Research III (1-9)
(See EDMP 621.)

EDMP 627. Applied Research IV (3-9)
(See EDMP 621.)

EDMP 637. Social Policy Development (3)
Multiple forces shape the development of social policies that often have profound consequences for individuals, communities, and the nation as a whole. This seminar is intended to enable participants to develop a deeper understanding of the social, political, and economic forces shaping policy development and to identify critical questions which should be addressed in assessing the consequences of new policy initiatives. The seminar explores various mechanisms for influencing policy development and their efficacy. Literature relevant to the analysis and implementation of social policy and study will be read.

EDMP 638. Qualitative Research Methods I (3)
This course builds upon the students' first year of work in conceptualizing a problem driven topic or phenomenon of interest. The aim of the second year is to ground the student's conceptual model in rigorous qualitative inquiry through semi-structured interviewing, developing, refining, and clarifying the understanding of one's problem. In addition to a continuing synthesis of literature and field experience, the seminar deals with specific issues of designing research questions, sampling, interview structuring, interviewing technique, and anticipated data analysis. Students prepare a complete research proposal by the end of the semester.

EDMP 640. Social Ethics: Contemporary Issues (3)
While drawing upon intellectual ancestors in philosophy and ethics, a primary focus on current issues and points of view. Analysis of social and ethical questions pertaining to the definition and purpose of contemporary life, the need for moral coherence, and the meaning of living in a global society. Particular emphasis on the ethical questions of living in a global society. Participation in the ethical questions and dilemmas, opportunities and threats, posed by technological advances. Objectives are to expand capacity to address the ethical implications of these issues and to come closer to framing the right questions.

EDMP 641. Qualitative Research Methods II (3)
This seminar represents the second semester of a year-long sequence in qualitative methods during the second program year. Fieldwork is conducted, qualitative data are analyzed, and the student's conceptual model of the topic or problem of interest is revised. Emphasis is placed on inductive coding of semi-structured interviews and quantification of data and its statistical manipulation where appropriate. The aim of the course is to revise and specify one's conceptual model based on the fieldwork and to integrate new literature arising as a result of the fieldwork. Hypotheses for third year qualitative analysis are developed. Completed projects are reviewed and assessed for quality and readiness for quantitative evaluation.

EDMP 642. Directed Studies Seminar (1-9)
This course is dedicated to student-identified directed study during the Fall semester. Individually, or in trios, students develop objectives and plans of study to deepen their understanding in particular topics, either through initiating a new writing project, extending a previous project, engaging in a directed reading program, or undertaking new field research. Case faculty are invited to advise projects in their areas of interest. Sharing of interests and learning among students in a dedicated seminar.

EDMP 643. Foundations for Quantitative Inquiry (3)
This seminar will focus on foundational studies for designing generalizable (quantitative) studies. The participants will be able to use these skills in framing and designing their own research work. Basic foundations will be covered including survey, longitudinal, and secondary research design issues, sampling, control over confounding variables, selection/survey error and generalizability issues. Also covers scaling and measurement of social science phenomena with emphasis on reliability and validity of constructs.

EDMP 644. Multivariate Statistics and Computer Toolkit (2)
This seminar builds on instruction in univariate statistics from year two. The seminar covers the assumptions, principles, and applications of covariance, test for mean difference, multiple comparisons, and regression/ANOVA. This seminar develops the use of SPSS and/or EQS software for statistical analysis.

EDMP 645. Critical Applications and Research Project Issues (4)
This seminar addresses common application issues that may arise during the participants' execution of individual research projects. In addition, it focuses on critical analyzing selected pieces of published applied research to allow participants to develop an appreciation of application issues that have wide applicability and relevance. Application to the participant's own research work will be encouraged and supported by sharing and discussing common themes and problems.

EDMP 646. Advanced Analytical Methods for Generalizable Studies (3)
This seminar will focus on building the methodological skill base for rigorous analysis of quantitative data. This covers the assumptions, principles, and application of multivariate statistics including multiple regression analysis, moderator-mediator analysis, factor analysis, and path analysis. Also includes implementation of multivariate procedures using SPSS/EQS.

EDMP 699. Applied Research Project Continuation (1-9)
Program participants who have not successfully completed their Applied Research Projects before the start of the fall semester following their third year of enrollment in the E.D.M. Program will have seven years from the date of their initial matriculation into the Program to complete degree requirements. If their
work continues beyond the normal 54 credit hours of
designed courses, they will register for Applied Re-
search Project Continuation. Continuation credits may
also be used for students enrolling in the Program after
August 2000, who have not completed their required
course work and research requirements within the
Program's required 54 semester credit hours.

ENTREPRENEURIAL STUDIES (ENTP)

Undergraduate Courses

ENTP 301. Entrepreneurial Strategy (3)
This course is designed to show students how to iden-
tify potential business opportunities, determine what
constitutes a good business model, and to strategi-

cally implement a business proposal. Topics of focus
include an overview of the entrepreneurial process,
determinants of venture success in high tech and other
business environments, and strategies for industry en-
try and venture growth. Prereq: ACCT 101 or ACCT
303. Coreq: At least sophomore standing.

ENTP 310. Entrepreneurial Finance - Undergradu-
ate (3)
This course explores the financing and financial man-
agement of entrepreneurial new ventures. The course
will focus on issues of financial management of new
ventures (forecasting cash flows, cash flow manage-
ment, capital budgeting, valuation, capital structure)
and the various financial methods and mechanisms
available to entrepreneurs (bootstrapping, angel
investors, venture capitalists, IPOs). Prereq or Coreq:
ACCT 101 or ACCT 303 or consent of instructor.

ENTP 311. New Venture Creation (3)
This course explores all aspects of the creation of a
new venture from idea through startup, growth, and
beyond. Students will learn how to evaluate oppor-
tunities, develop strategies, create a business plan and
acquire financing for a new venture. In this course
students will develop a business plan for a new venture.

ENTP 312. Managing the New Venture (3)
The main objective of this course is to teach students
to recognize and deal with the problems of managing
a new venture during its life-cycle. The course will
pay particular attention to the problem of successfully
managing a rapidly growing company. Case analysis
will be the primary method of instruction. Prereq:
ENTP 310 or ENTP 311.

Graduate Courses

ENTP 418. New Enterprise Development (3)
This entrepreneurship course teaches how to start,
acquire and manage one's own business. Valuation,
capital acquisition, turnarounds and growth strategies
are featured, utilizing successful entrepreneurs and
their companies to assure a real world learning experi-
ence. Cross-listed as PLCY 418.

ENTP 419. Entrepreneurship and Personal Wealth
Creation (3)
(See PLCY 419.) Cross-listed as PLCY 419.

ENTP 420. Managing the Family Firm (3)
The vast majority of U.S. firms are family controlled
and present special problems in strategic management
including the interaction of family and firm objectives,
executive succession, management development and
motivation, finance, estate planning, etc. This course
explores solutions to these problems in the context of
guiding the firm's growth through the threshold
between personal and professional management. The
course pedagogy is participative and experiential.
Cross-listed as PLCY 420.

ENTP 422. Managing an Emerging Growth Enter-
prise (3)
Students are exposed to what it is like to work in an
emerging growth company with sales under $100
million. Prospective students might be individuals
who are considering employment with middle market
companies, entrepreneurs who may start a company,
or business persons who may buy a middle market
company. The learning experience will stem from par-
ticipating in an actual semester-long project. In-class
discussions include: business planning, selling, manag-
ing technology transfer, and creativity/innovation,
and guest presentations by CEOs from middle market
companies. Prereq: ACCT 401 and BAFI 402 and
MKMR 403 and MIDS 409 and consent of instructor.
Cross-listed as PLCY 422.

ENTP 424. Advanced Principles of Entrepreneur-
ship (3)
This course will provide students with in-depth infor-
mation on the entrepreneurial process by cross-cutting
the stages of venture development with key func-
tional business areas including marketing, operations,
strategic planning, finance, and human resources.
Each student will complete a practicum with a host
company that consists of a weekly time commitment
(work schedules will be set and agreed to by the course
instructor, the host company and the student). Prereq:
Approval of Robert Hisrich. Cross-listed as PLCY 424.

ENTP 425. Managing Human Resource Issues in
Entrepreneurial Firms (3)
(See LHRP 425.) Cross-listed as LHRP 425.

ENTP 426. International Entrepreneurship (3)
This course introduces the area of international entre-
preneurship by focusing on various aspects of this area.
Topics to be covered include: conditions making small,
medium-sized, and new ventures increasingly impor-
tant in international business; information sources
relevant to international entrepreneurship; critical steps
in deciding on doing international entrepreneurship,
strategic planning and methods in conducting inter-
national entrepreneurship; and benefits and problems
of going international as a new venture. Cross-listed
as PLCY 426.

ENTP 427. Entrepreneurial Strategy (3)
(See PLCY 427.) Cross-listed as PLCY 427.

ENTP 428. Small Enterprise Consulting (3)
Student teams will apply their expertise and experi-
ence to solve a strategic problem for a small enterprise
selected by COSE (Council of Small Enterprises).
Teams are expected to meet with their client, manage
the project workload, and provide a case report with
recommendations. Cross-listed as PLCY 428.

ENTP 429. New Venture Creation (3)
This course focuses on all aspects of creating a new
venture from both an entrepreneurial as well as an
intrapreneurial perspective. The primary focus of the
course will be understanding all the aspects of the
business plan both at start-up as well as growing the
venture. This will involve understanding: sources of
capital, the financial plan, the marketing plan, the or-
ganization plan, and the production plan all within the
business plan framework. (Fall) XLIST: PLCY 429.

ENTP 439. Intrapreneurship - Entrepreneurship
within the Corporation (3)
Intrapreneurs are the entrepreneurs within corpora-
tions who combine innovation, creativity and leader-
ship to develop and launch new products, new product
lines, and new business units that grow revenues and
profits from within. Intrapreneurial innovation and
creativity have never been needed more by U.S.
corporations than they are today. Numerous corpora-
tions have been increasing revenues through mergers
and acquisitions, rather than through internal product
innovation and new business creation. Today, many
companies are returning to their entrepreneurial roots.
Reinvigorating existing companies through intrapreneur-
ial activity creates new capital, retains and increases
jobs, and creates exciting places to work and achieve.
The purpose of this course is to encourage students
to research and understand the theories, principles,
concepts, and practices of entrepreneurship within
organizations--Intrapreneurship. Students will become
acquainted with trends, expectations, organizational
challenges to innovation, and opportunities in today's
corporate America. Cross-listed as PLCY 439.

ENTP 440. Entrepreneurial Finance (3)
This course explores the financing of entrepreneurial
new ventures. The primary focus of the course will be
the various financing methods and mechanisms avail-
able to entrepreneurs. This will involve understanding:
estimation of capital requirements, bootstrap financing,
angel investors, venture capitalists, private placements,
firm valuation and initial public offerings. Cross-listed
as PLCY 440.

ENTP 441. Technology-Based Entrepreneurship (3)
(See PLCY 441.) Prereq: May not receive credit for
ECON 424 and ECON 464. Cross-listed as PLCY
441.

ENTP 445. Business Development in the Bioscience
Sector (1.5)
This 1.5 credit module addresses the strategic and
managerial challenges of business development, includ-
ing investor relations and the management of joint
ventures and strategic alliances. Topics will include
investor relations, corporate and university partnership,
partner selection, alliance negotiation, and alliance
management, including building trust, warning signs,
and managing the exit. The content will be a combina-
tion of lecture, case analysis, and guest speakers.
Cross-listed as PLCY 445 and BIOS 445.

ENTP 446A. Venture Law (2.5)
(See BIOS 446A.) Cross-listed as BIOS 446A.

ENTP 446B. Venture Law (3)
(See BIOS 446B.) Cross-listed as BIOS 446B.

ENTP 450. Entrepreneurial Marketing (3)
(See MKMR 450B.) Cross-listed as MKMR 450B.

ENTP 464. Economic Perspective of Technology
and Entrepreneurship (3)
(See ECON 464.) Cross-listed as ECON 464.

ENTP 471. Innovation and Intrapreneurship (3)
(See PLCY 471.) Cross-listed as PLCY 471.

ENTP 501. Special Problems and Topics (1-36)

School of Medicine

Room BRB 113, School of Medicine
10900 Euclid Ave.
Cleveland, Ohio 44106-4915
Phone (216) 368-2825
Fax (216) 368-2820
http://casemed.case.edu
Ralph I. Horwitz, M.D., Dean

The mission of the Case Western Reserve University (Case) School of Medicine is to advance the health of humankind through four interrelated components:

1) Education: To provide the highest-quality humanistic and scientific education for students pursuing the doctor of medicine degree, advanced degrees in the biomedical sciences, and graduate and continuing medical education.

2) Research: To lead in the development of new knowledge in the biomedical sciences, the clinical disciplines, and areas of inquiry that examine the organization and provision of health care services.

3) Clinical care: To deliver excellent clinical care through faculty members and bring leading-edge treatments from the laboratory to practice.

4) Public service: To contribute to the public good—locally, nationally, and globally—in activities related to health and health care.

Since its founding in 1843, the Case Western Reserve University School of Medicine has been an innovator in medical education and a leader in pioneering research.

The school was one of the first medical schools in the country to employ instructors devoted to full-time teaching and research. Six of the first seven women to receive medical degrees from accredited American medical schools graduated from Western Reserve College (as it was called then) between 1850 and 1856.

Already a leading educational institution for more than a century, in 1952 the School of Medicine initiated the most advanced medical curriculum in the country, pioneering integrated education, a focus on organ systems and team teaching in the preclinical curriculum. This curriculum instituted a noncompetitive grading system for the first two years of medical school to promote cooperation among students instead of competitiveness, introduced students to clinical work and patients almost as soon as they arrived on campus, and provided free, unscheduled time in an era when doing so seemed unthinkable. Many other medical schools followed suit, and these components remain at the core of the medical school’s curriculum today.

At least 11 Nobel Prize holders have ties to the School of Medicine:

- John J.R. Macleod, M.B., Ch.B., D.P.H., physiology professor at Case from 1903 to 1918, shared the 1923 Nobel Prize in Physiology or Medicine for the discovery of insulin. Dr. Macleod completed a considerable amount of the groundwork that furthered his understanding of diabetes in Cleveland.
- Corneille J.F. Heymans, M.D., who was a visiting scientist in the Department of Physiology in 1927 and 1928, received the Nobel Prize in Physiology or Medicine in 1938 for work on carotid sinus reflexes.
- Frederick C. Robbins, M.D., shared the 1954 Nobel Prize in Physiology or Medicine for his work on the polio virus, which led to the development of polio vaccines. He received the award two years after joining the medical school. Dr. Robbins was active at the school until his death in 2003, at which time he held the titles of medical school dean emeritus, University Professor emeritus, and emeritus director of the Center for Adolescent Health.
- Earl W. Sutherland, Jr., M.D., who had been professor and director of pharmacology from 1953 to 1963, won the 1971 Nobel Prize in Physiology or Medicine for establishing the identity and importance of cyclic adenosine monophosphate (AMP) in the regulation of cell metabolism.
- Paul Berg, Ph.D., who earned his biochemistry degree at the university in 1952, received the 1980 Nobel Prize in Chemistry for pioneering research in recombinant DNA technology.
- H. Jack Geiger, M.D., a 1958 alumnus of the medical school, is a founding member and past president of Physicians for Social Responsibility, which shared the 1985 Nobel Peace Prize as part of International Physicians for the Prevention of Nuclear War, and Physicians for Human Rights (PHR), which shared the 1997 Nobel Peace Prize as part of the International Campaign to Ban Land Mines.
- George H. Hitchings, Ph.D., who had been a biochemistry instructor from 1939 to 1942, shared the 1988 Nobel Prize in Physiology or Medicine for research leading to the development of drugs to treat leukemia, organ transplant rejection, gout, the herpes virus, and AIDS-related bacterial and pulmonary infections.
- Alfred G. Gilman, M.D., Ph.D., a 1969 graduate of the medical school, shared the 1994 Nobel Prize for Physiology or Medicine for identifying the role of G proteins in cell communication.
- Ferid Murad, M.D., Ph.D., a 1965 graduate of the medical school, shared the 1998 Nobel Prize in Physiology or Medicine for discoveries concerning nitric oxide as a signaling molecule in the cardiovascular system.
- Paul C. Lauterbur, Ph.D., a 1951 graduate of the engineering school and a visiting professor of radiology at Case in 1993, shared the 2003 Nobel Prize in Physiology or Medicine for pioneering work in the development of magnetic resonance imaging.
The School of Medicine is the largest biomedical research institution in Ohio, as measured by funding received from the National Institutes of Health (NIH), the world’s largest funding agency of biomedical research. The medical school receives more NIH funding than all the other Ohio medical schools combined and is in the top tier of medical schools nationally.

U.S. News and World Report repeatedly has ranked the Case Western Reserve School of Medicine as one of the top research medical schools in the country.

In 2002, the school became only the third institution in history to receive the best review possible from the body that grants accreditation to U.S. and Canadian medical schools, the Liaison Committee on Medical Education. Also in 2002, the school built on its tradition of innovation in education when Case and the Cleveland Clinic Foundation entered into an agreement to form the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, with the first class matriculating in 2004.

HISTORY

Founded in 1843 as the Medical Department of Western Reserve College (and popularly known then as the Cleveland Medical College), the school moved into its first permanent home, in downtown Cleveland, in 1846. In 1915, a 20-acre site was secured for a medical center in University Circle, the current home of Case, its School of Medicine, and two of the school's affiliated hospitals, University Hospitals of Cleveland and the Louis Stokes Cleveland Department of Veterans Affairs Medical Center. University Circle also is home to many of the country’s outstanding cultural and educational institutions.

In 1924, the School of Medicine moved into the most modern and best-equipped preclinical science building in the country at that time. That building, donated by Cleveland industrialist Samuel Mather, remains an integral part of the medical school complex. It was named the Harland Goff Wood Building in 1993 in honor of the late chair and professor of biochemistry and former provost of the university.

In 1971, the Health Sciences Center was completed to house the university’s medical, dental, and nursing schools, as well as the Health Center Library. In 1994, the health sciences complex was named for now-retired U.S. Congressman Louis Stokes. The proximity of these excellent research and educational centers to other prestigious university departments, including science, engineering and social sciences, stimulates uniquely creative interaction among researchers and educators.

Another giant leap in research capabilities came in the early 1990s, when the Richard F. Celeste Biomedical Research Building, named for the former Ohio governor, was opened. The $70 million building, attached to the Wood Building, added 154,000 square feet of research space and includes conference spaces, a lecture hall, public spaces, and a cafeteria.

Recent boosts in research capabilities came with the spring 2003 dedication of a new, eight-floor addition to the School of Medicine's Wood Building, which added more than 40,000 square feet to the medical school, primarily for research laboratories. Also as part of the project, 30,000 square feet of existing laboratory space in the Wood Building was renovated. And in the fall of 2003, the School of Medicine and University Hospitals of Cleveland dedicated the new, eight-floor Iris S. and Bert L. Wolstein Research Building, adding 320,000 square feet of space for up to 700 researchers.

FACULTY

The university’s medical school educators have received four Abraham Flexner Awards for Distinguished Service to Medical Education, more than have educators at any other medical school in the country, from the Association of American Medical Colleges.

The School of Medicine has 1,670 full-time and 2,104 part-time faculty mem-
bers who teach in classroom, laboratory, small group and clinical settings. These faculty members work in the medical school’s 15 preclinical departments, 20 clinical science disciplines, and numerous centers.

EDUCATION

In 2002, the School of Medicine became only the third institution in history to receive the best review possible from the body that grants accreditation to U.S. and Canadian medical degree programs, the Liaison Committee on Medical Education. School of Medicine faculty lead two programs leading to the M.D. at the School of Medicine (the longstanding School of Medicine program, also known as the University Program, and the Cleveland Clinic Lerner College of Medicine at Case Western Reserve University, also known as the College Program, which is scheduled to open in academic year 2004-2005), and one program resulting in an M.D. through the University Program and a Ph.D. in a basic science discipline through the School of Graduate Studies (the Medical Scientist Training Program [MSTP]). Also, through the School of Graduate Studies, School of Medicine faculty lead programs resulting in Ph.D. and master’s degrees in basic science disciplines. All of these degree programs are detailed in this School of Medicine section of this General Bulletin.

RESEARCH

As a research institution, the School of Medicine also has a tradition of national leadership. The National Institutes of Health (NIH) is the country’s largest funding source for biomedical research, and the School of Medicine consistently has ranked in the top tier of the nation’s medical schools for federal research funding from the NIH. In fact, fiscal year 2002 (at press time the latest year for which figures were available) marked the 16th consecutive year that NIH funding to the medical school had increased. In fiscal year 2002, the school received more than $239 million in grants from the NIH, including funds to the school’s newest affiliate, the Cleveland Clinic Foundation. The school ranked first among Ohio’s six medical schools, receiving more NIH funding than all the other Ohio schools combined.

CLINICAL CARE

The School of Medicine provides world-class clinical care through full-time faculty at its major affiliates, including the Cleveland Clinic Foundation, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, MetroHealth Medical Center, and University Hospitals of Cleveland. Their positions on faculty ensure the transition of leading-edge treatments from the laboratory to the clinical setting.

PUBLIC SERVICE

The School of Medicine also serves the northern Ohio community in many ways. The school’s faculty provide 90 percent of the indigent health care in Cuyahoga County and a majority of the care for indigent patients in Ohio. The School of Medicine’s commitment to the community also is illustrated by a number of programs that link researchers and medical students to the community. These include the Center for Science, Health and Society, the Office of Urban Health, the Center for Adolescent Health, the Center for Health Promotion Research, the Primary Care Track, and the Institute for Public Health Sciences, involving the MetroHealth System and the School of Medicine. This latter program includes research into the prevention, diagnosis, and treatment of health problems in groups and communities, as well as educational programs for medical and graduate students, physicians, and other health care personnel.

Current community-based programs, including the Urban Area Health Education Center (AHEC) and the award-winning Cleveland Health Education Program, offer opportunities for students from several of the university’s undergraduate and professional schools, especially the medical school, to interact with students in the Cleveland public schools and with the community at large. Also, through the master of public health degree program, students complete a public health field practicum in which they work on a project for a public agency and produce a report for the agency. M.P.H. graduates are qualified to work in local and state health departments, universities and colleges, hospitals, ambulatory medical centers, non-profit organizations, and the insurance and pharmaceutical industries.

A major economic influence on the northern Ohio area, the School of Medicine and its affiliated hospitals are among the largest employers of personnel in the area and further stimulate the economy by providing concepts for technology transfer to the business sector.

On the international level, the School of Medicine has a global health and diseases program focusing on AIDS, parasitic diseases, tuberculosis, malaria, and other diseases that directly threaten world health.

ADMINISTRATION

The dean of the School of Medicine, who reports to the president of the university, also is vice president for medical affairs at Case. The dean is responsible for the administration of the school and for the university’s relationships with affiliated hospitals; medical health-related agencies and institutions; and community health care, education, and research programs involving the faculty of the School of Medicine. One of the dean’s newest education-related responsibilities is the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, a program within the School of Medicine that enrolled its first class in 2004. The dean of the School of Medicine also is the director of the Case Research Institute, a joint, virtual research enterprise of Case and University Hospitals of Cleveland, announced in late 2002, that brings together the strategic planning, operational aspects, and financial support of all research initiatives of the clinical and translational departments of the School.
of Medicine and University Hospitals of Cleveland.

The chairpersons of university departments are delegated administrative responsibility in their respective areas and report to the dean.

The faculty of the School of Medicine, through the Faculty Council, plan and implement educational programs and formulate general policies and those regarding student affairs.

**ADMINISTRATION**

Ralph I. Horwitz, M.D.
Dean, School of Medicine, and Vice President for Medical Affairs, Case

Robert B. Daroff, M.D.
Interim Vice Dean for Education and Academic Affairs

Morton H. Grusky, J.D.
Vice Dean for Administration and Finance, School of Medicine, and Associate Vice President for Medical Affairs, Case

Lindsey C. Henson, M.D., Ph.D.
Vice Dean for Medical Education, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

Pamela B. Davis, M.D., Ph.D.
Senior Associate Dean for Research

C. Kent Smith, M.D.
Senior Associate Dean for Students, and David Satcher Society Dean (student advising)

Richard D. Aach, M.D.
Associate Dean and Director of Residency and Career Planning

Daniel E. Anker, Ph.D., J.D.
Associate Dean for Faculty and Institutional Affairs

Brigette Bryant
Interim Associate Dean for Development and Alumni Relations

Claire Doershuk, M.D.
Associate Dean for Medical Student Research

Robert Haynie, M.D., Ph.D.
Associate Dean for Student Affairs, and Frederick Robbins Society Dean (student advising)

Albert C. Kirby, Ph.D.
Associate Dean for Admissions

Jerome Kowal, M.D.
Associate Dean for Geriatric Medicine

Thomas M. Nosek, Ph.D.
Associate Dean for Biomedical Information Technologies

Daniel B. Ornt, M.D.
Associate Dean for Clinical Affairs

Jerry M. Shuck, M.D.
Associate Dean for Graduate Medical Education

Terry Wollapaw, M.D.
Associate Dean for Curricular Affairs

Kenneth Kutina
Senior Advisor for Planning and Management

Elizabeth McKinley, M.D.
Emily Blackwell Society Dean (student advising)

Steven Ricinati, M.D.
Joseph Wearn Society Dean (student advising)

Alison K. Hall, Ph.D.
Director of Graduate Education

Murray D. Altose, M.D.
Associate Dean for the Louis Stokes Cleveland Department of Veterans Affairs Medical Center

Ben Brouhard, M.D.
Associate Dean for the MetroHealth System

Andrew Fishleder, M.D.
Executive Dean, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

Alan Hull, M.D., Ph.D.
Associate Dean for Curricular Affairs, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

Jeffrey Hutzler, M.D.
Associate Dean for Student Affairs and Admissions, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

Andrew Novick, M.D.
Associate Dean for Faculty Affairs, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

Joseph Corrao, M.Ed.
Registrar

**ACADEMIC DEPARTMENT CHAIRS**

**Preclinical Departments**

**Anatomy**

Joseph LaManna, Ph.D. (Acting)

**Biochemistry**

Michael A. Weiss, M.D., Ph.D.

**Bioethics**

Stuart Youngner, M.D.

**Biomedical Engineering**

Patrick Crago, Ph.D.

**Environmental Health Sciences**

G. David McCoy, Ph.D. (Acting)

**Epidemiology and Biostatistics**

Alfred A. Rimm, Ph.D.

**General Medical Sciences**

Ralph I. Horwitz, M.D.

**Case Comprehensive Cancer Center**

James K. V. Willson, M.D., Director

**Center for Adolescent Health**

Barbara A. Cromer, M.D., Director

**Center for Bio-architectonics**

Raymond J. Lasek, Ph.D., Director

**Center for Global Health and Diseases**

James W. Kazura, M.D., Director

**Center for Psychoanalytic Child Development**

Thomas F. Barrett, Ph.D., Director

**Center for RNA Molecular Biology**

Timothy W. Nilsen, Ph.D., Director

**Center for Science, Health and Society**

Nathan A. Berger, M.D., Director

**Genetics**

Joseph H. Nadeau, Ph.D.

**Molecular Biology and Microbiology**

Jonathan Karn, Ph.D.

**Molecular Medicine (Cleveland Clinic Lerner College of Medicine of Case Western Reserve University)**

Paul DiCorleto, Ph.D.

**Neurosciences**

Lynn Landmesser, Ph.D.

**Nutrition**

Henri Brunengraber, M.D., Ph.D.

**Pathology**

George Perry, Ph.D. (Acting)
Pharmacology
Michael E. Maguire, Ph.D. (Acting)

Physiology & Biophysics
Antonio Scarpa, M.D., Ph.D.

CLINICAL DEPARTMENTS

Cleveland Clinic Lerner College of Medicine of Case Western Reserve University

Department Chairs
Anesthesiology
Fawzy Estafanous, M.D.
Pathology (Clinical)
William Hart, M.D.
Radiology
Michael Modic, M.D.
Surgery
Kenneth Ouriel, M.D.

MetroHealth Medical Center

Department Chairs
Anesthesiology
Tejbir Sidhu, M.D.
Dermatology
Marlene Willen, M.D. (Acting)
Emergency Medicine
Charles L. Emerman, M.D.
Family Medicine
James Campbell, M.D.
Medicine
Alfred Connors, Jr., M.D.
Neurology
Joseph P. Hanna, M.D.
Orthopaedics
Brendan Patterson, M.D.
Otolaryngology - Head and Neck Surgery
Joseph Carter, M.D.
Pathology (Clinical)
Joseph F. Tomasheski, M.D.
Pediatrics
Robert Cohn, M.D.

Physical Medicine and Rehabilitation
Gary Clark, M.D.
Psychiatry
R. Taylor Segraves, M.D., Ph.D.
Radiology
Anthony Minnotti, M.D.
Reproductive Biology
Patrick Catalano, M.D.
Surgery
Mark A. Malangoni, M.D.

University Hospitals of Cleveland

Department Chairs
Anesthesiology
Howard Nearman, M.D.
Dermatology
Kevin D. Cooper, M.D.
Emergency Medicine
Edward A. Michelson, M.D.
Family Medicine
George Kikano, M.D.
Medicine
Richard A. Walsh, M.D.
Neurological Surgery
Robert A. Ratcheson, M.D.
Neurology
Dennis M.D. Landis, M.D.
Ophthalmology
Jonathan H. Lass, M.D.
Orthopaedics
Randall E. Marcus, M.D.
Otolaryngology-Head and Neck Surgery
James Arnold, M.D.
Pathology (Clinical)
John Anhalt, M.D., Ph.D.
Pediatrics
Avroy Fanafoff, M.D.
Psychiatry
Pedro Delgado, M.D.
Radiation Oncology
Timothy I. Kinsella, M.D.

Radiology
John R. Haaga, M.D.
Reproductive Biology
James Liu, M.D.
Surgery
Jerry Goldstone, M.D. (Acting)
Urology
Martin I. Resnick, M.D.

ADMINISTRATIVE DEPARTMENT DIRECTORS

Edward Bruss
Finance and Planning
Amy Ross (Acting)
Continuing Medical Education
Anne Duli
Research
Kurt Fretthold
Administrative Services
Ernest McLendon
Facilities
Virginia Saha
Cleveland Health Sciences Library
George Stamatis
Public Affairs

FACULTY

Department of Anatomy

Acting Chair
Joseph LaManna, Ph.D.

Professor
Ita R. KaisermanAbramof, Ph.D.

Associate Professor
Hue-Lee C. Kaung, Ph.D.
Joseph C. Miller, Ph.D.
Anna-Liisa Nieminen, Ph.D.
Ronald J. Przybylski, Ph.D.
Scott W. Simpson, Ph.D.

Adjunct Associate Professor
Bruce Latimer, Ph.D.

Assistant Professor
Faton Agani, M.D., Ph.D.
Darin Andrew Croft, Ph.D.
Donald G. Ferguson, Ph.D.
John R. Fredieu, Ph.D.
Barbara Kent Freeman, Ph.D.
Charles E. Maier, Ph.D.
Adjunct Assistant Professor
David Aldrich, M.S.
Yohannes Haile-Selassie, Ph.D.
Richard C. Hall, M.S.
Kathleen Inez Jung, M.S.

Adjunct Instructor
William Zeus Bligh-Glover, M.D.

Secondary Appointments

Acting Chair
Joseph C. LaManna, Ph.D.

Professor
Cynthia Beall, Ph.D.
Musa Hashiu, M.D., Ph.D.
Charles J. Malen, Ph.D.
Jerry M. Shuck, M.D.
Kingman P. Strahl, M.D.

Associate Professor
Thomas M. Heran, Ph.D.
Brian Johnstone, Ph.D.
Michiko Watanabe, Ph.D.

Associate Clinical Professor
Richard B. Freeman, M.D., Ph.D.

Assistant Professor
David Dean, Ph.D.
Cathy White-Owen, M.D.
Nicholas P. Zias, Ph.D.

Assistant Clinical Professor
Sally Telford Baden, D.D.S.

Senior Clinical Instructor
Robin Dhillon, M.D.

Clinical Instructor
Kenneth A. Spano, M.D.

Department of Anesthesiology

Chair – Cleveland Clinic
Fawzy Estafanous, M.D.

Chair – MetroHealth Medical Center
Tejibir Sidhu, M.B.B.S.

Chair – University Hospitals
Howard S. Neaman, M.D.

Professor
Helmut F. Cascorbi, M.D., Ph.D.
Nagy A. Mekhal, M.B.B.S.
Philip G. Morgan, M.D.
Paul A. Murray, Ph.D.
Armin Schubert, M.D.
Margaret M. Sedensky, M.D.
Charles Smith, M.D., Weatherhead
Professor
John E. Tetzlaff, M.D.

Associate Professor
Mark V. Boswell, M.D., Ph.D.
John G. Fraser, M.D.
Paul Alan Tripi, M.D.

Associate Clinical Professor
George S.L. Bause, M.D.
Don M. Benson, M.D.

Assistant Professor
Anjali P. Adur, M.B.B.S.
Maura C. Berkelhammer, M.D.
Norman Bolden, M.D.
Michelle Capdeville, M.D.
Ronald L. Cecher, Ph.D.
Anthony Jules Chang, M.D.
David M. Conger, M.D.
Antonio Cooper, M.D.
Barbara F. Dabb, M.D.
Cynthia Lee Dietrich, O.D.
David R. Dininn, M.D.
Victoria Eskanazi, M.D., Ph.D.
John R. Fisgus, M.D.
Ivan Florentino-Pineda, M.D.
Eri J. Frye, M.D.
Mark M. Goldfinger, M.D.
Evan J. Goodman, M.D.
Gregory J. Gordon, M.D.
Raymond G. Gruber, M.D.
Judith Haas, M.D.
Maureen S. Harders, M.D.
Irving A. Hirsch, M.D.
Matthew A. Joy, M.D.
Gareth S. Kantor, M.B.B.S.
David Kazdan, M.D.
E. Nicolas Leon-ruiz, M.D.
Lora Levin, M.D.
Agnes A. Lina, M.D.
Charles Lind, M.D.
Ronald M. Lisan, M.D.
Peter Matgouranis, M.D.
Anne E. Meyers, M.D.
Samuel P. Miranda, M.D.
Sheryl F. Modlin, M.D.
Arnold Morsch, M.D.
Girish D. Mulgaokar, M.D.
Eric H. Nakanishi, M.D.
Matthew P. Norcia, M.D.
Annmarie Norenberg, M.D.
Alfred Pinchak, M.D., Ph.D.
Samuel K. Rosenberg, M.D.
James R. Rowbottom, M.D.
Kanwaljit Sidhu, M.D.
Subhalakshmi Sivashankaran, M.B.B.S.
John E. Stork, M.D.
Susan Gail Sweda, M.D.
Donald M. Volkz, M.D.
David A. Wallance, O.D.
Joel B. Zivot, M.D.

Assistant Clinical Professor
Susan Dakin Dumas, M.D.
Haiyee Lin, M.D.
Melvin A. Lucas, M.D.
Ali S. Mchaburab, M.D.
Thomas Stan, M.D.
Farkas Vasarhelyi, M.D.
Ranga Venna, M.B.B.S.
James A. Weiss, M.D.

Adjunct Assistant Professor
Joseph M. Rifici, M.Ed.

Senior Instructor
Samuel Joseph DeJoy, M.D.
Mohan Y. Kareti, M.B.B.S.

Instructor
Frank J. Ditzig, D.D.S.
Jana D. Kirilcuk, M.D.

Clinical Instructor
Peter Adamek, M.D.
Surendra Adusumulli, M.D.
Raymond T. Braun, M.S.
Adriana Caldeira, M.D.
William B. Cleveland, M.D.
Steven R. Ditro, M.D.
Carl L. Forrest, M.D.
Adam J. Haas, M.D.
Varsha Jhala, M.D.
Al-Amin Ahmed A. Khalil, M.B.B.S.
Kenneth S. Moss, M.D.
Sheryl J. Ontell-Silverman, M.D., Ph.D.
Daniela Orza, M.D.
Susan Dea Raphaely, M.D.
David Rapkin, M.D.
Pankaj D. Shah, M.B.B.S.

Adjunct Instructor
Arthur Arciaga, J.D.
Theodore K. Brewer, B.S.
Theresa M. Green, M.S.
Pete Kaluszyk, M.Ed.
David J. Zagorski, M.A.

Secondary Appointments

Professor
E. Bryon Marsolais, M.D., Ph.D.

Associate Professor
Joel R. Peerless, M.D.

Clinical Instructor
Gilles Pinault, M.D.

Department of Biochemistry

Chair
Michael A. Weiss, M.D., Ph.D., Cowan-Blum Professor
Professor
Vernon Anderson, Ph.D.
Amiya K. Banerjee, Ph.D.
Paul R. Carey, Ph.D.
Pieter L. De Haseth, Ph.D.
Andrei V. Gudkov, Ph.D.
Richard W. Hanson, Ph.D., Skeggs Professor
Vincent C. Hascall, Ph.D.
Joyce E. Jentoft, Ph.D.
Donal S. Luse, Ph.D.
William C. Merrick, Ph.D.
Bryan L. Roth, M.D., Ph.D.
David R. Samols, Ph.D.
Joseph Shore
Robert H. Silverman, Ph.D.
Edward Stavnezer, Ph.D.

Adjunct Professor
Ifeanyi J. Arinze, Ph.D.

Associate Professor
Cheng-Ming Chiang, Ph.D.
Richard M. Gronostajski, Ph.D.
Marian Nikki L. Harter, Ph.D.
Qing-Xin Hua, B.S.
Kanagaraj G. Kumar, Ph.D.
Nelson B.P. Phillips, Ph.D.
Menachem Shoham, Ph.D.
Martin D. Snider, Ph.D.
Vivian Yee, Ph.D.

Assistant Professor
Kwaku Dayie, Ph.D.
Eckhard Jankowsky, Ph.D.
Hung Ying Kao, Ph.D., Pardee-Gerstacker Professor
Xavier Lee, Ph.D.
Biaoru Li, M.D., Ph.D.
Narendra Narayana, Ph.D.
Marianne Pusztaí-Carey, Ph.D.
Focco Van den Akker, Ph.D.
Barbara A Wible, Ph.D.
Shwu-Yuan Wu, Ph.D.

Instructor
Wesley Kars Kroeze, Ph.D.
Zhu-li Wan, Ph.D.

Adjunct Instructor
Patrick Leahy, Ph.D.

Secondary Appointments
Professor
John E. Stuehr, Ph.D.
James E. Zull, Ph.D.
Nathan A. Berger, M.D.
Henri Brunengraber, M.D., Ph.D.
Dorr G. Dearborn, M.D., Ph.D.
Helen H. Evans, Ph.D.
Douglas S. Kerr, M.D., Ph.D.
Bernard R. Landau, M.D., Ph.D.
Vincent M. Monnier, M.D.
Nancy L. Oleinick, Ph.D.
Ganes Chandra Sen, Ph.D.

Associate Professor
Richard L. Eckert, Ph.D.
Thomas A. Gerken, Ph.D.
W. David Sedwick, Ph.D.
Martina L. Veigl, Ph.D.

Assistant Professor
Sosamma Berger, Ph.D.

Adjunct Assistant Professor
Jun Qin, Ph.D.

Department of Bioethics
Chair
Stuart Youngner, M.D., Watson Professor

Professor
Nahida H. Gordon, Ph.D.
Edward M. Hundert, M.D.
Stephen G. Post, Ph.D.
Laura Siminoff, Ph.D.

Adjunct Professor
Dena S. Davis, Ph.D.
Thomas H. Murray, Ph.D.

Associate Professor
Eric Thomas Juengst, Ph.D.
Patricia A Marshall, Ph.D.

Assistant Professor
Mark P. Aulisio, Ph.D.
Insoo Hyun, Ph.D.
Christian Simon, Ph.D.

Adjunct Assistant Professor
Jean R. Berggren, M.D.
Kathryn Weise, M.D.

Secondary Appointments
Professor
Maxwell Mehlman, J.D.
Robert H. Binstock, Ph.D.
Atwood D. Gaines, Ph.D.
Michael Lederman, M.D.
Peter J. Whitehouse, M.D., Ph.D.

Associate Professor
Sharona Hoffman, J.D.
Jessica Berg, J.D.
Barbara J. Daly, Ph.D.
Eric D Kodish, M.D.
Sana Loue, Ph.D.
Elizabeth O’Toole, M.D.
Julia Rose, Ph.D.

Assistant Professor
Peter J. Greco, M.D.
Ashwini Sehgal, M.D.

Senior Clinical Instructor
Elizabeth D. McKinley, M.D.

Clinical Instructor
Elizabeth Ford Pitorak, M.S.N.
Department of Biomedical Engineering Chair
Patrick E. Crago, Ph.D., Ford Professor

Professor
Dominique Durand, Ph.D.
Roger E. Marchant, Ph.D.
P. Hunter Peckham, Ph.D.
Yoram Rudy, Ph.D.
Gerald M. Saidel, Ph.D.
David L. Wilson, Ph.D.

Adjunct Professor
J. Lawrence Katz, Ph.D.
James Thomas, M.D.

Associate Professor
Ravi Bellamkonda, Igor Efimov, Ph.D.
Miklos Gratzl, Ph.D.
Warren M. Grill, Ph.D.
Robert F. Kirsch, Ph.D.
Niels Otani, Ph.D.

Adjunct Associate Professor
Joseph Izatt, Ph.D.
Ivan Vesely,

Assistant Professor
Jianmin Cui, Ph.D.
Cheri I Deng, Ph.D.
Steven J. Eppell,
Jinming Gao, Ph.D.

Associate Professor
Sharona Hoffman, J.D.
Jessica Berg, J.D.
Barbara J. Daly, Ph.D.
Eric D Kodish, M.D.
Sana Loue, Ph.D.
Elizabeth O’Toole, M.D.
Julia Rose, Ph.D.

Secondary Appointments
Professor
James M. Anderson, M.D., Ph.D.
Hillel Chiel, Ph.D.
Adjunct Professor
Kandice Kottke Marchant, M.D., Ph.D.

Associate Professor
David S. Rosenbaum, M.D.
Mark S. Rzeszotarski, Ph.D.

Assistant Professor
Marco E. Cabrera, Ph.D.
Ronald L. Cechner, Ph.D.
John Chae, M.D.
David Dean, Ph.D.
Pedro J. Diaz, Ph.D.
Brian Johnstone, Ph.D.
Kenneth R. Laurita, Ph.D.
Zhenghong Lee, Ph.D.
Raymond F. Muzic, Ph.D.
Ronald J. Triolo, Ph.D.
Nicolas P. Ziets, Ph.D.

Department of Dermatology

Acting Chair – MetroHealth Medical Center
Marlene D. Willen, M.D.

Chair – University Hospitals
Kevin D. Cooper, M.D.

Professor
Bryan R. Davis, M.D.
Mahmoud A. Ghannoum, Ph.D.
Henry W. Lim

Clinical Professor
Paul G. Hazen, M.D.
Beno Michel, M.D.

Adjunct Professor
David R. Bickers, M.D.
Craig A. Elmets, M.D.
Jean Krutmann, M.D.
Hans F. Merk, M.D.
Hasan Mukhtar, Ph.D.
Gary S. Wood, M.D.

Associate Professor
Anita C. Gilliam, M.D., Ph.D.
Christine Jaworsky, M.D.
Kefei Kang, M.D.
Neil J. Korman, M.D., Ph.D.

Associate Clinical Professor
Robert T. Brodell, M.D.
James F. Carney, M.D.

Anthony J. Castrovincini, M.D.
Robert B. Eppes, M.D.
Wilma Fowler-Bergfeld, M.D.
Fred S. Hirsh, M.D.
Leonard G. Katz, M.D.
Barry C. Lamkin, M.D.
Bartholomew Ragucci, M.D.
Donald R. Schermer, M.D.

Adjunct Associate Professor
Mary Margaret Chren, M.D.

Assistant Professor
Jonathan Bass, M.D.
Pamela Harris Davis, M.D.
Renuka Diwan, M.D.
Faith M. Durden, M.D.
Frances Florentino, M.D.
Lisa Gelles, M.D.
Milford E. Gottlob, M.D.
Robert S. Haber, M.D.
Kimberly J. Hollandsworth, M.D.
Thomas Joseph Hornyk, M.D., Ph.D.
Lian-Jie Li, M.D.
Thomas S. McCormick, Ph.D.
Paradi Mirmirani, M.D.
Susan T. Nedorost, M.D.

Adjunct Clinical Professor
Jaye Benjamin, M.D.
Harold L. Blumenthal, M.D.
Robert Brody, M.D.
Carol G. Burg, M.D.
Robert G. Corwin, M.D.
Conley W. Engstrom, M.D.
Stanley L. Fox, M.D.
Esti G. Gumpertz, M.D.
Cecelia L. Hamilton, M.D.
Curtis W. Hawkins, M.D.
Stephen E. Helms, M.D.
Amy Hehr Kassouf, M.D.
Rosemary S. Keskenen, M.D.
Mushtaq A. Khan, M.D.
Prakash K. Khandekar, M.B.B.S.
Jay C. Klemme, M.D.
Chi-Sown Ko, M.D.
William V. Krug, M.D.
George H. Kuffner, M.D.
Jerome Z. Litt, M.D.
Rolf F. Miller, M.D.

Adjunct Professor
Gilbert B. Bukenya

Associate Professor
Thomas F. Barrett, Ph.D., Hadden Professor
Ronald E. Blanton, M.D.
James P. Bruzik, Ph.D.
David Danielpour, Ph.D.
Jonathan M. Gott, Ph.D.
Michael E. Harris, Ph.D.
Frederick P. Heinzel, M.D.

Louis F. Dell’Osso, Ph.D.
Claire Doerschuk, M.D.
Jeffrey L. Duerk, Ph.D.
Michael W. Keith, M.D.
Richard John Leigh, M.D.
Jonathan S. Lewin, M.D.
Albert L. Waldo, M.D.

Adjunct Professor
Kandice Kottke Marchant, M.D., Ph.D.

Associate Professor
David S. Rosenbaum, M.D.
Mark S. Rzeszotarski, Ph.D.

Assistant Professor
Marco E. Cabrera, Ph.D.
Ronald L. Cechner, Ph.D.
John Chae, M.D.
David Dean, Ph.D.
Pedro J. Diaz, Ph.D.
Brian Johnstone, Ph.D.
Kenneth R. Laurita, Ph.D.
Zhenghong Lee, Ph.D.
Raymond F. Muzic, Ph.D.
Ronald J. Triolo, Ph.D.
Nicholas P. Ziets, Ph.D.

Department of Dermatology

Acting Chair – MetroHealth Medical Center
Marlene D. Willen, M.D.

Chair – University Hospitals
Kevin D. Cooper, M.D.

Professor
Bryan R. Davis, M.D.
Mahmoud A. Ghannoum, Ph.D.
Henry W. Lim

Clinical Professor
Paul G. Hazen, M.D.
Beno Michel, M.D.

Adjunct Professor
David R. Bickers, M.D.
Craig A. Elmets, M.D.
Jean Krutmann, M.D.
Hans F. Merk, M.D.
Hasan Mukhtar, Ph.D.
Gary S. Wood, M.D.

Associate Professor
Anita C. Gilliam, M.D., Ph.D.
Christine Jaworsky, M.D.
Kefei Kang, M.D.
Neil J. Korman, M.D., Ph.D.

Associate Clinical Professor
Robert T. Brodell, M.D.
James F. Carney, M.D.

Anthony J. Castrovincini, M.D.
Robert B. Eppes, M.D.
Wilma Fowler-Bergfeld, M.D.
Fred S. Hirsh, M.D.
Leonard G. Katz, M.D.
Barry C. Lamkin, M.D.
Bartholomew Ragucci, M.D.
Donald R. Schermer, M.D.

Adjunct Associate Professor
Mary Margaret Chren, M.D.

Assistant Professor
Jonathan Bass, M.D.
Pamela Harris Davis, M.D.
Renuka Diwan, M.D.
Faith M. Durden, M.D.
Frances Florentino, M.D.
Lisa Gelles, M.D.
Milford E. Gottlob, M.D.
Robert S. Haber, M.D.
Kimberly J. Hollandsworth, M.D.
Thomas Joseph Hornyk, M.D., Ph.D.
Lian-Jie Li, M.D.
Thomas S. McCormick, Ph.D.
Paradi Mirmirani, M.D.
Susan T. Nedorost, M.D.

Adjunct Clinical Professor
Jaye Benjamin, M.D.
Harold L. Blumenthal, M.D.
Robert Brody, M.D.
Carol G. Burg, M.D.
Robert G. Corwin, M.D.
Conley W. Engstrom, M.D.
Stanley L. Fox, M.D.
Esti G. Gumpertz, M.D.
Cecelia L. Hamilton, M.D.
Curtis W. Hawkins, M.D.
Stephen E. Helms, M.D.
Amy Hehr Kassouf, M.D.
Rosemary S. Keskenen, M.D.
Mushtaq A. Khan, M.D.
Prakash K. Khandekar, M.B.B.S.
Jay C. Klemme, M.D.
Chi-Sown Ko, M.D.
William V. Krug, M.D.
George H. Kuffner, M.D.
Jerome Z. Litt, M.D.
Rolf F. Miller, M.D.

Adjunct Professor
Gilbert B. Bukenya

Associate Professor
Thomas F. Barrett, Ph.D., Hadden Professor
Ronald E. Blanton, M.D.
James P. Bruzik, Ph.D.
David Danielpour, Ph.D.
Jonathan M. Gott, Ph.D.
Michael E. Harris, Ph.D.
Frederick P. Heinzel, M.D.

Steven J. Taub, M.D.
Karen J. Turgeon, M.D.
Judith J. Walker, M.D.
Janet S. Wieselthier, M.D.

Adjunct Assistant Professor
Rajesh Agarwal, Ph.D.
Marnita E. Sandifer, Ph.D.
Seth R. Stevens, M.D.

Senior Clinical Instructor
Louis S. Kish, M.D.
Joyce Ann Lender, M.D.
Michael G. Mancuso, M.D.
Nina Petroff, M.D.
Richard Edward Ranchoff, M.D.

Instructor
Elma D. Baron, M.D.
Pranab Mukherjee, Ph.D.

Clinical Instructor
Judith M. Andreano, M.D.
Monte Fox, O.D.
Jenifer R. Lloyd, O.D.
Lydia Parker, M.D.
Constance D. Sutter, M.D.
Lynn Ryan Williams, M.D.

Adjunct Instructor
Alice M. Jeromin, D.V.M.

Secondary Appointments

Professor
Richard L. Eckert, Ph.D.
Man-Sun Sy, Ph.D.

Associate Professor
Tariq M Haqqi, Ph.D.

Division of General Medical Sciences

Chair
Ralph I. Horwitz, M.D.

Professor
James W. Jacobberger, Ph.D.
James Kazura, M.D.
Raymond J. Lasek, Ph.D.
Timothy W. Nilsen, Ph.D.
Lynn Singer, Ph.D.

Adjunct Professor
Gilbert B. Bukenya

Associate Professor
Thomas F. Barrett, Ph.D., Hadden Professor
Ronald E. Blanton, M.D.
James P. Bruzik, Ph.D.
David Danielpour, Ph.D.
Jonathan M. Gott, Ph.D.
Michael E. Harris, Ph.D.
Frederick P. Heinzel, M.D.
Jane C. Timmons-Mitchell, Ph.D.
Joan E. Trex, M.D.
Scott B. Vande Pol, M.D., Ph.D.
Georgia L. Wiesner, M.D.
Peter M. Wiest
Jo Ann Wise, Ph.D.
Max Wiznitzer, M.D.

**Associate Clinical Professor**
Mark J. Cooper, M.D.

**Assistant Professor**
Claire Andrews, Ph.D.
Vira Chankong, Ph.D.
David L. Cooperrider, Ph.D.
Zhongwu Guo, Ph.D.
Charlotte Ikels, Ph.D.
Janet W. McGrath, Ph.D.
Kimberly Adams Tufts, N.D.
Jeffrey Albert, Ph.D.
Anthony Berdis, Ph.D.
Sosamma Berger, Ph.D.
Joseph Bokar, M.D., Ph.D.
Elaine Borawski, Ph.D.
Elaine Borawski, Ph.D.
Marilyn Davies, Ph.D.
Maryann Fitzmaurice, M.D., Ph.D.
Susan A. Flocke, Ph.D.
Sanjay Gupta, Ph.D.
Howard R. Hall III, Ph.D.
Michael E. Harris, Ph.D.
Paula V. Hendryx, M.D.
Eckhard Jankowsky, Ph.D.
Hung Ying Kao, Ph.D.
Ruth A. Keri, Ph.D.
Omer Koc, M.D.
Bruce T. Lamb, Ph.D.
Mary Joan Laughlin, M.D.
Rina Lazebnik, M.D.
Hua Lou, Ph.D.
Guangbin Luo, Ph.D.
David S McPheeters, Ph.D.
David S McPheeters, Ph.D.
George Minowada, M.D.
Masahiro Morikawa, M.D.
Louis J. Novak, M.D.
Michael Oefelein, M.D.
Beth Overmoyer, M.D.
Isabel M. Parraga, Ph.D.
P. Sridhar Rao, Ph.D.
Andrew Rollins, Ph.D.
David C. Schultz, Ph.D.
Abdelwahab Shalodi, M.B.B.CH.
Bernard J. Silver, M.D.
Nora G. Singer, M.D.
Seth R. Stevens, M.D.
Jean T. Stevenson, M.D.
Hakon Torjesen, B.A.

Bingcheng Wang, Ph.D.
Susan Wentz, M.D.
Christopher Curtis Whalen, M.D.
Cathy White-Owen, M.D.
Amy L. Wilson-Delosse, Ph.D.

**Assistant Clinical Professor**
Mary Ellen S. Davis, M.D.
Sigmund C. Norr, M.D., Ph.D.
Paul T. Omelsky, M.D.
Emmanuel O. Tufftur, M.D.

**Adjunct Assistant Professor**
Lolita M. McDavid, M.D.

**Instructor**
Craig R. Boitel, M.S.
Andrea E. Bonny, M.D.
Peter S. Ecklund, Ph.D.
Douglas Henry, M.D.
Judith P. Lipton, J.D.
Hua Lou, Ph.D.
Carlyn P. Yanda, M.S.

**Clinical Instructor**
Harry F. Gebert, M.D.
Elizabeth R. Imrie, M.B.B.S.
JoAnn Jackson, M.D.
Cheryl Lynne Morrow-White, M.D.
Ilana Schmitt, M.D.

**Department of Environmental Medicine**

**Chair – MetroHealth Medical Center**
Charles L. Emerman, M.D.

**Chair – University Hospitals**
Edward A. Michelson, M.D.

**Professor**
Louis Stewart Binder, M.D.

**Associate Professor**
Rita Kay Cydulka, M.D.
Thomas Lukens, M.D., Ph.D.
Stephen W Meldon, M.D.

**Assistant Professor**
Thomas E. Collins, M.D.
Lynn C. Dezelon, M.D.
David Effron, M.D.
Mary Hancock, M.D.
Robert A. Jones, O.D.
Sandra Najarian, M.D.
James D. Polk, O.D.
Janet M. Poponick, M.D.
Jonathan Siff, M.D.
Lance Wilson, M.D.

**Senior Instructor**
Katherine Manzon, M.D.
Heather Marshall, O.D.
Jeffrey Eugene Pennington, M.D.

Alix Rosenstein, M.D.
Jon W. Schroock, M.D.
David Stuhlmiller, M.D.
Sandra Werner, M.D.

**Instructor**
John E. Duldner, M.D.

**Clinical Instructor**
Vincent Ferrini, M.D.
Fredric M. Hustey, M.D.
Thomas P. Noeler, M.D.
Thomas A. Waters, M.D.

**Department of Environmental Health Sciences**

**Acting Chair**
G. David McCoy, Ph.D.

**Clinical Professor**
Dale H. Cowan, M.D.

**Adjunct Professor**
Herbert S. Rosenkranz, Ph.D.

**Associate Professor**
Ellen A. Rorke, Ph.D.

**Adjunct Associate Professor**
Paul C. Howard, Ph.D.
Robert Mermelstein, Ph.D.
Robert W. Naismith, Ph.D.

**Secondary Appointments**

**Professor**
Gilles Klopman, Ph.D.
Helen H. Evans, Ph.D.
Stanton L. Gerson, M.D.
John J. Mieyal, Ph.D.
Nancy L. Oleinick, Ph.D.
Thomas G. Pretlow II, M.D.
Lawrence M. Sayre, Ph.D.

**Adjunct Professor**
Hasan Mukhtar, Ph.D.

**Associate Professor**
David Allen Boothman, Ph.D.
James W. Jacobberger, Ph.D.
Michael Lederman, M.D.
Theresa P. Pretlow, Ph.D.
W. David Sedwick, Ph.D.

**Adjunct Associate Professor**
Craig A. Eimoto, M.D.

**Assistant Professor**
Lili Liu, M.D., Ph.D.
P. Sridhar Rao, Ph.D.
Martina L. Veigl, Ph.D.
Department of Epidemiology and Biostatistics

Chair
Alfred A. Rimm, Ph.D.

Professor
Robert H. Binstock, Ph.D.
Sara M. Debanne, Ph.D.
Robert C. Elston, Ph.D.
Duncan B. Neuhauser, Ph.D., Blanchard Professor

Associate Professor
Elaine Borawski, Ph.D.
Sudha Iyengar, Ph.D.
Paul K. Jones, Ph.D.
Sana Loue, Ph.D.
David R. Nerenz, Ph.D.
Jane M. Olson, Ph.D.
J. Sunil Rao, Ph.D.
Benjamin A. Rybicki, Ph.D.
Kathleen Smyth, Ph.D.
Christopher Curtis Whalen, M.D.

Adjunct Associate Professor
Gerald J. Beck, Ph.D.

Assistant Professor
Jeffrey Albert, Ph.D.
John F.P. Bridges, Ph.D.
Natalie Colabianchi, Ph.D.
Mireya Diaz-Insua, Ph.D.
Pingfu Fu, Ph.D.
Katra B. Goddard, Ph.D.
Christine L.M. Joseph, Ph.D.
Siran Koroukian, Ph.D.
Tomas Radivoyevitch, Ph.D.
Ajay K. Sethi, Ph.D.
Ethan L. Mendel Singer, Ph.D.
Kimberlydawn Wisdom, M.D.

Adjunct Assistant Professor
Terrence M. Allan, M.A.
Matthew P. Carroll, J.D.
Kathleen M. Fagan, M.D.
Tom Greene, Ph.D.
Timothy Horgan, M.A.
Wendy Johnson, M.D.
Robin B. Lake, Ph.D.
Lyle Palmer, Ph.D.
George D. Weiner, Ph.D.

Senior Instructor
Mei Lu, Ph.D.

Adjunct Instructor
Nancy Slocum, M.P.H.

Secondary Appointments

Professor
David C. Aron, M.D.
Randall D. Cebul, M.D.
Barbara A. Cromer, M.D.
Neal V. Dawson, M.D.
Antonnette V. Graham, Ph.D.
Mark D. Schuchter, Ph.D.
J.B. Silvers, Ph.D.
Kurt C. Stange, M.D., Ph.D.
Stephen Wotman, D.D.S.
Stephen J. Zyzanski, Ph.D.

Associate Professor
Norman B. Rushforth, Ph.D.
Rita Kay Cydulka, M.D.
Avi Dor, Ph.D.
Scott H. Frank, M.D.
Joseph P. Frolkis, M.D., Ph.D.
Charles H. King, M.D.
David G. Litaker, M.D.
Susan Redline, M.D.
Robert J. Ronis, M.D.

Assistant Professor
Gregory S. Cooper, M.D.
Douglas Einstadter, M.D.
Susan A. Flocke, Ph.D.
Li Li, Ph.D.
Masahiro Morikawa, M.D.
Patrick K. Murray, M.D.
Suchitra Nelson, Ph.D.
Ashwini Sehgal, M.D.
Susan Wentz, M.D.

Senior Instructor
Shan Mohammed, M.D.

Senior Clinical Instructor
Joy Marshall, M.D.

Instructor
Henry Lester Kirchner, Ph.D.

Department of Family Medicine

Chair – MetroHealth Medical Center
James Wiley Campbell, M.D.

Chair – University Hospitals
George E. Kikano, M.D.

Professor
Kathy Cole-Kelly, M.S.W.
Raymond Y. Demers
Antonnette V. Graham, Ph.D.
C. Kent Smith, M.D.
Kurt C. Stange, M.D., Ph.D., Hess Professor
Stephen J. Zyzanski, Ph.D.

Associate Professor
Louise S. Acheson, M.D.
Jason Chao, M.D.
Tanya I. Edwards, M.D.
Scott H. Frank, M.D.
Patricia Hughes Moore, M.D.
Michael Rowane, O.D.
Clint W. Snyder, Ph.D.

Associate Clinical Professor
Robert Peter Blankfield, M.D.
Henry R. Bloom, M.D.
Stephen P. Flynn, M.D.
Fred M. Jorgensen, M.D.
Thomas M. Mettee, M.D.
Laurie A. Stuart, M.D.
Edward C. White, M.D.

Assistant Professor
Christine A. Alexander, M.D.
Christine Antenucci, M.D.
Alan S. Cadesky, M.D.
Leanne M. Chrisman-Khawam, M.D.
Mary V. Corrigan, M.D.
Esa Davis, M.D.
Peter A. DeGolia, M.D.
Gaby El-Khoury, M.D.
Alan R. Fischler, O.D.
Susan A. Flocke, Ph.D.
Kenneth B. Frisof, M.D.
Ralph Guggenheim, M.D.
Darrell T. Hulisz, Pharm.D.
Neelima J. Kale, M.D., Ph.D.
Li Li, Ph.D.
Sybil K. Marsh, M.D.
James E. Misak, M.D.
Lynda Montgomery, M.D.
Masahiro Morikawa, M.D.
Heidi A. Morris, O.D.
Thomas Palmer, M.D.
Michael Louis Raddock, M.D.
Susan Schooley, M.D.
Douglas Van Auken, M.D.
Brian G. Wagstaff, M.D.
Susan Wentz, M.D.
Michael G. Workings, M.D.

Assistant Clinical Professor
Alena M. Baquet-Simpson, M.D.
Philip N. Bernard, M.D.
Edward T. Bote, M.D.
Karen Borneman, M.D.
Dorothy Candib, M.D.
Robert Joseph Dimeff, M.D.
David A. Eberlein, M.D.
Marti Stager Echols, Ph.D.
Andrew P. Franko, M.D.
Kenneth I. Goodman, M.D.
Laura A. Green, Ph.D.
Germaine R. Hahnel, M.D.
Mukesh Jain, M.D., Ph.D.
Nadim E. Karam, M.D.
Patricia Kellner, M.D.
Roger C. Klein, Ph.D.
Mark K. Komar, M.D.
Richard P. Kratche, M.D.
Robert Kuhnhenn, O.D.
Jungkwon Lee, M.D.
Conrad Lindes, M.D.
Charles L. MacCallum, M.D.
Richard C. McBurney, M.D.
Roger M. Oakes, M.D.
Mark A. Penn, M.D.
Linda Post, M.D.
Brenda Powell, M.D.
Richard W. Pressler, M.D.
Michael A. Rabovsky, M.D.
Ann Reichsman, M.D.
Daniel F. Reynolds, M.D.
J. Randall Richard, M.D.
Carl A. Robson, M.D.
William A. Rowane, O.D.
Larry D. Sander, M.D.
William J. Schultz, M.D.
Othman A. Shemisa, M.D., Ph.D.
Gary J. Silko, M.D.
Virginia Simons, M.S.
Kornelia C. Solymos, M.D.
Hava Tabenkin, M.D.
George Thomas, O.D.
Harold Thomas, O.D.
James R. Thomas, O.D.
John M. Thomas, M.D.
Robert M. Tupa, O.D.
Carl V. Tyler, M.D.
Jack Valancy, M.B.A.
Matthew S. Wayne, M.D.
Kazuhiro Waza, M.D.
Richard F. Weinberger, M.D.
Stephen A. Weirich, M.D.
Robert J. Whitehouse, M.D.
Anne S. Wise, M.D.

Adjunct Assistant Professor
David Silvaggio, M.B.A.

Senior Instructor
Nathan R. Beachy, M.D.
Wayne A. Forde, M.D.
Eric G. Friess, M.D.
Gail E. Jones, M.D.
James P. Meza, M.D.
Shan Mohammed, M.D.

Senior Clinical Instructor
Chris L. Adelman, M.D.
Bruce E. Agneberg, M.D.

Clinical Instructor
Ghassan Abdallah, M.D.
Julie Adams, M.D.
Daniel Allan, M.D.
Douglas Angerman, M.D.
Rochele M. Beachy, M.D.
Richard A. Below, O.D.
John P. Bertsch, M.D.
Vivian Bochenek, O.D.
Donald L. Bowers, O.D.
Harold J. Bowserox, O.D.

Instructor
Ian Beckford, M.D.
Rita Beckford, M.D.
Michelle Dietz, M.D.
Heather Mullen, M.D.
Luis Sosa, M.D.

Clinical Instructor
Ghassan Abdallah, M.D.
Julie Adams, M.D.
Daniel Allan, M.D.
Douglas Angerman, M.D.
Rochele M. Beachy, M.D.
Richard A. Below, O.D.
John P. Bertsch, M.D.
Vivian Bochenek, O.D.
Donald L. Bowers, O.D.
Harold J. Bowserox, O.D.

David M. Brill, O.D.
Wendy Cicek, M.D.
Nancy D. Dale, M.S.N.
Keith L. Davis, M.D.
Lisa A. DeSantis, M.D.
Laura A. Dorr-Lipold, M.D.
Merlita B. Evangelista, M.D.
Ernestine L. Fitch, M.D.
Kathleen L. Forbes, M.D.
Donald B. Ford, M.D.
Charles J. Garven, M.D.
Sonji L. Gaskins, M.D.
Eric A. Hansen, M.D.
Bradley Grover Hillard, O.D.
Erin Michael Hillard, O.D.
Susan M. Joy, M.D.
Erick Kauffman, M.D.
Julie Keller, M.D.
Quentin Kenoyer, M.D.
Tai-Chi Kwok, M.D.
Ignacio Lahorra, M.D.
Pamela Lancaster, O.D.
David Lash, M.D.
Mina K. Lee, M.D.
Elizabeth LeMaster, M.D.
Sheng Liu, M.D.
Anne T. Lombardo, O.D.
Karim H. Lopez, M.D.
Mathew Mark, M.D.
Lisa Marsh, M.D.
Rajeev Mathavan, M.D.
Janet Merlack-Maiocco, M.S.N.
Helen L. Narvaja, M.D.
Carol L. Noall, M.D.
Elizabeth O’Dair, M.D.
Aphrodite Papadakis, M.D.
Tod Podl, M.D.
Elizabeth Srima Ranasinghe, M.B.B.S.
Thomas F. Renny, O.D.
Lee A. Resnick, B.A.
Satinderpal K. Sandhu, M.D.
Beth Brandt Sersig, M.D.
Robert Smarsch, O.D.
Grace Song, M.D.
Jessica Strasburg, M.D.
Khin Zan Tha, M.D.
Heather Thomas, M.D.
Paul C. Thomas, O.D.
Oscar D. Velez, M.D.
Satesh K. Waghray, M.B.B.S.
Denise M. White, M.D.
Colette R. Willins, M.D.
Karen Winter, M.D.
John Victor Wirrz, M.D.
Larry Wittner, O.D.
Ann Marie Haw Witt, M.D.
Laura Yauch, M.D.
Simin Zarandy, M.D.
Cynthia B.R. Zelis, M.D.

Secondary Appointments

Professor
Eva Kahana, Ph.D.
Duncan B. Neuhauser, Ph.D.
Karen N. Olness, M.D.
Laura Siminoff, Ph.D.

Associate Professor
Elizabeth O’Toole, M.D.
Stephen G. Post, Ph.D.
Robert J. Ronis, M.D.

Associate Clinical Professor
Theodore V. Parran Jr., M.D.

Assistant Professor
Richard E. Christie, M.D.
Kathleen A. Clegg, M.D.
Cynthia S. Vrabel, M.D.

Department of Genetics

Chair
Joseph H. Nadeau, Ph.D., Jewell Professor

Professor
Peter J. Harte, Ph.D.
Terry J. Hassold, Ph.D.
Patricia Ann Hunt, Ph.D.
Stuart Schwartz, Ph.D.
George R. Stark, Ph.D.
Daniel Van Dyke, Ph.D.
Bryan R.G. Williams, Ph.D.

Adjunct Professor
Aravinda Chakravarti, Ph.D.
Marcelo Jacobs-Lorena, Ph.D.
Terry R. Magnuson, Ph.D.
Robert D. Nicholls
Huntington F. Willard, Ph.D.

Assistant Professor
Ronald A. Conlon, Ph.D.
Evans Eichler, Ph.D.
A. Gregory Matera, Ph.D.
Anne Matthews, Ph.D.
Kurt William Runge, Ph.D.
Helen K. Sailer, Ph.D.
Matthew L. Warman, M.D.
Georgia L. Wiesner, M.D.
Arthur B. Zinn, M.D., Ph.D.

Assistant Professor
Christine Curtis, Ph.D.
Bruce T. Lamb, Ph.D.
Hua Lou, Ph.D.
Guangbin Luo, Ph.D.
Shawn Edward McCandless, M.D.

Adjunct Assistant Professor
Stephanie L. Sherman, Ph.D.

Instructor
Patricia A. Conrad, Ph.D.
Feng Tie, Ph.D.
Nancy G. Wolf, M.D.

Clinical Instructor
Jennifer Bubb, M.S.
Leslie Cohen, M.S.
Duane Culler, Ph.D.
Jennifer Facher, M.S.
Michael D. Graf, M.S.

Assistant Professor
C. Cenk Sahinalp, Ph.D.
Kumar Alagramam, Ph.D.
Mitchell L. Drumm, Ph.D.
James W. Jacobberger, Ph.D.
Jennifer Liang, Ph.D.
Philip G. Morgan, M.D.
Mark R. Palmert, M.D., Ph.D.
Margaret M. Sedensky, M.D.
Michiko Watanabe, Ph.D.
Peter A. Zimmerman, Ph.D.

Department of Medicine

Chair – MetroHealth Medical Center
Alfred F. Connors, M.D., Rammelkamp Professor

Chair – University Hospitals
Richard Allen Walsh, M.D., Hord Professor

Professor
Richard D. Aach, M.D.
George Agich, Ph.D.
Murray D. Altose, M.D.
Baha H. Arafah, M.D.
David C. Aron, M.D.
Ali D. Askari, M.D.
Robert C. Bahler, M.D.
William H. Beierwaltes, Ph.D.
W. Henry H. Boom, M.D.
Frank V. Brozovich, M.D., Ph.D.
Mark D. Carlson, M.D.
Oscar Carretero, M.D.
Susan G. Carter, M.D.
Randall D. Cebul, M.D.
Neal V. Dawson, M.D.
Vincent William Dennis, M.D.
Janice G. Douglas, M.D.
Serpil C. Erzurum, M.D.
Michel G. Farah, M.D.
Claudio Fiocchi, M.D.
Jeffrey Garvin, Ph.D.
Saul M. Genuith, M.D.
Sidney Goldstein, M.D.
Richard C. Graham Jr., M.D.
Tariq M Haqqi, Ph.D.
John D. Hines, M.D.
Gary Stuart Hoffman, M.D.
Brian Hoit, M.D.
Ralph I. Horwitz, M.D.
Lansing C. Hoskins, M.D.
Donald E. Hricik, M.D.
Michael C. Iannuzzi, M.D.
Faramarz Ismail-Beigi, M.D., Ph.D.
Jeffrey Alan Kern, M.D.
Timothy Scott Kern, Ph.D.
Muhammad A. Khan, M.B.B.S.
Jerome Kowal, M.D.
Irving Kushner, M.D.
Paul Kvale, M.D.
Bernard R. Landau, M.D., Ph.D.
Hillard Lazarus, M.D.
Michael Lederman, M.D.
Alan D. Levine, Ph.D.
Hans Lueders, M.D., Ph.D.
Charles J. Malemud, Ph.D.
Maurice Markman, M.D.
Arthur J. McCullough, M.D.
Richard Tyler Miller, M.D.
Hugo D. Montenegro, M.D.
Kevin D. Mullen, M.D.
Richard Michael Nowak, M.D.
Ileana L. Pina, M.D.
Sudhaker Dhanwada Rao, M.B.B.S.
Scot C. Remick, M.D.
Edmond S. Ricanati, M.D.
Louis B. Rice, M.D.
Joel Edward Richter, M.D.
Richard A. Rudick, M.D.
Hani N. Sabbah, Ph.D.
Robert A. Salata, M.D.
Alfonso G. Scici, Ph.D.
John R. Sedor, M.D.
W. David Sedwick, Ph.D.
Michael V. Sivak, M.D.
Michael C. Smith, M.D.
James K. Stoller, M.D.
Kingman P. Strohl, M.D.
Anthony S. Tayl, M.D.
Zahra Toossi, M.D.
Eric Jeffrey Topol, M.D.
Victor Vertes, M.D.
Miriam A. Weiss, M.D.
Fred W. Whitehouse, M.D.
Jay Wish, M.D.
Jeffrey J. Wisnieski, M.D.
Jackson T. Wright, M.D., Ph.D.

Professor
Nathan A. Berger, M.D., Hanna-Payne Professor
Clark W. Distelhorst, M.D., Britton Professor
Sarah A. Augustine, M.D.
Nizar Bahlis, M.D.
Lidia Baltarowich, M.D.
Ernie-Paul Barrette, M.D.
Michael J. Beck, M.D.
Jeffrey Becker, M.D.
Mary Ellen Behmer, M.D.
Charles Belfi, Ph.D.
James A. Benes, M.D.
William A. Benish, M.D.
Sosamma Berger, Ph.D.
Kenneth A. Bodziak, M.D.
Joseph Bokar, M.D., Ph.D.
Joanna M. Brem, M.D.
David S. Bullard, M.D.
Carolyn P. Cacho, M.D.
Patricia Campbell, M.D.
David Canaday, M.D.
Caroline M. Casserly, M.D.
Grace N. Catter, M.D.
Anaya Das, M.B.B.S.
Srinivasan Dasarathy, M.B.B.S.
Hallie DeChant, M.D.
Ramon del Busto, M.D.
Bruno DiGiovine, M.D.
Teresa M. Dolinar, M.D.
Curtis Donkey, M.D.
Afshin Dowlati, M.D.
Caroleen Dzuvis, M.D.
Donald M. Eicher, M.D.
Matthew S. Eisen, M.D.
Anaya Das, M.B.B.S.
Sudhir Gosain, M.B.B.S.
Peter J. Greco, M.D.
Aric W. Greenfield, M.D.
D.R. (Shanti) Gunawardena, M.D.
Cynthia Gustafvero, M.D.
Jennifer Hanrahan, O.D.
Michael Harrington, M.D.
Carla Harwell, M.D.
Matthew T. Hawkins, M.D.
Michelle Theresa Hecker, M.D.
Nicola A. Helm, M.D.
Christine Hirsch, M.D.
Laura L. Holmes, M.D.
Raymond Hong, M.D.
Michele Hooper, M.D.
Thomas Hornick, M.D.
Karen R. Horowitz, M.D.
Chunfa Huang, Ph.D.
Henry Huizing, M.D.
Gerard Isenberg, M.D.
Khaled Issa, M.D.
Harriet Jakob, M.D.
Nancy J. Johnson, M.D.
Parag Kale, M.D.
Elizabeth S. Kaufman, M.D.
Catherine Keating, M.D.
Tariq J. Khan, M.B.B.S.
Nabil Khoury, M.D.
Margaret F. Kinnard, M.D.
Susan R. Kirsh, M.D.
Smitha Krishnamurthi, M.D.
Karen Kultoski, O.D.
Sean Lacey, M.D.
Shamsi Lashgari-Saegh, M.D.
Kenneth R. Laurita, Ph.D.
Debra S. Leizman, M.D.
Christopher Lewandowski, M.D.
William R. Lewis, M.D.
Michelle V. Lisgaris, M.D.
Lili Liu, M.D., Ph.D.
C. Patrick Loecnker, M.S.
Thomas Ezra Love, Ph.D.
Alan Lubin, M.D.
Judith A. Mackall, M.D.
Hugh L. MacKenzie, M.D.
Mary Jon Malirick, Ph.D.
David Mansour, M.D.
Gerard Martin, M.D.
Noe Bleza Mateo, M.S.
Charles O. Mbanefo, M.D.
Laurie McCreery, M.D., Ph.D.
Elizabeth D. McKinley, M.D.
Sanford Miller, M.D.
George Minowada, M.D.
Parul R. Mistry, M.B.B.S.
Sri Krishna Madan Mohan, M.B.B.S.
Susanne Mohr, Ph.D.
Pallakil Muralidhar, M.D.
Deborah Murdock, Ph.D.
Mastroor Mustafa, M.B.B.S.
Sally Namboodiri
Lavinia Aura Negrea, M.D.
Kathrin Nicolacakis, M.D.
Timothy O’Brien, M.D.
Robert S. O’Shea, M.D.
Scott K. Ober, M.D.
Jose Ortiz
Beth Overmoyer, M.D.
Clifford Packer, M.D.
Anoop Kumar Padival, Ph.D.
Patrick J. Pagano, Ph.D.
Kara Quan, M.D.
Kathleen P. Quealy, M.D.
Mahboob Rahman, M.B.B.S.
Chingleput Ranganathan, M.B.B.S.
Monica Ray, M.D.
Kumar B. Reddy, Ph.D.
Rolf Renne, Ph.D.
Jeffrey P. Renson, M.D.
Steven Ricianati, M.D.
Emanuel Rivers, M.D.
Michael Benjamin Rocco, M.D.
Laurie S Sadler, M.D.
Stephanie Sadlon, M.D.
Jayakumar Sahadevan, M.B.B.S.
Steven R. Savona, M.D.
Panos Savvides, M.D.
Eric Scher, M.D.
Robert Schilz, O.D.
David J. Schnell, M.D.
Marc D. Schrote, O.D.
Eileen Seelhorzer, M.D.
Mikkael Sekeres, M.D.
Kathleen Senger, M.D.
William Fred Shaw, M.D.
Michael J. Simoff, M.D.
Mamta Singh, M.D.
Brenda J. Smith, M.D.
David G. Smith, M.D.
Ajay Sood, M.B.B.S.
Joseph A. Sopko, M.D.
Steven Sorin, M.D.
Richard Alan Spech, M.D.
Linda Spinelli, M.D.
Robert Stern, M.D.
Arthur E. Van Dyke, M.D.
Vladimir I. Vekstein, M.D.
David M. Weiner, M.D.
Cheryl E. Weinstein, M.D.
Daniel Weiss, M.D.
Thomas S. Wilson, M.D.
Martin N. Wiseman, M.B.B.S.
Peter Yang, M.D.
Eric M. Yasinow, M.D.

Adjunct Assistant Professor
Georgia J. Anetzberger, Ph.D.
Lisa A. Atkinson, M.D.
Shukti Chakravarti, Ph.D.
Kenneth Covinsky, M.D.
Amir H. Hamrahian, M.D.
Said Ibrahim, M.D.
John Strony, M.D.

Adjunct Clinical Instructor
Billy L. Brown, M.D.
Jeffrey W. Bullard, M.D.
Christopher Cartellone, M.D.
Jay Edward Carter, M.D.
Marc E. Chapman, M.D.
Sandra D. Cobb, M.D.
Byron L. Coffman, M.D.
Robert S. Coleman, M.D.
Cathy L. Cooper, M.D.
James M. Coviello, M.D.
Ronald I. Cowan, Pharm.D.
Thomas Craig, M.D.
Sandra J. Daly, M.D.
Gregory J. Davis, O.D.
Michael E. Debs, M.D.
Debra A. DeJoseph, M.D.
Frederick S. Donaldson, M.D.
Irene Lesica Druzina, M.D.
Margaret Eckstein, M.D.
Michael B. Eckstein, M.D.
Donald E. Eghobamien, M.B.B.S.
Thomas F. Eiswerth, M.D.
John C. Elder, M.D.
Evelyn C. Erokwu, M.D.
Roger G. Espinosa, M.D.
John C. Eyre, M.D.
Christine Fall, M.D.
Mourad H. Fanous, M.D.
Ronald B. Fleming, M.D.
Susan B. Fox, O.D.
Bonnie L. Garbriel-Lobo, M.D.
Andrew P. Garlisi, M.D.
Igor Genkin, M.D.
Patria Gerardo, M.D.
Pamela K. Geyer, M.D.
Manash Ghose, M.R.C.P.
Thomas D. Ginley, O.D.
Joel Godard, M.D.
Raymond E. Goodman, M.D.
Nitin Govani, M.B.B.S.
Lawrence K. Gray, M.D.
Richard H. Gunning, M.D.
Gregory L. Hall, M.D.
Sandra D. Cobb, M.D.
Karen Hummel, M.D.
David M. Hutt, M.D.
Ralf Joje, O.D.
Philip D. Junglas, M.D.
Robert Kakish, M.D.
Gary B. Kaplan, M.D.
Georgianna Kates, M.D.
Joseph F. Kelley, M.D.
Sona S. Kirpekar, M.D.
Michael Kirsch, M.D.
Shawn J. Knakip, M.D.
Douglas Kohler, M.D.
Ashok Kondu, M.B.B.S.
Marvin Kopelson, M.D.
Alan E. Kravitz, M.D.
Marie Kuchynski, M.D.
Praveer Kumar, M.B.B.S.
Donna Kwilosz, Ph.D.
Annette Kyprianou, M.D.
Richard S. Lang, M.D.
Daniel J. Leizman, M.D.
Donald R. Lewis, M.D.
J. Michael Lonergan, M.D.
James P. Loveland, M.D.
Gina Loveman, O.D.
John R. Ludgin, M.D.
Himanshu Majmudar, M.D.
Rajesh Malik, M.B.B.S.
Mary Beth Manning, M.D.
Lonnie Marsh, M.D.
Nancy M. McBride, M.D.
Zoraida A. Mendez, M.D.
Daniel Mendlovic, M.D.
Jill Chavinson Miller, M.D.
Mohammad Ali Moayeri, M.D.
Pamela J. Murphy, M.D.
Doris Myers, O.D.
Emmanuel Okafor, M.D.
Frank X. Pamela, M.D.
Mukul Pandit, M.B.B.S.
David C. Parris, M.D.
Brenda J. Perryman, M.D.
Selden Polster, M.D.
Lawrence Porter, M.D.
Eshwar Punjabi, M.B.B.S.
Arthur J. Rabinowitz, M.D.
Jayati Rakshit, M.D.
Lino P. Ramos, M.D.
Rory Ramsey, M.B.B.S.
Amy J. Ray, M.D.
Pamela L. Redden, M.D.
William J. Riebel, M.D.
Helen L. Rizi, M.D.
Steven P. Robertson, M.D.
Amy Rosenfield, M.D.
Arnold I. Rosenzweig, M.D.
Carrie Ross-Shelton, M.D.
Elizabeth Roter, M.D.
David L. Roth, M.D.
Mark A. Roth, M.D.
Somnath D. Roy, M.B.B.S.
Lisabeth Scalzi, M.D.
Nora G. Singer, M.D.
Susan Wentz, M.D.
Cathy White-Owen, M.D.
Roslyn A. Yomtovian, M.D.
Jinzhong Zhang, Ph.D.

Assistant Clinical Professor
Lois S. Freedman, M.D.
Richard J. Koletsky, M.D.
Donald Mann, M.D.
Sudhir K. Mehta, M.D.
Daniel F. Reynolds, M.D.
Carl A. Robson, M.D.
Sebouh Setrakian, M.D.
Theodore H. Sher, M.D.
Joel S. Steinberg, M.D.

Senior Instructor
Karen M. Knight, M.D.
Thomas Lukens, M.D., Ph.D.
Ethan L. Mendel Singer, Ph.D.

Senior Clinical Instructor
Peter Laufer, M.D.
Edward C. White, M.D.

Adjunct Senior Instructor
Mary Margaret Chren, M.D.

Clinical Instructor
David Alan Bowe, M.D.
Ernest H. Friedman, M.D.
James E. Gibbs, M.D.
Beth Brandt Sersig, M.D.
Heather Ways, M.D.

Department of Molecular Biology and Microbiology

Chair
Jonathan Karn, Ph.D., Reinberger Professor

Professor
Lloyd A. Culp, Ph.D.
Jo Ann Wise, Ph.D.

Adjunct Professor
Hsing-Jien Kung, Ph.D.

Associate Professor
Susann M. Brady-Kalnay, Ph.D.
Piet A. J. de Boer,

Associate Associate Professor
Sandia K. Lemmon, Ph.D.
Russell A. Maurer, Ph.D.

Assistant Professor
Erik D. Andrulis, Ph.D.

Adjunct Assistant Professor
Katherine W. Klinger, Ph.D.
Richard A. Padgett, Ph.D.

Instructor
Peter S. Ecklund, Ph.D.
David S McPheeters, Ph.D.

Secondary Appointments

Professor
Amiya K. Banerjee, Ph.D.
Pamela B. Davis, M.D., Ph.D.
Faramarz Ismail-Beigi, M.D., Ph.D.
Michael Lederman, M.D.
Donal S. Luse, Ph.D.
Michael E. Maguire, Ph.D.
Timothy W. Nilsen, Ph.D.

Associate Professor
Cheng-Ming Chiang, Ph.D.
Jonatha M. Gott, Ph.D.

Assistant Professor
Eric J. Arts, Ph.D.
Joseph Bokar, M.D., Ph.D.
James P. Bruzik, Ph.D.
Mark G. Caprara, Ph.D.
Koh Fujinaga, Ph.D.
Michael E. Harris, Ph.D.
Sanford Markowitz, M.D., Ph.D.
Rolf Renne, Ph.D.

Adjunct Assistant Professor
Thomas E. Evans, Ph.D.

Instructor
Eric Ladner Christian, Ph.D.
Patricia Maroney, B.S.
Department of Molecular Medicine
Chair
Paul DiCorleto, M.D.

Professor
Guy Chisolm, Ph.D.
John W. Crabb, Ph.D.
James H. Finke, Ph.D.
Paul L. Fox, Ph.D.
Thomas Alan Hamilton, Ph.D.
Edward F. Plow, Ph.D.
Jun Qin, Ph.D.

Associate Professor
Josephine Clare Adams, Ph.D.
Sunnel S. Apte, M.B.B.S.
Richard E. Morton, Ph.D.
Dianne M. Perez, Ph.D.
Qing Wang, Ph.D.

Assistant Professor
Hitoshi Komuro, Ph.D.

Department of Neurological Surgery
Chair
Robert A. Ratcheson, M.D., Brown Professor

Professor
Alan R. Cohen, M.D.
Kost Elisevich, M.D., Ph.D.
Russell W. Hardy Jr., M.D.
W. David Lust, Ph.D.
Robert J. Maciunas, M.D.
Mark Rosenblum, M.D.
Warren R. Selman, M.D.

Associate Professor
David Dean, Ph.D.
Irvine G. Mc Quarrie, M.D., Ph.D.

Associate Clinical Professor
Benedit C. Colombi, M.D.
Melvin Shafron, M.D.

Assistant Professor
Sandra Rempel, Ph.D.
Shenandoah Robinson, M.D.

Assistant Clinical Professor
J. George Dakers, M.D.
Yannick Grenier, M.D.
Pete N. Poolos, M.D.
Robert Wade Taylor, M.D.

Secondary Appointments

Professor
Charles F. Lanzieri, M.D.
Jonathan S. Lewin, M.D.
Robert H. Miller, Ph.D.

Associate Professor
Robert W. Tarr, M.D.
Tim S. Whittingham, Ph.D.

Assistant Professor
Barbara A. Bangert, M.D.
Jose I. Suarez, M.D.
Jeffrey L. Sunshine, M.D., Ph.D.

Department of Neurology
Chair
Dennis M. Landis, M.D., Humphrey Professor

Professor
Robert Barry Daroff, M.D.
Louis F. Dell’Osso, Ph.D.
Michael Devereaux, M.D.
Robert F. Friedland, M.D.
Henry J. Kaminski, M.D.
M. Bashar Katirji, M.D.
Joseph C. LaManna, Ph.D.
John Daniel Porter, Ph.D.
David C. Preston, M.D.
Robert L. Ruff, M.D., Ph.D.
Stephen M. Sagar, M.D.
Peter J. Whitehouse, M.D., Ph.D.
Professor
Richard John Leigh, M.D., Blair-Daroff
Professor

Clinical Professor
John P. Conomy, M.D.
Asa Wilbourn, M.D.

Associate Professor
Gregory L. Barkley, M.D.
Thomas C. Chelinsky, M.D.
Carol S. Chester, M.D.
Jennifer S. Kriegler, M.D.
Alan J. Lerner, M.D.
Thomas Mikkelsen, M.D.
Mark J. Perlow, M.D.
David E. Riley, M.D.
Barbara E. Shapiro, M.D., Ph.D.
Robert L. Tomsak, M.D., Ph.D.
Tarvez Tucker, M.D.
Edward L. Westbrook, M.D.
Marc D. Winkelman, M.D.

Associate Clinical Professor
Donald Mann, M.D.
Patrick Sweeney, M.D.

Adjunct Associate Professor
Janis J. Daly, Ph.D.
Marian B. Patterson, Ph.D.

Assistant Professor
Amer Alshekhlee, M.B.B.S.
Francisco H. Andrade, Ph.D.
James R. Ewing, Ph.D.
Gerald E. Grossman, M.D.
Mustafa Kahrman, M.D.
Irene Katzan, M.D.
Gwendolyn Ford Lynch, M.D.
Brian Neil Maddux, M.D., Ph.D.
Daniel Miller, M.D.
Panayiotis Mitsias, M.D.
Janet Rucker, M.D.
Concepcion Santillan, M.D.
Michael R. Schoenberg, Ph.D.
Alice Silbergleit, Ph.D.
Brien J. Smith, M.D.
John Stahl, M.D., Ph.D.
Jose I. Suarez, M.D.
Sophia Sundararajan, M.D., Ph.D.
Mary Ann Werz, M.D., Ph.D.

Assistant Clinical Professor
Jack Anstandig, M.D.
Zev S. Ashenberg, Ph.D.
Michael Bahntge, M.D.
Peter Bambakidis, M.D.
Anthony J. Furlan, M.D.
Thomas E. Gretter, M.D.
Richard Lederman, M.D., Ph.D.
Leonard M. Weinberger, M.D.
Norton A. Winer, M.D.

Adjunct Associate Professor
Ziad Ahmed, M.D.
Mohamed Hatem Murad, M.D.
Carl E. Rosenberg, M.D.

Senior Clinical Instructor
Cynthia Griggins, Ph.D.

Instructor
Elizabeth Jean Angus, M.D.
Marek Buczek, M.D., Ph.D.
Heidi Moawad, M.D.
Paula Ogrocki, Ph.D.

Clinical Instructor
Dileep Ravi Nair, M.D.
Nimish J. Thakore, M.D.

Adjunct Instructor
Melissa Barber, M.S.
Thomas Fritsch, Ph.D.
Jonathan Bruce Jacobs, Ph.D.

Secondary Appointments
Professor
Milton E. Strauss, Ph.D.
C. Edwards Coffey, Pierluigi Gambetti, M.D.
Karl Herrup, Ph.D.
Gary Eugene Landreth, Ph.D.

Associate Professor
Robert W. Tarr, M.D.
Max Wiznitzer, M.D.

Assistant Professor
Mark L. Cohen, M.D.
Irwin B. Jacobs, M.D.
Paul V. Lehmann, M.D., Ph.D.
Jeffrey L. Sunshine, M.D., Ph.D.

Department of Neurosciences
Chair
Lynn Theresa Landmesser, Ph.D., Garvin
Professor

Professor
Karl Herrup, Ph.D.
David M. Katz, Ph.D.
Diana Kunze, Ph.D.
Gary Eugene Landreth, Ph.D.
Wendy Blair Macklin, Ph.D.
Robert H. Miller, Ph.D.
Guillermo R. Pilar,
Jerry Silver, Ph.D.
Bruce Trapp, Ph.D.
Richard E. Zigmond, Ph.D.
Adjunct Professor
Vance P. Lemmon, Ph.D.

Associate Professor
Evan Samuel Deneris, Ph.D.
David D. Friel, Ph.D.
Alison K. Hall, Ph.D.
Stephen O’Gorman, Ph.D.
Benjamin W. Strowbridge, Ph.D.

Assistant Professor
Stefan Herlitz, Ph.D.
Iain M. Robinson, Ph.D.

Adjunct Assistant Professor
Kurt Brunden, Ph.D.

Secondary Appointments
Professor
Hillel Chiel, Ph.D.
Roy E. Ritzmann, Ph.D.
Dominique Durand, Ph.D.
Henry J. Kaminski, M.D.
Joseph C. LaManna, Ph.D.
Dennis M. Landis, M.D.
Richard John Leigh, M.D.
W. David Lust, Ph.D.
George Perry, Ph.D.
John Daniel Porter, Ph.D.
Nanduri R. Prabhakar, D.Sc.
Robert L. Ruff, M.D., Ph.D.
Man-Sun Sy, Ph.D.
Peter J. Whitehouse, M.D., Ph.D.

Associate Professor
Cynthia F. Bearer, M.D., Ph.D.
Thomas E. Dick, Ph.D.
Paul Roos Ernsberger, Ph.D.
Alfred T. Malouf, Ph.D.
Irving G. Mc Quarrie, M.D., Ph.D.
Robert B. Petersen, Ph.D.
Bryan L. Roth, M.D., Ph.D.
Ruth E. Siegel, Ph.D.
Erik Van Lunteren, M.D.
Tim S. Whittingham, Ph.D.

Assistant Professor
Kumar Alagaram, Ph.D.
Susann M. Brady-Kalnay, Ph.D.
Maureen W. McEnery, Ph.D.
Elizabeth Pehek, Ph.D.
Shenandoah Robinson, M.D.
Corey B. Smith, Ph.D.
Sophia Sundararajan, M.D., Ph.D.
Christopher G. Wilson, Ph.D.

Department of Nutrition
Chair
Henri Brunengraber, M.D., Ph.D.
Vice Chair
Edith Lerner, Ph.D.

Associate Professor
Paul Roos Ernsberger, Ph.D.
Maria Hatzoglou, Ph.D.
Laura E. Nagy, Ph.D.
Isabel M. Parraga, Ph.D.
Kou-Yi Tserng, Ph.D.
Jonathan Whittaker, M.B.B.S.

Adjunct Associate Professor
Karen M. Fiedler, Ph.D.

Assistant Professor
Hope Barkoukis, Ph.D.
Colleen M. Croniger, Ph.D.
Takhar Kasumov, Ph.D.
Janos Kerner, Ph.D.
Duna Massillon, Ph.D.
Stephen Previs, Ph.D.
James Howard Swain, Ph.D.

Adjunct Assistant Professor
Karen M. Fiedler, Ph.D.

Instructor
Margaret M. Cicirella, M.S.
Mary Beth Kavanagh, M.A.

Adjunct Instructor
Phyllis Allen, M.S.
Kimberly Altman, M.S.

Assistant Professor
Saul M. Genuth, M.D.
Richard W. Hanson, Ph.D.
Douglas S. Kerr, M.D., Ph.D.
Anthony S. Tavill, M.D.

Associate Professor
John Kirwan, Ph.D.
William C. Stanley, Ph.D.

Assistant Professor
Sharon Groh-Wargo, M.S.

Department of Ophthalmology
Chair – University Hospitals
Jonathan H. Lass, M.D., Thomas Professor

Professor
Suber S. Huang, M.D.

Clinical Professor
William E. Bruner, M.D.
Mark Levine, M.D.
Lawrence J. Singerman, M.D.

Associate Professor
David S. Bardenstein, M.D.
Edward N. Burney, M.D.
Ram H. Nagaraj, Ph.D.
William J. Reinhart, M.D.
Loretta B. Szczotka, O.D.
Gary Trick

Associate Clinical Professor
Kathleen A. Lamping, M.D.
Jeffrey B. Robin, M.D.
Daniel T. Weidenthal, M.D.
Richard E. Wyzynski, M.D.
Nicholas Z. Zakov, M.D.

Assistant Professor
Julie K. Belkin, M.D.
Beth Ann Benetz, M.A.
Richard E. Gans, M.D.
Thomas J. Joly, M.D., Ph.D.
Stephen C. Kaufman, M.D.
Michael S. Lee, M.D.
Shari Martyn, M.D.
Joseph M. Thomas, M.D.
Stacia S. Yaniglos, O.D.
Jinzhong Zhang, Ph.D.

Assistant Clinical Professor
Marc A. Abrams, M.D., Ph.D.
David H. Adams, M.D.
Carl F. Asseff, M.D.
Thomas S.K. Chi, M.D.
Michael V. Coseriu, M.D.
James P. Dailey, M.D.
Terry E. Daniel, O.D.
Lorri A. Effron, M.D.
Bruce R. Jacobson, M.D.
Stephen R. Kaufman, M.D.

Secondary Appointments
Professor
Saul M. Genuith, M.D.
Department of Orthopaedics

Chair – MetroHealth Medical Center
Brendan M. Patterson, M.D.

Chair – University Hospitals
Randall E. Marcus, M.D., Herndon

Professor
Henry Bohlman, M.D.
Daniel R. Cooperman, M.D.
Sanford E. Emery, M.D.
Victor M. Goldberg, M.D.
Michael W. Keith, M.D.
James H. Kimura, Ph.D.
E. Bryan Marsolais, M.D., Ph.D.
John W. Shaffer, M.D.
George H. Thompson, M.D.
John H. Wilber, M.D.

Clinical Professor
Avrum I. Froimson, M.D.

Adjunct Professor
A. Seth Greenwald, Ph.D.

Associate Professor
Donald Goodfellow, M.D.
Edward M. Greenfield, Ph.D.
Thomas M. Hering, Ph.D.
Brian Johnstone, Ph.D.
Matthew Kraay, M.D.
Stephen Lacey, M.D.
Thomas McLaughlin, M.D.
Ronald J. Triolo, Ph.D.
Brian N. Victoroff, M.D.
Jung Yoo, M.D.

Associate Clinical Professor
Stanley H. Nahigian, M.D.
William H. Seitz Jr., M.D.

Adjunct Associate Professor
Marcia Z. Wile, Ph.D.

Assistant Professor
John A. Davis, M.D.
Christopher Furey, M.D.
Patrick Getty, M.D.
Allison Gilmore, M.D.
Harry Hoyen, M.D.
William J. Petersilge, M.D.
John D. Sontich, M.D.
Scott Tashman, Ph.D.
Heather A. Vallier, M.D.
Jean F. Welte, Ph.D.
Roger G. Wilber, M.D.

Assistant Clinical Professor
James D. Brodell, M.D.
Dennis B. Brooks, M.D.
John E. Feighan, M.D.

Mark I. Froimson, M.D.
Lawrence Haber, M.D.
Richard D. Parker, M.D.
Timothy L. Stephens, M.D.

Senior Clinical Instructor
Gordon N. Farner, M.D.

Instructor
Luis Solchaga, Ph.D.

Clinical Instructor
Robert H. Anschuetz, M.D.
Michael Banks, M.D.
Mark S. Berkowitz, M.D.
Laurence Bilfield, M.D.
Patrick G. Convery, M.D.
Robert C. Corn, M.D.
Robert de Swart, M.D.
Michael D. Eppig, M.D.
Ralph J. Kovach, M.D.
Robert B. Leb, M.D.
Audley M. Mackel, M.D.
Cyril E. Marshall, M.B.B.S.
Mark Panigutti, M.D.
John Posch, M.D.
Benjamin Richman, M.D.
Jeffrey J. Roberts, M.D.
Paul M. Saluan, M.D.
Susan E. Stephens, M.D.
R. Denison Stewart, M.D.

Secondary Appointments

Professor
Dwight T. Davy, Ph.D.
P. Hunter Peckham, Ph.D.

Associate Professor
Fadi W. Abdul-Karim, M.D.

Assistant Professor
Stephen E. Haynesworth, Ph.D.
Joseph M. Mansour, Ph.D.
Frederick S. Frost, M.D.

Assistant Clinical Professor
Cheryl A. Petersilge, M.D.

Department of Otolaryngology

Chair – MetroHealth Medical Center
James E. Arnold, M.D., McCall Professor

Chair – University Hospitals
Joseph B. Carter, M.D.

Professor
Michael Benninger, M.D.
Pierre Lavertu, M.D.
Melvin Strauss, M.D.
Harvey M. Tucker, M.D.
Associate Professor
Cliff A. Megerian, M.D.
David W. Stepnick, M.D.

Associate Clinical Professor
Michael Broniatowski, M.D.
Richard B. Freeman, M.D., Ph.D.
Sam E. Kinney, M.D.

Assistant Professor
Kumar Alagramam, Ph.D.
Daphne A. Bascom, M.D., Ph.D.
Steven M. Houser, M.D.
Gail S. Murray, Ph.D.
Rod P. Rezaee, M.D.
Robert C. Sprecher, M.D.

Assistant Clinical Professor
Abdul H. Abbass, M.D.
Tom I. Abelson, M.D.
David F. Bennhoff, M.D.
Charles L. Cassidy, M.D.
Joel O. D’Hue, M.D.
Toribio C. Flores, M.D.
Mohamed A. Hamid, M.D., Ph.D.
Michael J. Papsidero, M.D.
Richard L. Ruggles, M.D.
William J. Witt, M.D.

Clinical Instructor
Hassan A. Abbass, M.D.
Stephani F. Ackerman, M.A.
Lori Ann Ausperk, M.S.
Charles J. Bogdan, M.D.
Julie A. Bonko, O.D.
Bert M. Brown, M.D.
Deborah L. Cherpillod, M.A.
Davinna J. Cohen, M.A.
Edward D. Fine, M.D., Ph.D.
Madeleine M Lenox, M.D.
Jane M. Mackall, M.A.
Theresa McLeod, M.A.
Adnan E. Mourany, M.D.
Tracey S. Newman, M.A.
Cara A. Niksa, M.S.
Sue Ann Philippbar, M.A.
A. Tony Reisman, M.D.
Leslie E. Schulman, M.A.
Andrew M. Stein, M.D.
Sanford M. Timen, M.D.
Raymond J. Votyoka, M.D.
Rebecca Warnock, M.A.
Vladimir Zelitsky, M.D.

Secondary Appointments
Professor
Wen H. Ko, Ph.D.
Richard John Leigh, M.D.

Assistant Professor
Russell Wang, D.D.S.

Department of Pathology
Acting Chair – Case
George Perry, Ph.D.
Chair – Cleveland Clinic
Tejbir Sidhu, M.B.B.S.

Professor
Fadi W. Abdul-Karim, M.D.
James M. Anderson, M.D., Ph.D.
Mark L. Cohen, M.D.
Beverly B. Dahms, M.D.
Steven N. Emancipator, M.D.
Melinda L. Estes, M.D.
Pierluigi Gambetti, M.D., University
Pathologists of Cleveland Professor
John Reid Goldblum, M.D.
Neil S. Greenspan, M.D., Ph.D.
Clifford V. Harding, M.D., Ph.D.
William R. Hart, M.D.
Michael R. Jacobs, M.B.B.S.
David R. Kaplan, M.D., Ph.D.
Lawrence Kass, M.D.
Michael E. Lamm, M.D.
Paul V. Lehmann, M.D., Ph.D.
Kandice Kottke Marchant, M.D., Ph.D.
M. Edward Medof, M.D., Ph.D.
Vincent M. Monnier, M.D.
John G. Nedrud, Ph.D.
Richard A. Prayson, M.D.
Theresa P. Pretlow, Ph.D.
Thomas G. Pretlow II, M.D.
Raymond W. Redline, M.D.
Mark A. Smith, Ph.D.
Man-Sun Sy, Ph.D.
Alan M. Tartakoff, Ph.D.
Joseph F. Tomashefski, M.D.
Roslyn A. Yomtovian, M.D.
Richard John Zarbo, M.D.

Adjunct Professor
Dennis J. Templeton, M.D., Ph.D.

Associate Professor
Shu Guang Chen, Ph.D.
Ronald P. Cleveland, Ph.D.
Thomas G. Forsthuber, M.D., Ph.D.
Clive R. Hamlin, Ph.D.
Peter S. Heeger, M.D.
Yung T. Huang, Ph.D.
Michael P. Ip, Ph.D.
Gretta H. Jacobs, M.B.B.S.
Amanda J. Jenkins, Ph.D.
Michael D. Linden, M.D.
Gregory T. MacLennan, M.D.
Geoffrey Mendelsohn, M.B.B.S.

Assistant Clinical Professor
Russell Wang, D.D.S.

Department of Pathology
Acting Chair – Case
George Perry, Ph.D.
Chair – Cleveland Clinic
Tejbir Sidhu, M.B.B.S.
Assistant Clinical Professor
Kathleen A. Allen, M.D.
Mark J. Barcelo, M.D.
Joseph A. Boccia, M.D.
Ronald Chapnick, M.D.
Carol F. Farver, M.D.
Gurdev S. Garewal, M.D.
Anthony A. Greco, M.D.
Kadhim J. Jassani, M.D.
Thomas C. Laipply, M.D.
Jerry J. Marty, M.D.
Grace M. Paul, M.D.
Eugene Ross, M.D.
Paula M. Saracco, M.D.
Ronald S. Schmid, M.D.
Carol F. Farver, M.D.
Susan G. Hanke, M.D.
Robert T. Carroll, M.D.
David A. Pifer, M.D.
Robert S. Bell, M.D.
Jeffrey D. Munro, M.D.
Wayne A. Veilleux, M.D.
Nancy Wang Fong, M.D.
Andrea McCollom, M.D.
Frank Miller, M.D.
Stanley F. Seligman, M.D.
Jay Wasman, M.D.
Xiongwei Zhu, Ph.D.
Wenquan Zou, Ph.D.
Clinical Instructor
Christopher T. Clark, M.D.
Pamela T. Conover, M.D.
Rosemary Farag, M.B.B.S.
Curtiss Lee Jones, M.S.
Daniel Katz, M.D.
David J. Keep, M.D.
Linda M. Luke, B.S.
Heather N. Raaf, M.D.
Suneeti Sapatnekar, M.D., Ph.D.
Michael Tyrkus, Ph.D.
James T. Wentzel,
Adjunct Instructor
John D. Fayen, M.D.
Secondary Appointments
Professor
Melvin Berger, M.D., Ph.D.
Kevin D. Cooper, M.D.
Steven J. Czinn, M.D.
Claire Doerschuk, M.D.
Claudio Fiocchi, M.D.
James Kazura, M.D.
Mary L. Kumar, M.D.
Irving Kushner, M.D.
Alan D. Levine, Ph.D.
Neal S. Rote, Ph.D.
Danny R. Sawyer, D.D.S.
Lawrence M. Sayre, Ph.D.
John R. Schreiber, M.D.
George R. Stark, Ph.D.
Miriam A. Weiss, M.D.
Associate Professor
David S. Bardenstein, M.D.
Edward M. Greenfield, Ph.D.
Christopher L. King, M.D., Ph.D.
Assistant Professor
Stanley A. Hirsch, D.D.S.
Donald D. Anthony, M.D., Ph.D.
Thomas G. Blanchard, Ph.D.
Ronald L. Cechner, Ph.D.
Anita C. Gilliam, M.D., Ph.D.
Yiping W. Han, Ph.D.
Tariq M. Haqqi, Ph.D.
Frederick P. Heinzel, M.D.
Christine Jaworsky, M.D.
Mary Joan Laughlin, M.D.
Susan R. Marengo, Ph.D.
Anoop Kumar Padival, Ph.D.
Eric Pearlman, Ph.D.
Stephen C. Somach, M.D.
Maya Srivastava, M.D., Ph.D.
Qin Wang, Ph.D.
Marc D. Winkelman, M.D.
Assistant Clinical Professor
Mary Beth Mazanec, M.D.
Adjunct Assistant Professor
Robert L. Fairchild, Ph.D.
Senior Instructor
Jonathan Bass, M.D.
Department of Pediatrics
Chair – University Hospitals
Avroy A. Fanaroff, M.D.
Chair – MetroHealth Medical Center
Robert Copley Cohn, M.D.
Professor
Jill E. Baley, M.D.
Melvin Berger, M.D., Ph.D.
Brian W. Berman, M.D.
Jeffrey L. Blumer, M.D., Ph.D.
Ben H. Brouhard, M.D.
Barbara A. Cromer, M.D., Robbins Professor
Leona Cuttler, M.D.
Steven J. Czinn, M.D.
William T. Dahms, M.D.
Jane B. Black, M.D.
Diane C. Burgin, M.D.
Michele Carrouzzo, M.D.
Thelma Citta-Pietrolungo, O.D.
David M. Connuck, M.D.
Maria Coutinho, M.B.B.S.
Conleth Crotser, M.D.
Silas C. Daugherty, M.D.
Barbara L. Davis, M.D.
Aurora F. De Jesus, M.D.
Lyn Hollis Dickert-Leonard, M.D.
Mohan J. Durve, M.B.B.S.
Susan M. Dykeman, M.D.
Barbara D. Evans, M.D.
Rosalie Faraci, M.D.
Sarah Friebert, M.D.
Deborah B. Friedman, M.D.
Rachel M. Garber, M.D.
Ernesto A. Gerardo, M.D.
Simin M. Ghahremani, M.D.
Deborah Ghazoul, M.D.
Cindy Gherman, M.D.
Gregory Golonka, M.D.
Charles S. Griffin Jr., M.D.
Elizabeth L. Hellerstein, M.D.
Joanne Hempel, M.D.
Andrew R. Hertz, M.D.
Daniel D. Hostetler, M.D.
Robert W. Hostoffer, O.D.
Howard S. Jacobs, M.D.
Kelly Lyn Joyce, M.D.
Gopal R. Kapoor, M.B.B.S.
Naguib T. Khalil, M.D.
Manmohan Krishan Khosla, M.B.B.S.
Nancy K. Klein, Ph.D.
Susan K. Klein, M.D.
James T. Leslie, M.D.
J. Donald Luckner, M.D.
Amy Maneker, M.D.
Delbert D. Mason, M.D.
Timothy McKnight, M.D.
Richard A. Moore, M.D.
Sigmund C. Norr, M.D., Ph.D.
Scot J. Occhionero, M.D.
A. Peter Paladin Jr., M.D.
Thomas E. Phelps, M.D.
Shannon C. Phillips, M.D.
James J. Posch, M.D.
Anthony H. Repucci, M.D.
Bettina Reyes, M.D.
John C. Rosace, M.D.
Troy Sands, M.D.
Ilana Schmitt, M.D.
Theodore H. Sher, M.D.
Robert Stephens, M.D.
Thomas Taxman, M.D.
John P. Trudeau, M.D.
David C. Walker, M.D.
Thomas Wasserbauer, M.D.
Steven S. Wexberg, M.D.
Daniel C. Worthington, M.D.
Teresa Zimmerman, M.D.

**Adjunct Assistant Professor**

Douangdao Souk Aloun, M.D.
Tarif Bakdash, M.D.
Iqbal Ahmad Choudhry, M.B.B.S.
Barry Alan Cohen, M.D.
Ibrahim Haddad, M.D.
Soudaline Maniphon, M.D.
Khamseang Philavong, M.D.
Khampe Phongsavath, M.D.
Lourdes R. Prieto, M.D.
Aymen Saleh, M.D.
Bouannak Saysanasong Kham, M.D.
Jeffrey Schwersenski, M.B.B.S.
K. Sengmanivong, M.D.
Madhumita Sinha, M.B.B.S.
Ronald A. Strauss, M.D.
Kristine Torjesen, M.P.H.
Shari L. Wade, Ph.D.
William I. Zaia, M.B.B.S.

**Senior Instructor**

Nabil El-Ghoroury, Ph.D.

**Senior Clinical Instructor**

Samar H. Bashour, M.D.
Delia M. Di Gregorio, M.D.
Marc M. Feldman, M.D.
Daniel Fuller, M.D.
Elliot S. Herscher, M.D.
Randal N. Huff, O.D.
Peter Laufer, M.D.
Robert Me Evoy, M.D.
Bharati S. Rao, M.B.B.S.
Emmelyne St Germaine, M.D.
Nina F. Wimpie, M.D.

**Instructor**

Dale F. Bergamo, M.D.
Andrea E. Bonny, M.D.
Lisa R. Brand, M.D.
Hulya Bukulmez, M.D.
Laura Caserta, M.D.
John Cox, O.D.
Leron Jeremy Finger, M.D.
Samuel Friedlander, M.D.
Chad Jacobsen, M.D.
Harry K. Kiefer, M.D.
Ethan Leonard, M.D.
Katherine E. Mason, M.D.
Aurora Perez, M.D., Ph.D.
Lara Primak, M.D.
Lawrence Quang, M.D.
Ivona Sediva, M.D.
Michael Traylor, M.D.

**Clinical Instructor**

Mahmoud M. Abouel Soud, M.D.
Adebawale Adedipe, M.D.
Rosemary Amofah Dayie, M.D.
Mala Appachi, M.B.B.S.
Heather Arnett, M.D.
Stefanie Aronow, M.D.
Catherine Arora, M.D.
Andrea G. Asnes, M.D.
Jeffrey Auletta, M.D.
Janet Lorraine Benish, M.D.
Denise A. Bothe, M.D.
David Alan Bowe, M.D.
Maria Cynthia Brawner, M.D.
Joann L. Brewer, M.D.
Deborah Brindza, M.D.
Elizabeth Bucchiери, M.D.
Ernesto C. Bunye, M.D.
Diane A. Butler, M.D.
Daniel Callisto, O.D.
Peter Cantanzano, M.D.
Elizabeth Carpenter, M.D.
Amy Carruthers, M.D.
Constancia T. Castro, M.D.
David Chand, M.D.
Alaknanda S. Chandurkar, M.B.B.S.
Lisa Cherullo, M.D.
Laura Cifra-Bean, M.D.
Valerie Coats, M.D.
Jennifer Cochran, M.D.
Marcia L. Columbro, M.D.
Catheleen A. Coyne, M.D.
Naser Danan, M.D.
M. Stacia Dearmin, M.D.
Stephen Dutko, M.D.
Duane Dyson, M.D.
Sara Eapen, O.D.
Barbara L. Ekelman, Ph.D.
Laurie S. Ekstein, M.D.
Joy B. Ertel, M.D.
Mark Evans, M.D.
Lynne A. Eversman, M.D.
Ann Failinger, M.D.
Elizabeth Briggs Feighan, M.D.
Elaine Fitzgerald, M.D.
James E. Fuduric, M.D.
Joji E. Gacad, M.D.
Andrew Garner, M.D., Ph.D.
G. Bradley Gascoigne, M.D.
Edward J. Gaydos, O.D.
Susan Gillespie, M.D., Ph.D.
Mark J. Gipson, M.D.
Gwen K. Glazer, M.D.
Eleanor J. Gottesman, M.D.
Ellen Graber, M.D.
Mary Kay Greenberg, M.D.
Richard I. Grossberg, M.D.
Amy Grube, M.D.
Adjunct Assistant Professor
Kathleen Laing, Ph.D.
Daniel A. Weinberger, M.D.

Senior Instructor
Sian Cotton, Ph.D.
Sian Cotton, Ph.D.
David M. Kuentz, O.D.

Instructor
Anjali P. Adur, M.B.B.S.
Kumar Alagramam, Ph.D.
Mark M. Goldfinger, M.D.
George James Pallotta, O.D.

Clinical Instructor
David M. Bonnet, M.D.
Thomas D. Ginley, O.D.
Todd G. Gottschalk, O.D.
Karen Hummel, M.D.
Stacey Lacey, M.D.
Louise A. Sieben, M.D.

Department of Pharmacology
Acting Chair
Michael E. Maguire, M.D.

Professor
Charles L. Hoppel, M.D.
Michael E. Maguire, Ph.D.
John J. Mieyal, Ph.D.
Ruth E. Siegel, Ph.D.
Yu-Chung Yang, Ph.D., Goodman-Blum Professor

Adjunct Professor
John H. Nilson, Ph.D.

Associate Professor
Donald D. Anthony, M.D.
Paul N. MacDonald, Ph.D.

Assistant Professor
Anthony Berdis, Ph.D.
Diane R. Dowd, Ph.D.
W. John Durfee, D.V.M.
Ruth A. Keri, Ph.D.
Monica M. Montano, Ph.D.
David C. Schultz, Ph.D.
Amy L. Wilson-Delfosse, Ph.D.

Adjunct Assistant Professor
Alexandru Almasan, Ph.D.
Subrata Haldar, Ph.D.

Instructor
Rachel J. Mann, Ph.D.

Secondary Appointments
Professor
Jeffrey L. Blumer, M.D., Ph.D.
Leona Curtler, M.D.
Clark W. Distelhorst, M.D.
Janice G. Douglas, M.D.
Timothy Scott Kern, Ph.D.
W. David Lust, Ph.D.
Philip G. Morgan, M.D.

Adjunct Professor
Marc Thibonniere, M.D.
Richard Paul Woychik, Ph.D.

Associate Professor
David Allen Boothman, Ph.D.
David Danielpour, Ph.D.
George Dubyak, Ph.D.
Alan D. Levine, Ph.D.
Ram H. Nagaraj, Ph.D.
Michael F. Romero, Ph.D.

Assistant Professor
Eric J. Arts, Ph.D.
Robert Bonomo, M.D.
Paul Roos Ernsberger, Ph.D.
Alison K. Hall, Ph.D.
Thomas J. Kelley, Ph.D.
Andrew Korytko, Ph.D.
Bingcheng Wang, Ph.D.

Department of Physical Medicine and Rehabilitation
Chair
Gary Clark, M.D.

Professor
Gary S. Clark, M.D.

Associate Professor
John Chae, M.D.
Graham H. Creasey, M.B.B.S.
Shu Q. Huang, M.D.
Patrick K. Murray, M.D.

Assistant Professor
James J. Begley, M.D.
Thomas Dixon, Ph.D.
Elizabeth Dreben, Ph.D.
Frederick S. Frost, M.D.
Michael Harris, M.D.
Clay M. Kelly, M.D.
Asikin Mentari, M.D.
Kip Smith, Ph.D.
Mary M. Vargo, M.D.

Assistant Clinical Professor
Santhosh A. Thomas, M.D.

Adjunct Senior Instructor
Chloe Glasson, Ph.D.

Instructor
Mary Roach, Ph.D.

Department of Physiology and Biophysics
Chair
Antonio Scarpa, M.D., Ph.D., Myers- Scarpa Professor

Professor
Meredith Bond, Ph.D.
Arthur M. Brown, M.D., Ph.D.
Cathleen R. Carlin, Ph.D.
Paul E. DiCorleto, Ph.D.
Anthony F. DiMarco, M.D.
George Dubyak, Ph.D.
Richard L. Eckert, Ph.D.
Joan E.B. Fox, Ph.D.
Ulrich Hopfer, M.D., Ph.D.
Masao Ikeda-Saito, Ph.D.
Stephen W. Jones, Ph.D.
Paul J. Martin, Ph.D.
Thomas M. Nosek, Ph.D.
Nanduri R. Prabhakar, D.Sc.
William P. Schilling, Ph.D.
Ganes Chandra Sen, Ph.D.
Witold K. Surewicz, Ph.D.

Adjunct Professor
Robert Graham, M.D.

Associate Professor
Thomas Talbot Egelhoff, Ph.D.
Robert D. Harvey, Ph.D.
Philip Howe, Ph.D.
Jian-Ping Jin, Ph.D.
Albert C. Kirby, Ph.D.
Michael F. Romero, Ph.D.
Frank D. Sonnichsen, Ph.D.
William C. Stanley, Ph.D.
Luke Szveda, Ph.D.

Assistant Professor
Matthias Buck, Ph.D.
Kim Chan, Ph.D.
Margaret P. Chandler, Ph.D.
Michael Kinter, Ph.D.
Christine Schomisch Moravec, Ph.D.
Virgil Muresan, Ph.D.
Jeffrey L. Overholt, Ph.D.
Andrea Romani, M.D., Ph.D.
Corey B. Smith, Ph.D.

Adjunct Assistant Professor
Antonio Gualberto, M.D., Ph.D.

Instructor
Marco A. Brotto, Ph.D.
Tatiana Efimova, Ph.D.
Carlos Arturo Obegero-Paz, M.D., Ph.D.
Ozgur Ogut, Ph.D.

Adjunct Instructor
Karen Parker, Ph.D.

Secondary Appointments

Professor
Mary D. Barkley, Ph.D.
Pamela B. Davis, M.D., Ph.D.
Janice G. Douglas, M.D., Ph.D.
George I. Gorodeski, M.D., Ph.D.
Faramarz Ismail-Beigi, M.D., Ph.D.
Joseph C. LaManna, Ph.D.
Calvin U. Cotton, Ph.D.
Mark E. Dunlap, M.D.
Igor Efimov, Ph.D.
Edward M. Greenfield, Ph.D.

Associate Professor
David R. Bickers, M.D.
Neil S. Cherniack, M.D.
Hasan Mukhtar, Ph.D.

Assistant Professor
Frank V. Brozovich, M.D., Ph.D.
Calvin U. Cotton, Ph.D.
Mark E. Dunlap, M.D.
Igor Efimov, Ph.D.
Edward M. Greenfield, Ph.D.
John Kirwan, Ph.D.

Department of Psychiatry

Chair – MetroHealth Medical Center
Robert Segraves, M.D., Ph.D.

Chair – University Hospitals
Pedro L. Delgado, M.D., Bond Professor

Vice Chair
Robert Frymier, M.D.

Professor
David Agle, M.D., Sihler Family Professor
Peter Buckley, M.B.B.S.
Joseph R. Calabrese, M.D.
C. Edwards Coffey, Claire Ernhart, Ph.D.

Sarah Horwitz, Ph.D.
Javad H. Kashani, M.D.
Matig Mavissakalian, M.D.
Phillip Resnick, M.D.
Daniel S. Schubert, M.D., Ph.D.

Clinical Professor
Norman Clemens, M.D.
Stephen B. Levine, M.D.
Sylvia B. Rimm, Ph.D.
Ellen Rothchild, M.D.
Michael A. Schwartz, M.D.

Adjunct Professor
Herbert Y. Meltzer, M.D.

Associate Professor
Richard B. Corradi, M.D.
Thomas D. Epparency, M.D.
Robert L. Findling, M.D.
Peter F. Goyer, M.D.
William C. House, Ph.D.
Donald D. Howe, M.D.
George E. Jaskiw, M.D.
Robert J. Ronis, M.D., Lenkoski Professor
Stephen L. Ruedrich, M.D.
Martha Sajatovic, M.D.
Kathleen Segraves, Ph.D.
Carol S. White, Ph.D.
Abraham W. Wolf, Ph.D.

Associate Clinical Professor
Melvin J. Chavinson, M.D.
Mary Ellen S. Davis, M.D.
James A. Doull Jr., M.D.
A. Scott Dowling Jr., M.D.
Matthew A. Fuller, D.P.H.
Murray A. Goldstone, M.D.
James S. Jacobsohn, M.D.
Monique V. King, M.D., Ph.D.
Elizabeth Koss, Ph.D.
Leslie Lothstein, Ph.D.
Mark R. Munetz, M.D.
Arthur L. Rosenbaum, M.D.

Adjunct Associate Professor
Judith Dogin, M.D.

Assistant Professor
Nancy L. Adams, Ph.D.
Luis Felipe Aunategui, Ph.D.
Sarah C. Aronson, M.D.
David J. Blank, M.D.
Linda Christine Bond, M.D.
Karen Brocco-Kish, M.D.
William Campbell, M.D.
Kathleen A. Clegg, M.D.
Cristinel Coconcea, M.D.

Marilyn Davies, Ph.D.
Christina Reyes Delos, M.D.
Phillip Dines, M.D., Ph.D.
Jonathan E. Dunn, M.D., Ph.D.
Norah C. Feeny, Ph.D.
John R. Fisher III, M.D.
Howard Gottesman, M.D.
Deborah Gould, M.D.
Steven P. Hampl, Ph.D.
Jeffrey W. Janata, Ph.D.
George Juris, M.D.
Otto Kausch, M.D.
Susan E. Kimmel, M.D.
P. Eric Konicki, M.D.
Carolee K. Lesyk, Ph.D.
David S. Liebling, M.D.
Ana F. Martenez, M.D.
Mary L. Miller, M.D., Ph.D.
Stephen G. Noffsinger, M.D.
Elizabeth Pehe, Ph.D.
Harry W. Pollock, M.D.
Daniel J. Rapport, M.D.
Gary S. Richardson, M.D.
Magdi S. Rizk, M.D.
John J. Sanitato, M.D.
William E. Semple, Ph.D.
Melvin D. Shelton, M.D., Ph.D.
Sung Sool Shim, M.D., Ph.D.
Douglas A. Smith, M.D.
Thomas P. Swales, Ph.D.
Martha J. Tisdale, Ph.D.
Cynthia S. Vrabie, M.D.
Robert Weiss, M.D.
James M. Yokley, Ph.D.
Christopher Michael Young, M.D.
Steven J. Zuchowski, M.D.

Assistant Clinical Professor
Francoise Adan, M.D.
Robert W. Alcorn, M.D.
Robert J. Algair, M.D.
Lisa M. Anillo, Ph.D.
Monroe S. Arlen, M.D.
Pauline Benjamin, Ph.D.
Bijan Bastani, M.D.
Kurt A. Bertschinger, M.D.
Aaron Billowitz, M.D.
Gregory X. Boehm, M.D.
Valerie H. Boulware, M.D.
Minnie M. Bowers, M.D.
Ivy R. Boyle, M.D.
Kathryn A. Burns, M.D.
Robert Chwast, Ph.D.
Joan Clayton, Ph.D.
Phill I. Cohen, M.D.
Homai J. Cupala, M.B.B.S.
Sandra Curry, Ph.D.
Clinical Instructor
Michael H. Aronoff, Ph.D.
Jane Belkin, M.A.
Jay Berk, Ph.D.
James T. Bukuts, M.D.
Joselita Chua, M.D.
Nicolette Coconcea, M.D.
Yael T. Crawford, Ph.D.
Upma Dhingra, M.B.B.S.
Thomas Michael Evans, Ph.D.
David I. Falk, Ph.D.
William Fikter, M.D.
Gretchen K. Gardner, M.D.
Kenneth Gerstenhaber, Ph.D.
Myron W. Goldman, M.S.W.
David Y. Hahn, M.D.
John L. Hertzer, M.D.
Judith L. Hirschman, M.D.
Antonnette V. Graham, Ph.D.
C. Kent Smith, M.D.
Terry Stancin, Ph.D.
H. Gerry Taylor, Ph.D.
Peter J. Whitehouse, M.D., Ph.D.
Stuart Youngner, M.D.
Associate Professor
Lynn Singer, Ph.D.
Adjunct Associate Professor
Gay Kitson, Ph.D.
Marian B. Patterson, Ph.D.
Assistant Professor
Jane W. Kessler, Ph.D.
Zev S. Ashenberg, Ph.D.
Elizabeth Dreben, Ph.D.
Howard R. Hall III, Ph.D.
Sheryl A. Kingsberg, Ph.D.
Barry S. Layton, Ph.D.
Michael Rowane, O.D.
Clint W. Snyder, Ph.D.
Eric Youngstrom, Ph.D.
Assistant Clinical Professor
Olga B. Emery, Ph.D.
Fred M. Zimring, Ph.D.
Israel Weisberg, M.D.
Adjunct Assistant Professor
Jean R. Berggren, M.D.
Senior Clinical Instructor
Donna Kwilosz, Ph.D.
Gerald Strauss, Ph.D.
Clinical Instructor
Karen Bardenstein, Ph.D.
Department of Radiation Oncology
Chair – University Hospitals
Meredith A. Weinstein, M.D.
Professor
Jeffrey L. Duerk, Ph.D.
Charles F. Lanzieri, M.D.
Jonathan S. Lewin, M.D.
Thomas John Masaryk, M.D.
Michael T. Modic, M.D.
Donald Bruce Sodee, M.D.
Robert W. Tarr, M.D.
Carl J. Zylak, M.D.
Clinical Professor
Meredith A. Weinstein, M.D.
Adjunct Professor
Plinio Rossi, M.D.
Associate Professor
Vikram S. Dogra, M.B.B.S.
<table>
<thead>
<tr>
<th>Assistant Professor</th>
<th>Louise S. Acheson, M.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Howard B. Goldman, M.D.</td>
<td></td>
</tr>
<tr>
<td>Raymond W. Redline, M.D.</td>
<td></td>
</tr>
<tr>
<td>Adjunct Assistant Professor</td>
<td>Zuhayr Madhun, M.D.</td>
</tr>
<tr>
<td>Department of Surgery</td>
<td></td>
</tr>
<tr>
<td>Chair – Cleveland Clinic</td>
<td>Kenneth Ouriel, M.D.</td>
</tr>
<tr>
<td>Chair – MetroHealth Medical Center</td>
<td>Mark A. Malangoni, M.D.</td>
</tr>
<tr>
<td>Acting Chair – University Hospitals</td>
<td>Jerry Goldstone, M.D.</td>
</tr>
<tr>
<td>Professor</td>
<td>Walter Jakob Chwals, M.D</td>
</tr>
<tr>
<td></td>
<td>Robert L. Fairchild, Ph.D.</td>
</tr>
<tr>
<td></td>
<td>Richard B. Fratiianne, M.D.</td>
</tr>
<tr>
<td></td>
<td>Jerry Goldstone, M.D.</td>
</tr>
<tr>
<td></td>
<td>Linda M. Graham, M.D.</td>
</tr>
<tr>
<td></td>
<td>John Michael Henderson, M.B.B.S.</td>
</tr>
<tr>
<td></td>
<td>Joseph P. Iannotti, M.D., Ph.D.</td>
</tr>
<tr>
<td></td>
<td>Thomas J. Kirby, M.D.</td>
</tr>
<tr>
<td></td>
<td>Hiel Lewis, M.D.</td>
</tr>
<tr>
<td></td>
<td>Edward A. Luce, M.D.</td>
</tr>
<tr>
<td></td>
<td>Edward G. Mansour, M.D.</td>
</tr>
<tr>
<td></td>
<td>Marc R. Mayberg, M.D.</td>
</tr>
<tr>
<td></td>
<td>Christopher R. McHenry, M.D.</td>
</tr>
<tr>
<td></td>
<td>David Nathanson, M.B.B.S.</td>
</tr>
<tr>
<td></td>
<td>Andrew C. Novick, M.D.</td>
</tr>
<tr>
<td></td>
<td>Kenneth Ouriel, M.D.</td>
</tr>
<tr>
<td></td>
<td>Jeffrey L. Ponsky, M.D.</td>
</tr>
</tbody>
</table>
|                                            | Jerry M. Shuck, M.D., Payne Professor
|                                            | Norman Silverman, M.D. |
|                                            | John Patrick Spirkn, M.D.|
|                                            | Thomas A. Stellato, M.D.|
|                                            | Marshall Strome, M.D.  |
|                                            | Yoshio Takaoka, M.D.   |
|                                            | Robert J. White, M.D., Ph.D.|
|                                            | James E. Zins, M.D.    |
|                                            | Robert M. Zollinger Jr., M.D.|
| Clinical Professor                          | Jerald S. Brodkey, M.D.|
|                                            | Bahman Guyuron, M.D.   |
|                                            | Robert Hermann, M.D.   |
| Associate Professor                         | John Jeffrey Alexander, M.D.|
|                                            | Ami Aszodi, M.D.       |
|                                            | Bruce J. Averbok, M.D.  |
|                                            | Jon Bradrick, D.D.S.   |
|                                            | Christopher P. Brandt, M.D.|
|                                            | Julie Clayman, M.D.    |
|                                            | William F. Fallon, M.D.|
|                                            | Jeffrey A. Goldstein, M.D.|
|                                            | Hani A. Hennein, M.D.  |
|                                            | Terry A. King, M.D.    |
|                                            | Matt J. Likavec, M.D.  |
|                                            | Joel R. Peerless, M.D. |
|                                            | Marjie L. Persons, M.D.|
|                                            | Paul P. Priebe, M.D.   |
|                                            | Robert R. Shenk, M.D.  |
|                                            | Michael L. Spector, M.D.|
|                                            | Thomas L. Steinemann, M.D.|
|                                            | Charles J. Yowler, M.D.|
| Associate Clinical Professor                | William L. Annable, M.D.|
|                                            | Lu-Jean Feng, M.D.     |
|                                            | Fred Plecha, M.D.      |
|                                            | James E. Sampliner, M.D.|
|                                            | Helmut Schreiber, M.D. |
|                                            | Ezra Steiger, M.D.     |
| Assistant Professor                         | Marwan S. Abouljoud, M.D.|
|                                            | Roderick B. Jordan, M.D.|
|                                            | Brann R. Kaufman, M.D. |
|                                            | Roseanna Marie Lechner, M.D.|
|                                            | Rosemary Leeming, M.D. |
|                                            | David Magnuson, M.D.   |
|                                            | Bernado Martinez, M.D. |
|                                            | Daniel A. Medalie, M.D.|
|                                            | John A. Moawad, M.D.   |
|                                            | Jeff Lynn Myers, M.D., Ph.D.|
|                                            | Timothy J. Nypaver, M.D.|
|                                            | Raymond P. Ondres, M.D.|
|                                            | Robert L. Parry, M.D.  |
|                                            | Gilles Pinault, M.D.   |
|                                            | Michael J. Prokopius, M.D.|
|                                            | Harry L. Reynolds, M.D.|
|                                            | Christopher Thomas Siegel, M.D., Ph.D.|
|                                            | Anthony Stallion, M.D.  |
|                                            | Jean T. Stevenson, M.D.|
|                                            | Nicholas Stowe, Ph.D.  |
|                                            | John Valente, M.D.     |
|                                            | Daniel W. Van Heeckeren, M.D.|
|                                            | Michael Vogelbaum, Ph.D.|
|                                            | Cathy White-Owen, M.D.  |
|                                            | Diana Whittlesey, M.D. |
|                                            | Scott M. Wilhelm, M.D. |
| Assistant Clinical Professor                | Frederick Alexander, M.D.|
|                                            | Michael P. Binder, M.D.|
|                                            | William E. Cappaert, M.D.|
|                                            | John W. DiFiore, M.D.  |
|                                            | Richard V. Dowden, M.D.|
|                                            | Henry Eisenberg, M.D.  |
|                                            | Haysam El-Dalati, M.B.B.S.|
|                                            | Caldwell B. Esselstyn, M.D.|
|                                            | J. Peter Fegen, M.D.   |
|                                            | John L. Ferron, M.D.   |
|                                            | Anthony Forde, D.D.S.  |
|                                            | Kay Ellen Frank, M.D.  |
|                                            | Amitabh Goel, M.D.     |
|                                            | Charles K. Koster, M.D.|
|                                            | Donald W. Lenhart, M.D.|
|                                            | Isadore Lidsky, M.D.   |
|                                            | James A. Malgieri, M.D.|
|                                            | Alan H. Markowitz, M.D.|
|                                            | Jeffrey M. Marks, M.D. |
|                                            | Bryan J. Michelow, M.B.B.S.|
|                                            | Elmer Perse, M.D.      |
|                                            | James M. Persky, M.D.  |
|                                            | Roland S. Philip, M.D. |
|                                            | George John Picha Jr., M.D., Ph.D.|
|                                            | Ronald L. Price, M.D.  |
|                                            | Timothy J. Pritchard, M.D.|
|                                            | James F. Rambasek, M.D.|
|                                            | Victor Scharf, M.D.    |
|                                            | Ahmad H. Shatila, M.D. |
|                                            | George V. Smith Jr., M.D.|
|                                            | Clifford J. Vogt Jr., M.D.|
| Senior Instructor                           | Chandra Roy Altemare, M.D.|
| Senior Clinical Instructor                  | E. S. Brown, M.D.      |
|                                            | John P. Bryk, M.D.     |
|                                            | Robin Dhillon, M.D.    |
|                                            | Marianne Geraci-Rambasek, M.D.|
|                                            | Arthur C. Hill, M.D.   |
|                                            | Charles B. Hurst, M.D. |
|                                            | Derrick D. McElroy, M.D.|
|                                            | Bernard D. Perla, M.D. |
|                                            | Neil F. Sika, O.D.     |
|                                            | Robert W. Stewart, M.D.|
|                                            | Ivan P. Tewarson, M.B.B.S.|
|                                            | Stephanie W. Thomas, M.D.|
|                                            | Anthony Udekwu, M.B.B.S.|
| Instructor                                  | Edward J. Hartwig, O.D.|
|                                            | John Pakiela, O.D.     |
| Clinical Instructor                         | Dominick C. Adornato, D.D.S.|

**Case Western Reserve University General Bulletin 2004–2006**

School of Medicine • 531
The Cleveland Clinic Foundation

In 2002, Case and the Cleveland Clinic Foundation entered into an agreement to form the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, with the first students matriculating in 2004. The “College Program” is a program within the Case School of Medicine.

The Cleveland Clinic was founded in 1921 by four Case faculty members, three of whom are counted among the alumni of the Case School of Medicine. The Clinic’s main campus, where much of the activity associated with the program will occur, is located on 130 acres adjacent to and southwest of the Case campus.

The Clinic includes the 12-story, state-of-the-art Crile Building, a 934-staffed-bed hospital (including a children’s hospital), the Cleveland Clinic Educational Foundation and the Lerner Research Institute.

In 2001, the Clinic recorded more than 2.25 million outpatient visits and 52,000 hospital admissions. Among them were patients from all 50 states and 80 foreign countries. More than 1,100 full-time physicians and scientists and 700 house staff/fellows provide patient care in 100 specialties and subspecialties.

The Clinic provides health care for Cleveland-area communities through a network of family health centers and medical offices located in Beachwood, Brunswick, Chagrin Falls, Creston, Elyria, Independence, Lakewood, Lorain, Solon, Strongsville, Westlake, Willoughby Hills, and Wooster. Also, community-based oncologists offer a full range of hematology and oncology services for adults at eight suburban locations: Beachwood, Chagrin Falls, Independence, Middleburg Heights, Solon, Strongsville, Warrensville Heights and Willoughby Hills.

The Louis Stokes Cleveland Department of Veterans Affairs Medical Center

The Louis Stokes Cleveland Department of Veterans Affairs Medical Center is a major teaching hospital of the School of Medicine and is an important site for the education of medical students. The Cleveland VAMC also supports more than 100 residency and fellowship training positions in medicine, surgery, and psychiatry and their subspecialties. Most VAMC physicians hold faculty appointments within the School of Medicine. The affiliation is overseen by the Dean’s Committee, consisting of the dean, department chairpersons from the School of Medicine, and key VAMC officials.

The Cleveland VAMC is a part of the VA Healthcare System of Ohio, linking VA health care facilities in Ohio in an integrated service network. Inpatient care is provided at the Wade Park and Brecksville divisions and includes medicine, surgery, psychiatry, spinal cord injury, neurology and rehabilitation medicine as well as a nursing home and a domiciliary. Outpatient care is delivered in primary
The MetroHealth System

The MetroHealth System has been serving the medical needs of the Cleveland community for more than 160 years. Today the hospital system is one of the largest, most comprehensive health care providers in Northeast Ohio.

The MetroHealth System includes: MetroHealth Medical Center, MetroHealth Center for Rehabilitation, MetroHealth Center for Skilled Nursing Care, Elizabeth Severance Center for Skilled Nursing Care at MetroHealth, MetroHealth Clement Center for Family Care, and a dozen urban and suburban primary care sites. In addition, in 2000, MetroHealth opened an outpatient surgery center on Cleveland’s west side. Together, these units provide a complete spectrum of health care services.

As Cleveland’s first hospital and the largest on the city’s west side, the 731-bed MetroHealth Medical Center is the flagship unit of The MetroHealth System. The medical center provides a full range of general and tertiary services for the acutely ill; rehabilitation services are provided through MetroHealth Center for Rehabilitation.

MetroHealth is nationally recognized for its advanced techniques in treating complex medical problems. Special interests include emergency and trauma care, surgical specialties, family health, senior health, internal medicine, oncology, dentistry, women’s and children’s services, psychiatry, rehabilitation, and subacute and long-term care.

As a principal teaching center of the School of Medicine, MetroHealth maintains a fine tradition of academics and research. All active staff physicians are full-time faculty of the School of Medicine and actively participate in undergraduate and graduate medical education. Intensive training for physicians and medical professionals is offered in more than 25 medical specialties.

MetroHealth Medical Center provides care to more than 27,000 inpatients, including more than 3,500 newborns, annually. More than 600,000 visits are recorded each year in the medical center’s 100 outpatient clinics. In addition, patient visits to the emergency room exceed 75,000.

University Hospitals Health System

The tertiary hub of University Hospitals Health System (UHHS) is University Hospitals of Cleveland (UHC). Founded in 1866, UHC is a 947-bed academic medical center serving northern Ohio and the nation through patient care, research and teaching, with a historic commitment to the health care needs of the community. UHC’s main campus includes the Alfred and Norma Lerner Tower, Samuel Mather Pavilion, and Lakeside Hospital for adult medical/surgical care; the nationally renown Rainbow Babies & Children’s Hospital; University MacDonald Women’s Hospital, Ohio’s only women’s hospital; University Ireland Cancer Center, a partnership with the university designated by the National Cancer Institute as a comprehensive cancer center; University Psychiatric Center (Hanna Pavilion); and skilled nursing and rehabilitation services. The primary affiliate of Case Western Reserve University, UHC and the university form the largest biomedical research center in Ohio. UHC enjoys some of the most prestigious centers of excellence in the country and the world. These include not only those most familiar to the public — cancer, pediatrics, and women’s health — but also areas such as orthopaedics and spine, radiology and radiation oncology, neurosurgery and neuroscience, organ transplantation, infectious diseases, cardiology and cardiothoracic surgery, ophthalmology, dermatology, behavioral health, and the fast-emerging field of human genetics and genomics. UHC, along with its partner hospitals in UHHS, serves patients and families at more than 150 locations in northern Ohio. The system is the region’s broadest network of physicians, outpatient centers and hospitals; wellness programs, occupational health, behavioral health, skilled nursing, elder health, assisted living, rehabilitation services, and home care; and managed care and insurance.

CLEVELAND HEALTH SCIENCES LIBRARY

The Cleveland Health Sciences Library began operating in 1966 with an agreement between the Cleveland Medical Library Association and Case. CHSL operates in two locations: the Health Center Library in the Robbins Building (formerly the east wing) of the School of Medicine, and the Allen Memorial Medical Library, at the corner of Euclid Avenue and Adelbert Road. Both libraries have public computers with full Internet access, black-and-white and color copiers, and quiet study areas. The Health Center Library, which in 2003 underwent a $2.5 million renovation, offers several group study rooms and wireless network access throughout.

The CHSL collection consists of books, journals, theses, government documents, audio-visual items, and electronic resources. The Dittrick Medical History Center collection, located at the Allen Memorial Medical Library, also contains archives, rare books, photographs and artifacts for research in the history of medical technology. The CHSL’s total collection numbers close to 400,000 volumes. CHSL receives more than 1,800 print subscriptions and has access to approximately 7,000 electronic journals and more than 220 research databases. These
resources are included in the campus-wide online catalog, EuclidPLUS (http://catalog.case.edu), which also includes materials held by the University Library branches, the Law Library, the Harris Library of the Mandel School of Applied Social Sciences, the Cleveland Institute of Music Library, the Cleveland Institute of Art Gund Library, and the Laura and Alvin Siegal College of Judiac Studies Library. Classes on using these electronic resources are offered through the KS-Learn program (https://kslearn.case.edu. KSLearn/about.aspx). CHSL is a member of the statewide consortium OhioLINK (http://www.ohiolink.edu). Requests for materials not available on campus or through OhioLINK may be made online using ILLiad (http://charcoal.case.edu/ILLIad/logon.html).

Complete information about the CHSL can be found at http://www.case.edu/chsl/homepage.htm.

ENDOWED LECTURES

THE NIKAAN B. ANDERSON LECTURE

Established in 1974 by friends of the late professor of anesthesiology (from 1969 until his death in 1974), this annual lecture is presented by teachers of the science of anestheasia.

THE CLAUDE S. BECK SCHOLARSHIP VISITING LECTURESHP

This lecture, about cardiovascular surgery, was established in 1989. At what is now known as the Case Western Reserve University School of Medicine, Claude S. Beck, M.D., was demonstrator of surgery in 1924 to 1925; professor of neurosurgery in 1940; and the first professor of cardiovascular surgery in the United States from 1952 until 1965.

THE RICHARD E. BEHRMAN, M.D., LECTURE IN CHILD DEVELOPMENT

Established in 2001 with contributions from friends of colleagues of this former School of Medicine dean (1980 to 1989), this annual lecture is delivered by distingiushed scholars in child development.

THE JACK H. BERMAN, M.D., LECTURE

Established in 1999 by family, friends, and colleagues of this alumnus and associate clinical professor, guest lecturers discuss the basic science behind disease and its application to patient care through this program.

THE LOUIS A. BLOOMFIELD MEMORIAL LECTURE

Established in 1955 in memory of the Cleveland attorney Theodore R. Bloomfield by his widow and his son, this lecture brings outstanding members of the medical profession from around this country and abroad to discuss new concepts and developments in medicine with the medical community and allied professions.

THE WILLIAM E. BRUNER, M.D., D.SC., LECTURE IN OPHTHALMOLOGY

This lecture was established in 2002 in memory of the father of Clark E. Bruner and grandfather of William E. Bruner II, M.D., a 1975 medical school alumnus, with gifts coming from them as well as Susan F. Bruner.

THE COURTNEY BURTON FRONTIERS OF MEDICINE LECTURE

This annual lecture is presented by an outstanding individual who has achieved or helped achieve a significant advance in medicine or a closely related field and whose presentation would be of great interest to members of the medical profession. It is supported by a fund established in 1993. Courtney Burton, Jr., was chair of the board of Oglebay Norton Co. from 1957 until shortly before his death in 1992.

THE ALFRED CAHEN MEMORIAL LECTURE

This lecture series in gastroenterology has been supported by a fund established 1965 by Lottie Cahen, widow of the founder and former president of World Publishing Co., in memory of her late husband.

THE FROHRING PRESIDENTIAL LECTURESHP IN MEDICINE AND ENGINEERING

Lecturers in medicine and engineering deliver this lectureship at the discretion of the University president thanks to a fund begun in 1993 by Paul R. Frohring.

NATHAN S. GREENFIELD FAMILY VISITING LECTURERS IN PHARMACOLOGY

Through an endowment, Rosalee Greenfield Weiss, Ph.D., and Raymond A. Weiss, Ph.D., established this anannual lecture in 1997 to honor her father, Nathan S. Greenfield, a pharmacist who owned Wade Park Pharmacy in Cleveland from 1914 to 1956; her mother, Corinne Sternheimer Greenfield; and Lynn Stuart Weiss, daughter of the benefactors, who died of cancer in her mid-20s in 1971.

THE ZELLA HALL LECTURE

This annual lecture or series of lectures is presented by one or more distinguished visiting researchers selected by the dean of the School of Medicine or his or her designee. It/they are made possible because of support received in 1998 by the estate of Zella Hall.

THE HANNA LECTURES

Founded in 1913 by G. W. Crile, 1887-OW, in honor of H. Melville Hanna, philanthropist and founder of the M.A. Hanna Co., the Hanna Lectures are delivered by distinguished basic scientists from this country and abroad.

THE WILLIAM D. HOLDEN LECTURESHP IN SURGERY

Established in 1985 by the members of the Department of Surgery of MetroHealth Medical Center in honor of their former chair and Payne Professor of Surgery, this series of lectures in surgery is delivered by distinguished leaders in American surgery.

THE LORAND V. JOHNSON LECTURE

This lecture, for residents and visiting staff members in ophthalmology, was established in 1967 by the Wright Foundation.
THE KAISER PERMANENTE ENDOWED LECTURESHIP IN BIOETHICS

This lecture is presented by a distinguished visiting lecturer with the goal of advancing the study of bioethics. It was established in 1994.

THE RITA ANN KICHER LECTURE

In this annual lecture, established in 1996, a distinguished visiting lecturer promotes quality health care by emphasizing new developments in the identification and treatment of life-threatening cardiac arrhythmia. Rita Ann Kicher was the daughter of Thomas Kicher, Ph.D., a triple alumnus, long-time faculty member, and dean (1992-1997) of the Case School of Engineering. At the time of her death, she was a systems analyst at University Hospitals of Cleveland’s Center for Quality Assessment and Utilization Management.

THE CLIFFORD L. KIEHN, M.D., AND JOHN DESPREZ, M.D., VISITING LECTURERS IN PLASTIC AND RECONSTRUCTIVE SURGERY

These lecturers are distinguished visitors whose presentations advance the study of plastic and reconstructive surgery. The lectureship was established in 1994. Dr. Kiehn is the former head of plastic and reconstructive surgery, and Dr. Desprez followed him in that role.

THE JEROME I. KLEINERMAN, M.D., LECTURESHIP IN PULMONARY PATHOBIOLOGY

This lectureship is named for an internationally respected lung specialist and professor emeritus of pathology at the School of Medicine. Established in 2000 by the late Dr. Kleinerman’s daughters, friends, and colleagues, the lectureship each year supports a distinguished visiting lecturer whose presentation advances the study of pulmonary pathobiology. The lecturer is selected by a faculty committee that includes members having appointments at MetroHealth Medical Center. The members of the committee are chosen by the dean of the School of Medicine.

THE ROBERT R. KOHN LECTURE

The lecture honors an alumnus of the Class of 1957 and was established in his memory in 1989 by family, friends and colleagues to advance the study of pathology.

THE LESTER KRAMPITZ LECTURE AND EDUCATION FUND

The fund was established in 1982 by family, friends, and colleagues of former faculty member Lester Krampitz, M.D., to honor him with a lecture fund in microbiology. It is intended to facilitate the interchange of ideas, a process Dr. Krampitz, who joined the faculty in 1946 and retired in 1978, believes is vital to scientific research.

THE CARL H. LENHART SURGICAL LECTURE

Established in 1955 by friends of this alumnus of the Class of 1904, in his memory, this lecture presents outstanding speakers on clinical developments in surgery.

THE ALAN MORITZ, M.D., ENDOWMENT FUND

This fund was established in 1991 by friends and colleagues of the late forensic pathologist, medical school faculty member, and university provost.

THE OLOF H. PEARSON, M.D., LECTURE

Established in 1999 by family and friends of the late endocrinologist, oncologist, and faculty member, this lecture features a cancer-related topic at the School of Medicine.

THE ROBERT S. POST, M.D., VISITING LECTURESHIP

Established in 1995 by Dr. Post’s friends and colleagues in the Community Diaglisis Center, in memory of the former faculty member and head of nephrology, this lecture features a distinguished visiting expert in the field of nephrology.

THE EDWARD W. PURNELL LECTURESHIP IN OPHTHALMOLOGY

Established in 1991 and named for the late physician, surgeon, researcher, and medical school head of ophthalmology, this lecture features a visiting expert in the Department of Ophthalmology.

THE FREDERICK C. ROBBINS LECTURE IN THE DEPARTMENT OF MEDICINE VISITING LECTURER

Established in 1995 by the Department of Medicine in honor of Frederick C. Robbins, M.D., dean emeritus of the School of Medicine, university professor emeritus, and Nobel Prize winner, this lecture features a distinguished visiting expert each year in the Department of Medicine.

THE HENRY Z. SABLE, M.D., PH.D., ENDOWMENT FUND

Established in 1997 by Mrs. Florence M. Sable in honor of her late husband, who was professor emeritus of biochemistry, this lecture advances the study of biochemistry via a visiting expert selected by the chairperson of the Department of Biochemistry.

THE ROY SCOTT LECTURE

Established by colleagues, students, family and friends in memory of the former head of the Department of Medicine of MetroHealth Medical Center, this lecture involves an annual two-day visit of a leading cardiologist, who presents the lecture and grand rounds to house officers and students of the School of Medicine.

THE ROBERT STERNLICHT VISITING LECTURERS IN PHARMACOLOGY AND CANCER BIOLOGY

Originally established in 1990 by friends and family and named the Robert Sternlicht Memorial Fund, these lectures feature distinguished experts whose presentations will advance the study of oncology at the School of Medicine. Lecturers are chosen by the chair of the Department of Pharmacology and the director of the comprehensive cancer center. Robert Sternlicht was the son of Himan Sternlicht, Ph.D., associate professor emeritus of pharmacology.
The Merton F. Utter Memorial Lecture

Established in 1981 in memory of the former professor of biochemistry and chair of the Department of Biochemistry, this lecture is delivered by a scientist of the highest caliber in a field related to those in which Dr. Utter was interested. Lecturers are chosen by the chair of the Department of Biochemistry.

The Austin S. Weisberger Lecture

Established in 1972 in the Department of Medicine, this lecture honors the memory of the man who, at the time of his death in 1970, was the John Huntington Hord Professor and chair of the Department of Medicine of the School of Medicine and University Hospitals of Cleveland.

The Harland G. Wood Endowment Fund in the Department of Biochemistry

Established in 1994 in memory of the late chair and professor of biochemistry and former provost of the university, this fund supports an annual Page-Wood symposium, co-sponsored by the School of Medicine and the Cleveland Clinic Foundation, featuring a leader in the field of biochemistry, an annual guest lecturer in biochemistry, and an annual guest lecturer selected by faculty with the rank of assistant professor in the Department of Biochemistry.

Publications

Below are listed some of the many publications produced in paper form by the Office of Public Affairs. Many of them are accessible via the Web, too; visit http://casemed.case.edu and click on “news and publications.” News articles about the School of Medicine also are accessible at this site.

Communiqué

Communiqué is the calendar of events for the School of Medicine. It is published monthly in paper form and also is updated continuously on the Web.

Medical Bulletin

The Medical Bulletin is a magazine for faculty, students, alumni, friends, and media. Published three times a year, the Medical Bulletin contains feature articles highlighting research and education, as well as additional areas of interest. Articles provide a glimpse into the people behind the programs. Alumni receive an additional insert, Alumni News, which features class notes and obituaries as well as other news of special interest to alumni. A stand-alone edition of Alumni News featuring reunion coverage is published once a year for alumni.

MedLines

MedLines, a newsletter for faculty, staff, students, alumni, friends and media of the School of Medicine, is published about six times a year. It highlights news about research, education, and the people at the medical school.

Focus

Focus is a biannual tabloid produced in conjunction with the medical school’s Office of Development and Alumni Relations. It provides the medical school with the chance to thank its generous individual and organizational donors and inform them, and potential donors, of additional giving opportunities. As of press time, Focus was not available online.

Admissions Brochure

The Office of Public Affairs also produces a publication for prospective medical students. The information also is available online by visiting http://casemed.case.edu and clicking on “admissions.”

Annual Report

The Office of Public Affairs also produces an annual report highlighting accomplishments in research and education at the School of Medicine. Often, it includes an “honor roll” of donors for the most recent fiscal year. As of press time, the annual report was not available online.

Admission to Medical School

Those interested in obtaining a degree other than the medical degree should contact the appropriate school within the university. See individual schools’ listings elsewhere in this publication for contact information.

There are three paths to a medical degree at Case Western Reserve University: the School of Medicine (University Program), the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (College Program), and the Medical Scientist Training Program (MSTP).

All inquiries about admission and application to the University Program should be addressed to:

Office of Admissions
School of Medicine
10900 Euclid Ave.
Cleveland, Ohio 44106-4920
Phone: (216) 368-3450
ellen.rosenblum@case.edu

All inquiries about admission and application to the College Program should be addressed to:

Offices for Medical Education
Cleveland Clinic Lerner College of Medicine of Case Western Reserve University
9500 Euclid Ave., NA24
Cleveland, Ohio 44195
Phone: (216) 445-7435 or (800) 745-7438
cc lcm@ccf.org

All inquiries about admission and application to the Medical Scientist Training Program should be addressed to:

MSTP Office
School of Medicine
Case Western Reserve University
10900 Euclid Ave.
Cleveland, Ohio 44106-4936
(216) 368-3404
clifford.harding@case.edu or donna.mcilwain@case.edu

The information below pertains to prospective medical students. For additional information, visit http://casemed.case.edu and click on “admissions.”
Getting Started

Students wishing to apply to the School of Medicine, including the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, must initiate the process on the Internet through the American Medical Colleges Application Service (AMCAS). To learn more about the AMCAS application process, visit http://www.aamc.org/students/amcas/start.htm. Those interested in the Medical Scientist Training Program will need to apply to the School of Graduate Studies in addition to the School of Medicine; for more information, see http://mstp.case.edu.

Admissions Process

Here’s how the admissions process works at the Case School of Medicine: After AMCAS receives an applicant’s electronic application, he or she receives an e-mail directing him or her to the Case School of Medicine online secondary (final) application. Applicants must complete this application as instructed. After the applicant has submitted the secondary application and all supporting materials, the appropriate admissions committee will review the information and decide whether to invite the applicant for an interview. After the interview, if granted, the committee will decide whether to extend an offer of admission. Applicants are notified of the committee’s decision no later than May 1.

Admissions Criteria

Although the Admissions Committee considers grades and the score on the Medical College Admission Test (MCAT) in the admissions process, high grades and a high score on the MCAT alone are not sufficient criteria for admission (the MCAT is mandatory, however). Just as important are qualities such as integrity, interpersonal skills and leadership ability.

Academic Requirements

Applicants must have a solid foundation in the sciences needed to understand modern biomedical information. At a minimum, applicants should possess the following knowledge:

- Biology. Applicants ordinarily satisfy this requirement if they’ve taken a one-year course in biology that stressed molecular and quantitative concepts. Courses in anatomy, taxonomy, botany, and ecology will not satisfy this requirement.
- Chemistry (through organic). Applicants normally meet this requirement if they’ve completed a one-year course in basic chemistry and a one-year course in organic chemistry. Other sequences, and courses that included organic/biologic chemistry content, are acceptable, too.
- Basic physics. Applicants generally satisfy this requirement if they’ve taken a one-year course in physics.
- Writing skills. Applicants typically meet this requirement if they’ve taken an introductory course in expository writing. The committee considers other courses that required extensive writing, however.
- Biochemistry. A course in biochemistry is required of all those applying to the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University and is highly recommended for those applying to the Case School of Medicine.

Those interested in the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University or Case’s Medical Scientist Training Program should gain experience in research before applying.

Applicants must have taken these prerequisites at an accredited, four-year, degree-granting American or Canadian college or university.

As an undergraduate, students should pursue a major in a subject of their own choosing; they should not structure their undergraduate experiences in an attempt to sway the medical school admissions committee. Research strongly indicates that the choice of a major has little bearing on ultimate acceptance into medical school. Most applicants to medical school, however, are chemistry or biological science majors.

Financial Aid

About 80 percent of the university’s medical students receive some financial aid based strictly on financial need. It’s impossible to provide precise figures on financial aid before each specific situation is completely analyzed, but here is a description of the general aspects of the process:

The School of Medicine adheres to the unit loan concept used by most private medical schools. Under this concept, if a student qualifies for financial aid, he or she is expected to obtain a specific portion of his or her support from outside sources such as a Stafford Loan, savings, and family. Once the student obtains this amount, the remaining aid would be provided through School of Medicine resources, up to the amount determined to be his or her reasonable need. The school’s contribution would be a combination of loan and scholarship, with the exact ratio determined by the student’s particular circumstances.

Programs such as the Medical Scientist Training Program, the M.D./Ph.D. in health services research program, and others offer financial support for participants. For more information, see other entries in this publication and contact the specific program.

Also, the medical school offers up to 17 merit scholarships annually to each class through its Dean’s Scholars program and David Satcher, M.D., Ph.D.-Rubens Pamies, M.D. Minority Student Scholarship program. These scholarships are $20,000 annually for up to four years for selected students. The school also offers up to four merit scholarships through the Alumni Scholars and Amici Scholars programs. These scholarships are $20,000 annually for up to four years for selected students. Application for the scholarships is by invitation of the admissions committee. Recipients are students with records of exceptional academic and personal achievement.

To Those Currently in College

The admissions committee gives preference to candidates who will have com-
pleted the requirements for a bachelor of arts or bachelor of science degree before entering medical school. Most accepted candidates rank in the top one-third of their classes, and a large proportion of them have outstanding scholastic records.

The committee’s main considerations are the overall quality of college performance and general ability and potential. In most instances, applicants are given priority if they have completed all minimum academic requirements and have taken the MCAT by the time they submit their AMCAS applications. Although no special emphasis is placed on the applicant’s major field of study, the committee strongly favors the concept of a broad, general college education.

The School of Medicine values a widely diverse student body.

To Students Who Have Been Out of College a Year or More

Those who have been out of college for a year or more are encouraged to apply. Approximately half of the students at the School of Medicine have a year or more between the time they graduate from college and the time they enter medical school, and about 10 percent of them begin medical school when they are 30 years old or older.

Those two or more years removed from full-time college course work should plan to take challenging, advanced-level (junior-, senior- or graduate-level) courses in the biological sciences to prepare for entry.

PROGRAMS LEADING TO M.D.

Today, applicants can choose from three paths to obtain a medical degree at Case Western Reserve University: the University Program, the new College Program (Cleveland Clinic Lerner College of Medicine of Case Western Reserve University), and the Medical Scientist Training Program. Students in all three programs:

• are introduced to clinical work and patients almost as soon as they arrive on campus.
• learn medicine using an integrated, organ system-based approach.
• are treated as junior colleagues by faculty members.
• are taught the science of medicine infused with the skills of communication and compassion.
• learn how to learn, a skill they will call on throughout their careers in the quickly changing field of medicine.

Overview of the University Program

The University Program curriculum always has reflected the latest in educational practices and medical knowledge. In the 1950s, the School of Medicine was the first to introduce the organ systems approach to teaching the basic sciences, and Case has made periodic adjustments to incorporate innovation and feedback from faculty and students. Today’s curriculum fully coordinates its contents within and between its basic science and clinical components using horizontal themes (such as how various organ systems work together) and vertical themes (such as genetics, growth and development, aging, and the impact of environmental factors on health).

Integrated electronic resources make the most of classroom time while improving opportunities for self-directed learning and capitalizing on the cutting-edge technology available at Case. The medical school was the first in the country to provide all of its students with laptop computers. Through their computers, students may access the entire syllabus as well as numerous medical software programs and other pertinent material.

Clinical experiences begin in the first semester, when each student starts following a pregnant woman or geriatric patient. The student continues to join the patient and family for doctor’s appointments for the duration of the first two years of medical school. In the basic science curriculum, lectures are supplemented by small group, case-based learning that provides opportunities for close interaction between faculty and students during the first two years, to discuss clinical topics important to their development as physicians.

A key component of the University Program is the unscheduled time on weekday afternoons. Many students use this time to pursue a joint degree, take electives, participate in interest groups, shadow a practicing physician, or become active in one or more student organizations.

Each student in the University Program is a member of one of the following advising societies: Emily Blackwell Society, Frederick Robbins Society, David Satcher Society, or Joseph Wearn Society. Each society is headed by an advising dean, who helps the students navigate the curriculum, advises them on residency and career planning, and writes their dean’s letters. The society deans hold regularly scheduled small group and individual meetings with the students. The society deans are all members of the faculty of the School of Medicine and participate actively in the educational programs of the school. Some aspects of the curriculum are coordinated through the societies.

Please see the “Curricular structures of Case M.D. programs” chart and “The four-year University Program in detail” section on subsequent pages of this publication for additional information.

Overview of the College Program

Expanding its role as a leader in innovative education, in 2002 Case Western Reserve University entered into a landmark agreement with the Cleveland Clinic Foundation to launch a new medical education and research program in 2004. The new Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (the College Program) enrolls 32 medical students each year in a unique program designed to prepare them for successful careers as physicians and researchers. This program is designed for students who seek a research career but do not wish to pursue a Ph.D. in a basic science discipline.

The College Program is a distinct, five-year M.D. program within the Case School of Medicine. Most of the teaching
The program is administered by the MSTP Steering Committee, which consists of faculty from both basic science and clinical departments. Its functions include selecting candidates for admission, designing and administering the program curriculum, advising students, and evaluating student progress.

Please see the “Curricular structures of Case M.D. programs” chart, “The Medical Scientist Training Program in detail” section, and the Medical Scientist Training Program (under Other Degree Programs) and Integrated Biological Sciences entries on subsequent pages of this publication for additional information.

Overview of the Medical Scientist Training Program (MSTP)

A combined M.D./Ph.D. program in biomedical sciences, the Medical Scientist Training Program (MSTP), is available for students desiring research careers in medicine and related biosciences. This program takes seven to eight years to complete, depending on the time needed to complete the Ph.D. dissertation research. Financial support includes a stipend and full tuition support.

Candidates must meet established prerequisites for admission to both the School of Medicine and the School of Graduate Studies. Criteria include demonstrated capabilities in research and superior undergraduate academic credentials. Applicants must have either U.S. citizenship or permanent residency status to be considered for admission to the MSTP. Descriptive materials and applications can be obtained by contacting the MSTP program.

The first two years of the MSTP are centered on the University Program pre-clinical core medical school curriculum, which occupies five mornings each week. Afternoons are available for graduate courses and/or research rotations, thus integrating the medical school and graduate school experiences. The next three to four years are devoted to completion of graduate courses and Ph.D. thesis research in one of the seventeen MSTP-affiliated graduate programs. During the Ph.D. phase, MSTP students can choose to participate in the MSTP Clinical Tutorial, a program designed to enhance clinical skills and allow students to develop connections between their research and clinical interests (this further addresses the goal of integrating medicine and science). After completion of the Ph.D. program, students return to medical school for two years to complete clinical clerkships and finish the M.D. curriculum.

The program is administered by the MSTP Steering Committee, which consists of faculty from both basic science and clinical departments. Its functions include selecting candidates for admission, designing and administering the program curriculum, advising students, and evaluating student progress.

Please see the “Curricular structures of Case M.D. programs” chart, “The Medical Scientist Training Program in detail” section, and the Medical Scientist Training Program (under Other Degree Programs) and Integrated Biological Sciences entries on subsequent pages of this publication for additional information.
The focus of the clinical rotations is to ensure a cohesive educational experience with interdisciplinary integration and reinforcement of basic science knowledge during clinical training.

Introduction to Clinical Medicine

The Introduction to Clinical Medicine (ICM) course spans years one and two. In year one, it includes interviewing skills, physical diagnosis, family clinic, and science of clinical practice seminars. In year two, one additional component is added, the Core Physician Development Program. The Interviewing Skills Program includes instruction and videotaped practice interviewing standardized patients. Physical Diagnosis covers all aspects of the physical examination, and students practice the exam under the observation of attending physicians with patients in the hospital. Students participate in clinical care of patients and their families in Family Clinic in the first two years of medical school.

University Program students meet with students in the College Program and the MSTP in weekly, small-group discussion sessions called Science of Clinical Practice Seminars to learn about leadership, clinical reasoning, health care systems and quality improvement, professionalism, and other topics that will be critical to their success in careers as physicians. Medical school faculty members and leaders from the community jointly facilitate these small-group sessions.

Students are graded “commendable,” “satisfactory,” “unsatisfactory,” or “incomplete” for their performance in ICM. Assessment for ICM is based on performance in small groups, skill in critical appraisal of the literature, take-home examination in bioethics, Journal Club examination, history-taking, performing physical examination, interviewing skills including relationship building, gathering and giving information, patient care skills, student-doctor professionalism skills, and clinical reasoning skills. All students must receive a satisfactory grade in ICM in year one to be promoted to year two and a satisfactory grade in ICM in year two to be promoted to year three.

THE FOUR-YEAR UNIVERSITY PROGRAM IN DETAIL

The goal of the four-year curriculum of the University Program is to provide students with a scholarly foundation in the basic and clinical sciences and a diversity of curricular options, allowing them to pursue areas of special interest while developing the ability to integrate science and humanistic values in the care of patients. The curriculum is composed of three interrelated components: the basic science curriculum in the first two years, the four-year clinical curriculum, and the four-year flexible (electives) program.

Basic Science Curriculum

The organ system-based interdisciplinary teaching in the two-year basic science curriculum establishes the scientific foundation necessary for students to engage in the clinical curriculum in years three and four. Normal anatomy and physiology of the body’s organ systems are taught in year one; in year two, each organ system is revisited from the standpoint of pathophysiology. This approach ensures mastery of normal structure and function before students are introduced to the abnormalities of disease and facilitates the use of clinical correlations in first- and second-year courses.

The basic science curriculum is organized around subject committees (integrated courses) representing major content areas in basic and clinical medical sciences. Each committee has a chair or co-chairs responsible for content, scheduling, syllabus preparation, and student assessment. Students are assessed in subject committees based on written and/or practical interim examinations (at the end of each committee) supplemented by quizzes, problem sets and/or other activities during committees. All interim examinations in years one and two are designed for students and faculty to determine whether the students are making appropriate progress in mastering the material. Students who score below a specific minimum (usually 65 percent) on an interim examination are identified and work with their society dean to determine what additional assistance they need to master the material in the basic science curriculum. At the end of year one, there is a comprehensive examination that includes questions drawn from course work in all committees in the basic science curriculum. All students are expected to pass the year one comprehensive examination to be promoted to year two. At the end of year two, students must take and pass the U.S. Medical Licensing Examination (USMLE) Step 1 to be promoted to year three.

Clinical Curriculum

The clinical curriculum extends throughout the four-year program and prepares students with the requisite skills, knowledge, and behaviors for providing supervised patient care. The Introduction to Clinical Medicine (ICM) program in years one and two focuses on the knowledge base that impacts on effective delivery of health care and the skills and professionalism necessary to become an effective physician. In years three and four, the core clinical rotations provide students with a comprehensive experience in the major disciplines of medicine in both ambulatory and inpatient settings.
Clinical Rotations

Clinical rotations during the third year are offered in all Case-affiliated hospitals in the Cleveland area: the Cleveland Clinic Foundation, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, MetroHealth Medical Center, and University Hospitals of Cleveland.

The primary goal for the clinical rotations is for the student to acquire the skills to solve clinical problems scientifically, humanistically, and to the objective benefit of the patient. The student learns by case study: the history, physical examination, and laboratory data underlie a systematic approach to evaluating patients and prescribing appropriate treatment. Another goal is the acquisition of medical and scientific knowledge to support an informed solution to patient problems. In addition, the student learns to care for patients as human beings in whom organic or psychologic illness may have a profound socioeconomic and emotional impact. Cooperation with all members of the health professions team is essential in the solution of broad patient problems. The clinical rotations emphasize a general approach to the case study method that will serve as a base for the special skills added in residency training. Teaching is enhanced by direct involvement of the clinical faculty and residents in the training programs in the affiliated hospitals.

Assessment of student performance during clinical rotations differs from the written examination format used in the basic science curriculum in years one and two. Students’ acquisition of information, application of knowledge, and development of clinical skills generally are assessed by faculty and house officers’ observation and questioning in the clinical setting. Oral and/or written examinations also are required on each clinical rotation.

An equally important component in evaluating clinical performance concerns behavioral characteristics of students as physicians-in-training. In particular, it is expected that students’ behavior reflect a high level of responsibility and commitment to their patients, an awareness of the necessity for some degree of personal sacrifice in caring for the ill, and a commitment to developing productive interpersonal relationships with their colleagues, which is necessary for working in the team setting characteristic of contemporary health care delivery. Excellence in fund of medical knowledge cannot compensate for behavioral characteristics detrimental to considerate and ethical human relationships.

Students are graded “honors,” “commendable,” “satisfactory,” “unsatisfactory,” or “incomplete” for their performance on clinical rotations.

The Contemporary Learning in Clinical Settings Program (CLICS)

In addition to participation in clinical rotations, all students participate in continuity learning groups during their third year of medical school. The mission of the continuity learning groups is to allow third-year medical students to process their clinical experiences in a non-judgmental setting and to explore topics in professionalism, ethics, and communication that are relevant to clinical practice. The principle supporting the CLICS program is the need of third-year students to reflect on their experiences in a structured way.

The program consists of small-group sessions designed to support personal growth, learner development, and basic content. Through participation in this required program, small groups of students led by faculty facilitators develop continuity relationships with each other and their group leaders, engage in self-reflection about the third year experience, identify and discuss strategies to maximize learning in diverse clinical settings, and acquire basic knowledge about specific topics related to their clinical experiences. Each continuity group consists of one or two faculty facilitators, a fourth-year student, and 10 third-year students. The topics, with readings and learning objectives, are not covered elsewhere in the third year and are explored from the vantage point of the students, using their real-life experiences, in an environment that supports personal growth and reflection. Participation in the CLICS group sessions is mandatory for all third-year students. No formal grades are given for this course.

Flexible Program

The Flexible Program is a major component of the University Program curriculum and offers electives for enrichment, research, and individualized study throughout the four years. The content of the Flexible Program is designed to complement the basic science and the clinical curricula, to extend them, and to promote integration across the usual disciplinary boundaries. Elective time enables students to engage in scholarly activities, work toward dual degrees, pursue an area of concentration, or take a broad range of electives based on their individual interests.

The Objectives of the Flexible Program:

1. Increase the student’s capacity for critical and analytical thinking in the medical sciences;
2. Provide opportunities for meaningful student involvement in scholarly activities, both independently and in consort with professional colleagues;
3. Allow students to pursue individual areas of concentrated study in depth and across traditional disciplinary boundaries;
4. Expose students to newer concepts, areas of controversy, issues of social relevance, and changing technology in medical science;
5. Increase students’ initiative, responsibility, and capacity in self-education in the medical sciences.

The Flexible Program has two pathways: areas of concentration and diversified medical sciences. All students are required to participate, and the minimum course requirement is the same for either pathway. Courses include electives offered by the medical school in years one and two (type A electives) and in years three and four (type B electives). Students also can pursue credit for graduate course and/or research.
Areas of concentration (AoCs) are offered to those students who wish to pursue a single area of study in depth. Scholarship of this type is of value for medical students and will establish patterns of study for physicians who must continue their own self-education throughout their lives. Additionally, the collegiality that results from faculty and students working together in areas of common interest adds much to the academic environment of this medical school. The student’s completion of an area of concentration is recognized by notation on the official transcript. Students achieving excellence in an area of concentration are awarded distinction in the area of concentration.

Students who do not choose an AoC participate in the diversified medical sciences pathway. This pathway is intended to appeal to those students whose interests have not been refined to the point where they feel comfortable in committing themselves to an in-depth pursuit of a single area of study.

Each student is required to complete satisfactorily 13 type A elective credits by the end of year two. Student performance in the type A electives is graded by individual instructors on a “satisfactory,” “unsatisfactory,” or “incomplete” basis. Satisfactory completion of seven to eight type B electives is required for graduation. Student performance in type B electives is graded on an “honors,” “commendable,” “satisfactory,” “unsatisfactory,” or “incomplete” basis.

**ASSESSMENT FOR PROMOTION AND GRADUATION**

The faculty of the School of Medicine is charged with assessing all aspects of student performance, including knowledge, skills, and personal characteristics that are pertinent to the development of a responsible, competent, and humane physician. This responsibility is delegated by the faculty to the Committee on Students, a standing committee of the faculty of medicine, with a majority of its members faculty-elected.

The Committee on Students reviews the performance of every medical student in the University Program during each of the four years, determines each student’s continuing status as a student in the school, and recommends candidates for graduation. The committee reviews a medical student’s total performance, which includes the usual indices such as formal grades and assessments, as well as the professional attitudes and behavior manifested by the student. Medical education entails the mastery of didactic, theoretical, and technical matters as well as the demonstration of appropriate professional and interpersonal behavior, sensitivity, sense of responsibility and ethics, and the ability to comport oneself suitably with patients, colleagues, and coworkers. To be eligible for promotion and graduation, students must complete the requirements and perform satisfactorily in all components of the curriculum. Medical students in the University Program are graded “satisfactory” or “identified for remediation” in the first two years and as “honors”/“commendable”/“satisfactory”/“unsatisfactory”/“incomplete” in the clerkships of the third and fourth years. There is no class ranking.

In addition, medical students must pass the U.S. Medical Licensing Examination (USMLE) Step 1 at the end of the second year to advance to the third year. Students also are required to take the USMLE Step 2 by Jan. 31 in the year they intend to graduate. To be eligible for graduation from the school, students must obtain at least the minimum passing score on this examination as established by the USMLE Composite Committee. In addition to passing the written USMLE Steps 1 and 2, students must sit for the USMLE Step 2 Clinical Skills Examination before graduation.

**THE FIVE-YEAR COLLEGE PROGRAM IN DETAIL**

The goal of the curriculum of the five-year Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (College Program) is to foster a passion for scientific inquiry and skills for critical thinking, coupled with broad-based clinical expertise, to optimally position the M.D. graduate to pursue a career as a physician-investigator. The College Program is unique in the United States in incorporating a research thread woven throughout the five-year curriculum, including two full summers focused on research training and experiences, and an additional full year to enable students to complete a substantive research thesis required for graduation. The educational program nurtures the students’ curiosity about science and medicine and provides them with clinical skills, a substantive research experience, and core skills and knowledge about research and research careers. The relatively small class size encourages discussion and collaboration among students and faculty. Students are immersed in a supportive, integrated, and richly diverse clinical and research environment, which provides each student with research and clinical knowledge and skills and a core professional network to build a strong foundation for a career as an expert clinician and researcher. The College Program holds promise of a new approach to increasing the number of M.D.s prepared to become physician-investigators.

**Basic Science Curriculum**

The College Program is based on a graduate education model, with active learning in teams and individually, while leaving significant time for independent study. The organ systems curriculum in the first two years uses problem-based learning (PBL), in which small groups of students work through clinical cases to identify basic science and other learning objectives and research the answers with the help of a faculty tutor. The PBL approach encourages teamwork and exploration and understanding of concepts. The PBL cases are complemented by interactive seminars, labs, and problem sets in which students further develop and hone their ability to define and analyze problems, formulate answerable questions, and search for and evaluate evidence.

Discipline-based learning objectives in cell biology and biochemistry, physiology,
pharmacology, anatomy, embryology, histology, pathology, oncology, and genetics are integrated as threads throughout the organ systems blocks. The goal is for students to integrate concepts in these core biomedical disciplines into their growing understanding of the function of the human body in health and disease.

Anatomy is case-based and taught using prosections, cross-sectional images, and interactive electronic curriculum. Electives are available for students who wish to pursue more-in-depth exposure to specific aspects of anatomy with dissection of cadavers.

Advanced basic science teaching is integrated into the clinical rotations in years three through five, with basic science "rounds" on clinical services, special basic science seminars for students, and required in-depth essays and reports on the basic science underlying problems they encounter in specific patients.

Clinical Curriculum

The Introduction to Clinical Medicine course in years one and two addresses the same core learning objectives as the ICM course for University Program students and includes interviewing skills and physical diagnosis, with patient care in the office of a longitudinal clinical preceptor for a half day every other week in year one and every week in year two. In year two, an additional half day per week is devoted to clinical experiences that relate directly to the organ systems courses or develop special clinical skills such as the pediatric history and physical exam or experience with acute care medicine. The objective is for students to develop clinical skills, integrate clinical activities with their basic science and research learning, and become proficient in the history and physical examination before beginning inpatient rotations. College students meet with students in the University Program and the MSTP in weekly Science of Clinical Practice Seminars, facilitated by medical school faculty and leaders from the community, to learn about leadership, clinical reasoning, health care systems and quality improvement, professionalism, and other topics.

Students then move into a flexible, three-year continuum of core and elective clinical rotations, with dedicated time to complete a required research project under the guidance of a three-faculty thesis committee. Required clinical rotations are the same as for students in the University Program and are offered at all Case-affiliated hospitals in the Cleveland area. Clinical rotations at the Cleveland Clinic have the same core learning objectives as those at other hospitals, with the addition of research and basic science threads incorporated into the clinical experiences. During their research time, students spend a half day per week in a clinical experience specifically related to their area of research, which is selected with the advice of their research and physician advisers.

Research Curriculum

The research curriculum begins in the summer of year one with small group discussions, journal clubs, and labs addressing basic and translational research methods coupled with hands-on experience with a research project in the lab of an established research preceptor. Students learn core principles of designing and interpreting research experiments, reading the research literature, presentation of research data in written and oral form, and the skills needed for productive interactions with all members of a basic science research team. The curriculum continues throughout years one and two, with research learning objectives emphasized during PBL cases and other activities in the basic science and clinical curriculum, and weekly Process of Discovery seminars in which investigators present and discuss their latest research findings.

The summer research curriculum in the year two focuses on clinical research, with an in-depth course on applied statistical and epidemiological methods, journal clubs focusing on reading the clinical research literature, and other interactive sessions in which students learn core principles of designing and analyzing clinical research projects, human subjects protection, and ethics of clinical research. Each student also participates in a clinical research project with an established clinical researcher and writes a clinical research proposal to address a question he or she developed during the summer.

By the end of year two, each student must select a research project and advisor for his or her thesis, which is to be completed during the last three years of the program. Students may choose to conduct their research with a basic or translational researcher or with a clinical researcher and may choose from a broad range of research opportunities at the Cleveland Clinic, Case, or other research facilities in Cleveland. Other opportunities, such as those offered by the Howard Hughes Medical Institute at the National Institutes of Health, also will be considered. Each student has a three-member thesis committee consisting of his or her advisor and two other faculty members, one of whom must be an expert in a related area of clinical research for students who engage in basic research or an expert in a related area of basic research for students in engage in clinical research. The goal is for each student to understand the spectrum of potential applications of his or her own research in the understanding of human health and disease.

Assessment for Promotion and Graduation Using Learning Portfolios

Each medical student in the College Program has a close advising relationship with a physician advisor, who works with a total of six to eight students throughout all five years of the curriculum. Students build a learning portfolio that demonstrates their mastery of the clinical, basic science and research objectives of the curriculum. The physician advisor reviews the student’s portfolio regularly, helps the student identify learning goals to address relative weaknesses or build on areas of relative strength, and assists with designing a final three-year clinical/research continuum and with career advising. Nine learning outcomes have been identified for the College Program, and
progressive levels of competency for each outcome are defined for each year of the curriculum. Ongoing assessments of competency for each outcome allow the faculty to determine students’ readiness for advancement in and graduation from the program. Assessment of College Program students is competency based; grades are not assigned for any component of the curriculum, and there is no class ranking system. The learning outcomes:

1. Research: Demonstrate knowledge base and critical thinking skills for basic and clinical research, skill sets required to conceptualize and conduct research and understand the ethical, legal, professional, and social issues required for responsible conduct of research.

2. Basic, clinical, and social sciences: Demonstrate and apply knowledge of human structure and function, pathophysiology, human development, and psychosocial concepts.

3. Communication: Demonstrate effective verbal, nonverbal, and written communication skills in a wide range of relevant activities in medicine and research.

4. Clinical skills: Perform appropriate history and physical examination in a variety of patient care encounters and demonstrate effective use of clinical procedures and laboratory tests.

5. Clinical reasoning: Diagnose, manage, and prevent common health problems of individuals, families, and communities. Interpret findings and formulate action plan to characterize the problem and reach a diagnosis.

6. Professionalism: Demonstrate knowledge and behavior that represents the highest standard of medical research and clinical practice, including compassion, humanism, and ethical and responsible actions at all times.

7. Personal development: Recognize and analyze personal needs (learning, self-care, etc.), and implement plan for personal growth.

8. Health care systems: Recognize and be able to work effectively in the various health care systems, to advocate and provide for quality patient care.

9. Reflective practice: Demonstrate habits of analyzing cognitive and affective experiences that result in identification of learning needs leading to integration and synthesis of new learning.

As students progress through the curriculum, the faculty for each course identifies expected competencies to be achieved for each learning outcome. These explicit competencies provide students with a standard by which to judge their progress. The portfolio approach requires students to take an active role in assessing and directing their own learning. Regular self-assessment of strengths and weaknesses for purposes of determining learning needs is essential to becoming a lifelong learner.

The portfolio will contain evidence of the students’ work to be used for both formative and summative assessments. Formative assessments, scheduled at regular intervals throughout each year, require students to provide written self-reflections on evidence of their progress, receive feedback from their physician advisers, and develop learning plans to progressively enhance their competencies. At the end of each year, students construct a portfolio for summative assessment and meet with members of an evaluation committee who will determine their readiness to proceed to the next year or graduate from the program. The evaluation committee serves in the same capacity as the Committee on Students for the University Program and presents reports on the progress of College Program students at end-of-year meetings of the Committee on Students.

The major objective of the portfolio system is for students to assume responsibility for monitoring and directing their learning progress by becoming skilled in self-assessment, reflection, and self-directed learning. This innovative approach also will provide them with documentation of their achievements in medical school that will be useful in their applications to residency programs.

In addition to satisfactory summative assessments of the learning portfolio each year, students in the College Program must pass the U.S. Medical Licensing Examination (USMLE) Step 1 at the end of the year two to advance to year three. Students are also required to take the USMLE Step 2 by Jan. 31 in the year they intend to graduate. To be eligible for graduation from the school, students must obtain at least the minimum passing score on this examination as established by the USMLE Composite Committee. In addition to passing the written USMLE Steps 1 and 2, students must sit for the USMLE Step 2 Clinical Skills Examination before graduation.

THE MEDICAL SCIENTIST TRAINING PROGRAM IN DETAIL

General Description

The Case Medical Scientist Training Program (MSTP) provides training for future physician-scientists by combining well-developed curricula for training in science and medicine. Medical school and graduate school components are combined in a manner designed to optimize dual-degree training. Unique aspects of the program include the integration of graduate school and medical school in many phases of the program and a high degree of student involvement in running the program.

The MSTP includes three major phases of training.

First phase: During the first two years, each student completes the first two years of the University Program medical school curriculum, including early clinical experiences, completes at least three research rotations, takes graduate courses, and chooses his or her Ph.D. graduate program and thesis lab. During the summers before the first two years of medical school, students complete research rotations. During the fall and spring semesters of years one and two, students generally take a graduate course or complete a research rotation.
Second phase: During the Ph.D. thesis phase, students complete all requirements of their Ph.D. thesis program. They also can participate in the MSTP Clinical Tutorial.

Third phase: The final phase is the return to years three and four of the University Program medical school curriculum. The focus is clinical training, but research electives can be taken for part of year four.

Although each of these three phases has a different focus, opportunities exist for students to pursue both research and clinical training in each phase. The philosophy of the Case MSTP is to integrate medicine and science throughout the program as much as possible.

The Case MSTP is run by faculty, students and staff. The MSTP Council is a body of students that plans and runs certain aspects of the program. The program manager and program assistant have many important roles and run the day-to-day management of the program. They are often the first people students contact for advice or help. The associate director is involved in decisions at all levels of the program and is the primary advisor for students in the first two years of the program. The director is responsible for all aspects of the program and is available to students for advice at any stage. The MSTP Steering Committee makes decisions on MSTP policy, planning, student admissions, approval of mentors, and evaluation of students.

Incoming MSTP students are expected to enter the program on July 1 so they can complete a research rotation before the beginning of the first year of medical school. The MSTP summer retreat, usually held in July, provides an important orientation to the program and includes sessions and workshops for program and professional development.

Advising System
The MSTP associate director advises students in the first two years on research rotations and course work. Students may also meet with an MSTP Steering Committee member representing an area of research interest or with the MSTP director. During the Ph.D. training period, mentoring is provided by the thesis advisor and thesis committee, which includes a member of the MSTP Steering Committee and a member with an M.D. MSTP students are full members of the medical school class and enter one of the four advising societies for the University Program when they matriculate in the program. In addition, the MSTP provides clinical advisers to help MSTP students with issues concerning the clinical curriculum.

Classes and Research Rotations in Years One and Two
During years one and two of the University Program, MSTP students register for 11 credit hours of graduate course work for each semester dedicated to the medical school core curriculum and clinical care.

Fall semester, year 1: IBIS courses 401 and 411
Spring semester, year 1: IBIS courses 402 and 412
Fall semester, year 2: IBIS courses 403 and 413
Spring semester, year 2: IBIS courses 404 and 414

IBIS 401, 402, 403 and 404 courses (Integrated Biological Sciences I-IV) are nine credits each. IBIS 411, 412, 413, 414 courses (Clinical Science I-IV) are two credits each. In contrast to their fellow medical students, MSTP students are graded during years one and two of the medical school curriculum for these graduate courses, which provide graduate school credit for the medical school curriculum. These grades are for graduate school purposes and do not affect standing in the medical school.

Additional credits are added for other graduate-level courses as selected by the student. Students generally take one graduate school course per semester. Graduate courses are scheduled in the afternoon to avoid conflict with the medical school basic science curriculum. MSTP students substitute graduate school courses for the Flexible Program electives taken by other medical students in the afternoons. For their research rotation requirement, MSTP students will be registered for MSTP 400 during the summer terms before each of the first two years of medical school. Students also may complete a research rotation instead of a graduate school course during the fall or spring semester.

The Ph.D. Phase
After completion of the second year of medical school, each student chooses a Ph.D. thesis mentor, joins a specific Ph.D. program, and completes any remaining graduate school course work and other requirements for the Ph.D. degree. The following graduate programs are affiliated with the MSTP:
- Biochemistry
- Biology
- Biomedical Engineering
- Biomedical Engineering/Physician Engineer Training Program (PETP)
- Cell Biology
- Chemistry
- Developmental Biology
- Genetic and Molecular Epidemiology
- Genetics: Molecular, Developmental and Human Genetics
- Molecular Biology
- Molecular Virology
- Molecular and Cellular Basis of Disease (Pathology and Immunology)
- Neurosciences
- Neurosciences and Bio-engineering
- Nutritional Sciences
- Pharmacological Sciences
- Physiology and Biophysics

All MSTP students are required to take a one-week ethics course (IBMS 500 - Being a Professional Scientist - 0 credits) during the spring semester of their third year in the program (first year of Ph.D. research).

Clinical Tutorial, clinical refresher course and years three and four of medical school
During the Ph.D. thesis phase, MSTP students are encouraged to take the optional MSTP Clinical Tutorial, which provides a unique longitudinal part-time clinical experience. The MSTP Clinical Tutorial is a year-long course that
enhances clinical skills for the return to year three of medical school. It also serves a special career development objective by allowing students to balance medical and scientific interests and explore the connections between these areas. The MSTP Clinical Tutorial, offered during the Ph.D. phase, is an example of the integration of science and medicine in the Case MSTP. An alternative approach to enhancement of clinical skills is the new MSTP Clinical Refresher course, which is taken before the start of year three. After completion of the Ph.D., MSTP students are enrolled in medical school to complete the requirements for the M.D. (see description provided for the University Program).

MSTP Activities
The MSTP supports several activities that enhance the scientific and professional development of students. These activities also foster a vibrant and collegial MSTP community with a strong sense of mission in the training of physician scientists.

MSTP Student Council: The MSTP Student Council is a student group that meets once a month to discuss new issues and the progress of the on-going student committees. Its goals are to identify objectives for the program, to allow students to initiate programs to enhance the MSTP, to encourage increased student involvement in the operation of the MSTP, and to enhance development of leadership skills of MSTP students. The president, vice president, and secretary all are elected for a one-year period. Committees are organized around topics such as the summer retreat planning committee, the monthly Wednesday evening dinner meeting series, the student-invited faculty program, the program newsletter, and the Web site.

The students run all these activities with logistical and financial support from the MSTP office and advice from the MSTP director. All students are welcome and encouraged to participate in the various committees and to attend the student council meetings.

Summer retreat: The annual MSTP summer retreat is a two-day event focusing on professional development and program planning for the upcoming academic year. Winter retreat: This retreat occurs in January or February. All students, mentors, and Steering Committee members are invited. Students in their research years present their thesis work (completed or in progress) through a brief oral or poster presentation.

Monthly dinner program: The MSTP sponsors a monthly dinner program. The series is organized by students and is attended by students, Steering Committee members, and research mentors. Invited speakers (students, faculty, alumni and outside speakers) address issues pertinent to research, professional development or other topics of interest. The informal environment at these gatherings promotes social and professional interactions.

Scientific meetings: The program strongly encourages students to present their research at national or international meetings. MSTP travel support policy provides up to $500 per year for meeting expenses to MSTP students who make a research presentation (talk or poster) of work done in the Case MSTP at an appropriate national or international scientific meeting. The student’s mentor generally will obtain funding for expenses in excess of these limits. In addition to the general meeting support for all students, each year two students are offered the opportunity to attend the annual M.D./Ph.D. national student conference in Colorado, with all expenses paid by the MSTP.

Research symposia: MSTP students are encouraged to present their research at Case student symposia, including the annual graduate student symposium and the Irwin H. Lepow Student Research Day. These symposia feature a nationally recognized keynote speaker, and students have the opportunity to interact extensively with the noted scientist. A committee awards prizes for outstanding student presentations.

Assessment of MSTP Students
Students in the MSTP are assessed for the medical school component of the program in the same manner as students in the University Program, with the exception that grades are awarded for those courses in the M.D. curriculum in years one and two that receive graduate school credit and are used to satisfy requirements for the Ph.D. degree. Students must satisfactorily complete all requirements for promotion and graduation for the M.D. and the Ph.D. to receive both degrees.

EXPECTATIONS FOR PERSONAL AND PROFESSIONAL CHARACTERISTICS
Students are evaluated on knowledge base, clinical skills, and professional behavior and attitudes. The following characteristics are evaluated throughout the medical curriculum, and students are expected to adhere to these standards in both their academic and personal pursuits:

Interpersonal relationships: Provides supportive, educational, and empathetic interactions with patients and families and is able to interact effectively with “difficult” patients. Demonstrates respect for and complements roles of other professionals and is cooperative, easy to work with, commanding respect of the health care team.

Initiative: Independently identifies tasks to be performed and makes sure that tasks are completed. Performs duties promptly and efficiently and is willing to spend additional time, assume new responsibilities, and able to recognize the need for help and ask for guidance when appropriate.

Dependability: Completes tasks promptly and well. Present on time and actively participates in clinical and didactic activities. Always follows through and is exceptionally reliable.


Integrity and honesty: Demonstrates integrity. Is honest in professional encounters. Adheres to professional ethical standards.
Tolerance: Demonstrates exceptional ability to accept people and situations. Acknowledges her or his biases and does not allow them to affect patient care.

Function under stress: Consistently maintains professional composure and exhibits good clinical judgment in stressful situations.

Appearance: Always displays an appropriate professional appearance. Is always well-groomed.

EDUCATIONAL AUTHORITY

Governance of the educational programs leading to medical degree resides in the Faculty of Medicine. Each class of students selects representatives who become voting members of the Faculty of Medicine. The faculty of the School of Medicine is responsible for the content, implementation, and evaluation of the curriculum. The dean of the School of Medicine serves as its chief academic officer with overall responsibility to the university for the entire academic program. The vice dean for education and academic affairs carries the dean’s academic and administrative authority and has direct supervisory responsibility over the units that lead and support the curriculum.

The faculty's Committee on Medical Education (CME) evaluates, reviews, and makes recommendations concerning the major units of the medical education program. Acting for the faculty, the Committee on Medical Education evaluates the achievement and outcomes of curricular objectives and reviews the curriculum as a whole. The faculty elects the majority of the members of the Committee on Medical Education; student representatives also serve on this committee and its various subcommittees.

Three curriculum councils are responsible for the University Program, and one curriculum council is responsible for the College Program; all four councils report to the CME. These councils are responsible for the strategic planning, content, design, selection of teaching leadership, and oversight of the curriculum, student assessment and program evaluation.

GRADUATION

A medical student who has satisfactorily completed all the required work in the School of Medicine program in which he or she is enrolled may be granted the degree of doctor of medicine (M.D.) by Case Western Reserve University, provided that:

1) He or she has been registered at Case Western Reserve University School of Medicine for at least four academic years or has transferred to the University Program after two years at another accredited medical school.

2) The Committee on Students of the University Program or the evaluation committee at the College Program approves his or her record of performance, and the faculty recommends him or her to the trustees for graduation.

3) He or she has discharged all financial obligations to the university and to the program in which he or she is enrolled.

4) He or she has taken the U.S. Medical Licensing Examination (USMLE) Steps 1 and 2 and has obtained a minimum passing score on the examinations as determined by the USMLE Composite Committee and has taken the USMLE Step 2 Clinical Skills Examination.

The requirements for graduation of any class may be altered by action of the faculty of the School of Medicine.

LICENSURE

Licensure to practice medicine in the United States and its territories is a privilege granted by the individual licensing boards of the states and territories. Each licensing board of the individual jurisdictions establishes its policies, eligibility, and requirements for the practice of medicine within its boundaries pursuant to statutory and regulatory provisions. The degree of doctor of medicine awarded by Case Western Reserve University is an academic degree and does not provide a legal basis for the practice of medicine.

THE ELECTRONIC CURRICULUM

The School of Medicine has developed an integrated electronic curriculum for all four years of the medical curriculum that contains a list of learning objectives as well as the resources that allow the students to achieve the objectives. These resources include references to traditional textbooks and journal articles, original textual material, PowerPoint files, illustrations, animations, videos, audio files, and links to Internet-based learning resources (including original journal articles in electronic format). These resources are made available on the Internet by an NT/Internet server system.

An electronic testing system (using an SQL server) has been developed to administer examinations (containing multimedia features such as color illustrations, animations, audio files, video clips, etc.) on the student desktop computers over CWRUnet, automatic grading of the examinations, and e-mail feedback to the students that includes the test score, a short descriptive phrase that describes the concepts that the student did not answer questions on correctly, and links to the places in the electronic curriculum where these concepts are introduced and explained.

Students have access to the Internet and the electronic curriculum from their assigned personal desks via fiber optic Ethernet connection to CWRUnet and via wireless access when away from their desks. When off campus, access is through a modem connection.

THE PRIMARY CARE TRACK (PCT)

School of Medicine
Room E-414
Program Coordinator: Pamela B. Glover, M.Ed.
Phone (216) 368-5966
Web site: http://casemed.case.edu/dept/pct

Case launched the Primary Care Track (PCT) in 1994 as part of the Robert Wood Johnson Foundation’s Generalist...
Physician Initiative. The PCT continues to afford medical students increased opportunities to explore careers in primary care. The focus is on general pediatrics, general internal medicine, and family medicine, but the program provides a strong foundation for students regardless of what medical discipline they eventually pursue.

Students in this program have several advantages beginning in the first year of medical school:

- access to innovative educational strategies, such as a pilot program in early physical diagnosis that was subsequently implemented for the entire class;
- increased clinical experiences in the second and third years, through the Clinical Care Preceptorship (CPCP), which enables students to establish longitudinal relationships with primary care practitioners in their practices;
- support for the CPCP through an exciting online curriculum that ensures a common baseline of knowledge and skills for students at a wide variety of teaching sites;
- a home-based site for third-year clerkships in internal medicine, family medicine and pediatrics at MetroHealth Medical Center or University Hospitals of Cleveland/Louis Stokes Cleveland Department of Veterans Affairs Medical Center;
- small-group activities in the third year organized around primary care topics that take advantage of educational strategies such as problem-based learning;
- experience developing, conducting, and presenting research studies through a health promotion/disease prevention project during the summer between the first and second year and a focused health policy project during the fourth year;
- association with a primary care faculty advisor throughout medical school.

The PCT’s influence continues into the residency programs at the affiliated teaching sites and into the community, with a number of PCT alumni now in practice serving as preceptors for their junior colleagues.

OTHER DEGREE PROGRAMS

The degree programs listed in this section may require admission to another school at the university in addition to or instead of the School of Medicine. Each school may have different deadlines and requirements for admissions. Please contact the other schools separately using information provided under that school’s listing in this publication. Please see departmental listings in this section of the General Bulletin for information about additional degree programs offered through the medical school’s departments.

Clinical Research Scholars Program (CRSP)

A program leading to a master of science in clinical research degree, the Clinical Research Scholars Program (CRSP) aims to develop a new generation of clinical investigators in leadership roles in academia and industry.

The program resides in the Center for Academic Clinical Research in the Division of General Medical Sciences of the School of Medicine. Students are individuals who have completed their clinical training and want to develop a professional career based on clinical investigation. A prerequisite for consideration for admission is a degree in medicine, dentistry, nursing, or an allied science such as pharmacy or biomedical engineering, along with postgraduate training in health care provision or similar clinical applications of each applicant’s basic discipline.

The CRSP consists of formal didactic course work, a longitudinal seminar series, and an intensive mentored experience centered on a specific clinical research problem. The curriculum makes use of existing didactic material offered throughout Case’s medical, nursing, and dental schools as well as offerings specifically designed for CRSP students.

The program has a two-year curriculum requiring 36 credit hours. A total of 15 hours are accumulated in five required courses common to all fields of clinical investigation. Specialty tracks provide maximum flexibility and can be adapted to meet a wide array of clinical research career goals. Completion of a formal thesis is required for the awarding of the master of science in clinical research degree.

Some financial support may be available based on merit and need.

For more information, see http://casemed.case.edu/CRSP/ or contact Carol Tolin, Program Coordinator, Case Clinical Research Scholars Program, c/o MetroHealth Medical Center - Bell Greve 3-45, 2500 MetroHealth Dr., Cleveland, Ohio 44106-1998; e-mail: ctolin@metrohealth.org

Clinical Research Scholars Program (CRSP)

Graduate Courses

CRSP 401. Introduction to Clinical Research Summer Series (1–3)

This course is designed to familiarize one with the language and concepts of clinical investigation and statistical computing, as well as provide opportunities for problem-solving, and practical application of the information derived from the lectures. The material is organized along the internal logic of the research process, beginning with mechanisms of choosing a research question and moving into the information needed to design the protocol, implement it, analyze the findings, and draw and disseminate the conclusions(s). Prereq: M.D., R.N., D.D.S., health professionals.

CRSP 402. Study Design and Epidemiologic Methods (3)

This course will cover the methods used in the conduct of epidemiologic and health services research and considers how epidemiologic studies may be designed to maximize etiologic inferences. Topics include: measures of disease frequency, measures of effect, cross-sectional studies, case-control studies, cohort studies, randomized controlled trials, confounding, bias, effect modification, and select topics. Prereq: CRSP 401 or permission of instructor.

CRSP 403. Biostatistics for Clinical Research (3)

We introduce biostatistical methods for clinical investigators involved in patient-oriented, translational, epidemiologic, health services and public health research. We anticipate that students will be involved in designing and interpreting their own studies, but also in critically evaluating the work of others. The course thus emphasizes the statistical process: how to conduct studies, what the results mean, and what can be inferred about the whole from pieces of information. The focus is on understanding and describing relationships between phenomena and measuring how well these relationships fit data. A project involves problem-solving, and statistical computing, as well as provide opportunities for problem-solving, and practical application of the information derived from the lectures. The material is organized along the internal logic of the research process, beginning with mechanisms of choosing a research question and moving into the information needed to design the protocol, implement it, analyze the findings, and draw and disseminate the conclusions(s). Prereq: M.D., R.N., D.D.S., health professionals.

CRSP 402. Study Design and Epidemiologic Methods (3)

This course will cover the methods used in the conduct of epidemiologic and health services research and considers how epidemiologic studies may be designed to maximize etiologic inferences. Topics include: measures of disease frequency, measures of effect, cross-sectional studies, case-control studies, cohort studies, randomized controlled trials, confounding, bias, effect modification, and select topics. Prereq: CRSP 401 or permission of instructor.

CRSP 403. Biostatistics for Clinical Research (3)

We introduce biostatistical methods for clinical investigators involved in patient-oriented, translational, epidemiologic, health services and public health research. We anticipate that students will be involved in designing and interpreting their own studies, but also in critically evaluating the work of others. The course thus emphasizes the statistical process: how to conduct studies, what the results mean, and what can be inferred about the whole from pieces of information. The focus is on understanding and describing relationships between phenomena and measuring how well these relationships fit data. A project involves problem-solving, and statistical computing, as well as provide opportunities for problem-solving, and practical application of the information derived from the lectures. The material is organized along the internal logic of the research process, beginning with mechanisms of choosing a research question and moving into the information needed to design the protocol, implement it, analyze the findings, and draw and disseminate the conclusions(s). Prereq: M.D., R.N., D.D.S., health professionals.

CRSP 402. Study Design and Epidemiologic Methods (3)

This course will cover the methods used in the conduct of epidemiologic and health services research and considers how epidemiologic studies may be designed to maximize etiologic inferences. Topics include: measures of disease frequency, measures of effect, cross-sectional studies, case-control studies, cohort studies, randomized controlled trials, confounding, bias, effect modification, and select topics. Prereq: CRSP 401 or permission of instructor.

CRSP 403. Biostatistics for Clinical Research (3)

We introduce biostatistical methods for clinical investigators involved in patient-oriented, translational, epidemiologic, health services and public health research. We anticipate that students will be involved in designing and interpreting their own studies, but also in critically evaluating the work of others. The course thus emphasizes the statistical process: how to conduct studies, what the results mean, and what can be inferred about the whole from pieces of information. The focus is on understanding and describing relationships between phenomena and measuring how well these relationships fit data. A project involves problem-solving, and statistical computing, as well as provide opportunities for problem-solving, and practical application of the information derived from the lectures. The material is organized along the internal logic of the research process, beginning with mechanisms of choosing a research question and moving into the information needed to design the protocol, implement it, analyze the findings, and draw and disseminate the conclusions(s). Prereq: M.D., R.N., D.D.S., health professionals.

CRSP 402. Study Design and Epidemiologic Methods (3)

This course will cover the methods used in the conduct of epidemiologic and health services research and considers how epidemiologic studies may be designed to maximize etiologic inferences. Topics include: measures of disease frequency, measures of effect, cross-sectional studies, case-control studies, cohort studies, randomized controlled trials, confounding, bias, effect modification, and select topics. Prereq: CRSP 401 or permission of instructor.

CRSP 403. Biostatistics for Clinical Research (3)

We introduce biostatistical methods for clinical investigators involved in patient-oriented, translational, epidemiologic, health services and public health research. We anticipate that students will be involved in designing and interpreting their own studies, but also in critically evaluating the work of others. The course thus emphasizes the statistical process: how to conduct studies, what the results mean, and what can be inferred about the whole from pieces of information. The focus is on understanding and describing relationships between phenomena and measuring how well these relationships fit data.
specification, data collection, management, analysis, and presentation. Students will use statistical software extensively and will be exposed to multiple packages. Topics include descriptive statistics, exploratory data analysis, the fundamentals of probability, sampling, inferential statistics, power and sample size, experimental design, correlation, regression, and association. Prereq: EPBI 431.

CRSP 407. Logistic Regression and Survival Analysis (3)
This course introduces two commonly used statistical modeling techniques found in the medical, epidemiologic, and public health research fields; logistic regression and survival analysis. The course emphasizes summarizing and analyzing binary and time-to-event outcomes. The focus is on establishing a foundation for when and how to use these modeling techniques as well as an understanding of interpreting results from analyses. Two course projects will involve problem specification, data collection, analysis, and presentation. Students will use statistical software extensively and will be exposed to output from SAS. Planned topics include contingency tables, logistic regression models and diagnostic measure, analyzing ordinal outcomes, estimating of the survival curve, Cox proportional hazard regression models and diagnostic measures, and sample size estimation. Prereq: EPBI 431 or consent of department.

CRSP 500. Observational Studies (3)
An observation study is an empirical investigation of treatments, policies or exposures and the effects that they cause, but it differs from an experiment because the investigator cannot control treatment assignment. We introduce design, data collection and analysis methods appropriate for clinical investigators, preparing students to design and interpret their own studies, and those of others in their field. Technical formalities will be minimized, and the presentations will focus on the practical application of methodologies and strategies. A course project involves the completion of an observational study, and substantial use of statistical software. Topics include randomized experiments and how they differ from observational studies, planning and design for observational studies, adjustments for overt bias, sensitivity analysis, methods for detecting hidden bias, and propensity methods for selection bias adjustment, including multivariate matching, stratification and regression adjustments. Prereq: EPBI 432, EPBI 441, or consent of instructor.

CRSP 515. Large Database Management and Analysis (3)
This course is designed to introduce the student to the use of large datasets for clinical, health services, and health policy research. The student will be introduced to representative types of available data including administrative and vital statistics files, national survey data collected for research, and local data of a registry nature. The student will learn to prepare analytic data for statistical analysis using SAS and STATA. The course will emphasize the strengths and the limitations of conducting research using secondary data, as well as the legal issues that surround access to such data. Session topics will include accurate and confidential movement of data, data formatting, use of hierarchical data, management of weighted data, transformation, merging, cleaning of data, and the management of missing data. Laboratory sessions will allow hands-on experience with the techniques presented in the course. Prereq: EPBI 431, CRSP 401 or consent of instructor.

CRSP 651. Clinical Research Scholars Thesis (1-18)
CRSP Thesis M.S. Prereq: Permission of program faculty.

Master of Public Health (M.P.H.)
The master of public health program prepares students to enhance health in human populations through organized community effort. Graduates are qualified to work in local and state health departments, universities and colleges, hospitals, ambulatory medical centers, non-profit organizations, and the insurance and pharmaceutical industries.

The program seeks to attract a rich mix of students, including those pursuing degrees in medicine, nursing, dentistry, law, social work, bioethics, management and other fields, as well as students holding undergraduate degrees.

The program has tracks in adolescent health (the first in the country), health services research, urban health, health care policy and administration, health promotion/disease prevention, genetic epidemiology, queer health, international health, biostatistics, and epidemiology. The 36-hour program can be completed in two years. Students earn 15 credit hours through five required courses representing the fundamentals of public health: biostatistics, epidemiology, environmental health sciences, health services administration, and social and behavioral sciences. Also, students receive a total of nine credit hours for three courses in an area of concentration of their choice (see aforementioned list), three credit hours for an elective course, and nine credit hours from a one-semester public health field practicum. In the practicum, students develop and work on a project that brings their new public health knowledge and skills to the community.

The M.P.H. program recently has introduced several new dual degree programs. Each program combines a master of public health degree with one of the following degrees: master of science in nursing degree, medical degree, master of business administration degree, juris doctorate degree, or master of arts/Ph.D. in anthropology. Additional dual degree programs are being developed the bioethics department and the schools of dental medicine and social work.

Initial admission is through the University's School of Graduate Studies. For more information, call (216) 368-3725, e-mail virginia.morrison@case.edu, or visit http://epbiwww.case.edu/mpfh.html on the Web.

Master of Public Health (MPHP) 
Graduate Courses

MPHP 313. Peer Health (3)
Through interactive learning, students will work with peers, peer mentors, physicians, and community health professionals on a broad range of health advocacy projects, using diverse theoretical and strategic approaches, including creative arts and media projects and peer teaching. As individual health consumers, students will focus on their own personal development, acquiring knowledge and enhancing skills necessary to adopt, practice, and maintain healthy behaviors. As health activists, students will learn effective advocacy tools, leadership skills, and communication techniques.

MPHP 405. Statistical Methods in Public Health (3)
This one-semester survey course for public health students is intended to provide the fundamental concepts and methods of biostatistics as applied predominantly to public health problems. The emphasis is on interpretation and concepts rather than calculations. Topics include descriptive statistics; vital statistics; sampling, estimation and significance testing; sample size and power; correlation and regression; spatial and temporal trends; small area analysis; statistical issues in policy development. Examples of statistical methods will be drawn from public health practice. Use of computer statistical packages will be introduced.

MPHP 408. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

MPHP 411. Introduction to Behavioral Medicine (3)
Using a biopsychosocial perspective, an overview of the measurement and modeling of behavioral, social, psychological, and environmental factors related to disease prevention, disease management, and health promotion is provided. Cross-listed as EPBI 411.

MPHP 413. Peer Health (3)
(See MPHP 313.)

(See NURS 318.) Prereq: Graduate status or permission of instructor. Cross-listed as NURS 418.

MPHP 421. Health Economics and Strategy (3)
(See ECON 421.) Cross-listed as ECON 421 and HSMC 421.

MPHP 424. Innovations, Markets, and Organization in Pharmaceutical Industry (3)
(See ECON 424.) Cross-listed as ECON 424.

MPHP 425. Community Health Advocacy (3)
The objective of this course is to acquaint students with basic theoretical and practical aspects of community health advocacy (including foundations, needs assessment, post assessment and priority setting, ethical
issues, and approaches and strategies) and to explore the roles that they can play as health professionals. The course will be taught using an intensive weekend format.

**MPHP 429. Introduction to Environmental and Occupational Health (3)**

This course is designed to provide an overview of both environmental and occupational health. Students will be introduced to the basics of toxicology and exposure assessment. Topics considered will range from local to global. Socioeconomic, political and public health implications of environmental and occupational issues will be discussed. Students completing the course should be able to recognize environmental and occupational problems, access resources in these fields, and understand control and preventive measures. Core requirement for M.P.H. Degree.

**MPHP 431. Statistical Methods I (3)**

(See EPBI 431.) Cross-listed as EPBI 431.

**MPHP 432. Statistical Methods II (3)**

(See EPBI 432.) Prereq: MPHP 431. Cross-listed as BIOL 432 and EPBI 432.

**MPHP 433. Community Interventions and Program Evaluation (3)**

(See EPBI 433.) Cross-listed as EPBI 433.


This course will include a description of the health care system, an understanding of population based health care, concept and methods of health management, current issues in health policy and the application of these concepts using case studies. Topics will include the role of the manager, organizational design and control, professionals in organizations, adaptation and accountability. This is a required course in the M.P.H. degree. Grades will be based on class participation and a paper.

**MPHP 442. Biostatistics II (3)**

(See EPBI 442.) Prereq: MPHP 432. Cross-listed as EPBI 442.

**MPHP 444. Law, Sexuality, and Public Health (3)**

This course provides an overview of numerous issues that arise at the intersection of public health, sexuality, and the law. In the context of public health, these issues include the prevention of infectious disease transmission, the prevention of violence, and the protection of the public health. Legal issues include those related to individuals’ right to privacy, child custody, child abuse and neglect, and protection of the public.

**MPHP 445. Current Issues in Queer Health (LG-BTQI Health) (3)**

The course is devoted to an examination of health status and health care access among gay, lesbian, bisexual, and transgender/transsexual individuals in urban settings. The objective of this course is to acquaint student with current issues in LGBT (lesbian, gay, bisexual, and transgender) health, public health law, HIV/AIDS in the U.S., intentional injury, and environmental health and environmental justice.

**MPHP 450. Clinical Trials and Intervention Studies (3)**

(See EPBI 450.) Cross-listed as EPBI 450.

**MPHP 451. Principles of Genetic Epidemiology (3)**

(See EPBI 451.) Cross-listed as EPBI 451.

**MPHP 456. Health Policy and Management Decisions (3)**

(See HSMC 456.) Cross-listed as HSMC 456.

**MPHP 458. Statistical Methods for Clinical Trials (3)**

(See EPBI 458.) Cross-listed as EPBI 458.

**MPHP 460. Health Research Methods I (3)**

This is a course in research methods focusing on practical issues in the conduct of health services research studies. Topics include: an overview of health services research; ethics in health services research; proposal writing and funding; the relationship between theory and research; formulating research questions; specifying study design and study objectives; conceptualizing and defining variables; validity and reliability of measures; scale construction; operationalizing health research relevant variables using observation, self and other report, and secondary analysis; formatting questionnaires; developing analysis plans; choosing data collection methods; sampling techniques and sample size; carrying out studies; preparing data for analysis; and reporting of findings. Cross-listed as EPBI 460.

**MPHP 463. Survey Design and Data Collection in Health Research (3)**

This course takes an in-depth look at survey/questionnaire design and issues related to collecting and using survey data. Specifically, the course focuses on four major areas: (a) survey design; (b) developing and writing survey questions; (c) assessing reliability and validity; and, (d) scale development and psychometric exploration (factor analyses). Students receive practical experience at writing survey questions, as well as analyzing survey data using existing databases. Basic statistical background is required for this course. Prereq: EPBI 431. Cross-listed as EPBI 463.

**MPHP 466. Economics in Health Services (3)**

(See EPBI 466.) Cross-listed as EPBI 466.

**MPHP 467. Cost-Effectiveness Analysis in Health Care (3)**

Evaluation of alternative medical treatments and drug therapies. Topics include cost-benefit, cost-effectiveness and cost-utility analysis. Measuring cost, benefits and health outcomes. Quality of life and other measures of effectiveness will also be addressed. Emphasis on case studies, course project, and evaluation of publications. Some decision analysis and policy implications will also be included. Cross-listed as EPBI 467.

**MPHP 468. The Continual Improvement of Healthcare: An Interdisciplinary Course (3)**

The focus of this course is on collaborative work for the benefit of patients and community. Seminar classwork is combined with a field project, in which interdisciplinary student teams apply what they have learned to the improvement activities of a local health care organization. Successful completion of the course depends on participation in seminar sessions and completion of the interdisciplinary student team project. Prereq: Consent of instructor. Cross-listed as EPBI 468.

**MPHP 469. Stated Preference Evaluation (3)**

(See EPBI 469.) Cross-listed as EPBI 469.

**MPHP 475. Management of Disasters Due to Natural, War, or Terror (3)**

The purpose of this course is to make participants aware of the special needs of children and families in disaster situations and understand public health approaches to address these needs. The learning objectives for this course are: 1) Identify the most important problems and priorities for children in disaster situations, 2) Identify the organizations most frequently involved in providing assistance in disaster situations and define their roles and strengths, 3) Describe the reasons why children are among the most vulnerable in disaster events, 4) Conduct emergency nutritional assessments for children, 5) Develop health profiles on displaced children and plan interventions based on results, 6) Define common psychosocial issues of children and the means to address them, 7) List basic points of international law including the Geneva Convention that relate to all persons involved in disaster situations, 8) List important security issues, 9) Appreciate ethical issues involved in disaster situations and employ skills of cross cultural communication, 10) Recognize and respond to special issues for children involved in biological and chemical terrorist attacks. Prereq: Consent of department.

**MPHP 477. Internship at Health-Related Government Agencies (3)**

(See EPBI 477.) Prereq: EPBI 515. Cross-listed as EPBI 477.

**MPHP 485. Adolescent Development (3)**

(See ADHT 485.) Prereq: Consent of instructor. Cross-listed as ADHT 485.

**MPHP 486. Adolescent Health Care Policies (3)**

(See ADHT 486.) Prereq: Consent of instructor. Cross-listed as ADHT 486.

**MPHP 487. Launching a Program: Reaching Goals in Research and Community Projects (3)**

(See ADHT 487.) Cross-listed as ADHT 487.

**MPHP 488. Gender, Ethnicity, and Health Research (3)**

The course is designed to acquaint students with the literature addressing the constructs of race, ethnicity, gender and social class; to examine critically the contexts in which these constructs are often applied; and to assess the relationship between each of these constructs and access to health care, quality of care, and health outcome. Cross-listed as EPBI 488.

**MPHP 490. Epidemiology: Introduction to Theory and Methods (3)**

Epidemiologic principles and methods needed to understand population-based statements of illness and health. Descriptive epidemiology, analytic epidemiology, and epidemiologic inference. Classification, morbidity and mortality rates, sampling, screening, epidemiologic models, field trials, controlled epidemiologic surveys, sources of bias, and causal models. Cross-listed as EPBI 490.

**MPHP 491. Epidemiology: Application of Theory/Methods (3)**

(See EPBI 491.) Cross-listed as EPBI 491.

**MPHP 492. Epidemiology: Statistical Methods (3)**

The course focuses on strategies for model building. Topics include the analysis of cohort and case-control studies where the emphasis is on risk estimation. Students are expected to analyze a database obtained from a cohort study of the effects of maternal alcohol drinking on outcomes of pregnancy and from a related nested case-control study. The analysis of survival data focuses on parametric and non-parametric techniques and utilizes data from an ongoing study of quality of life of patients on kidney dialysis. In addition to regular class assignments, students are expected to write a report on each of the databases and present results to the class. Prereq: MPHP 431 and MPHP 491. Cross-listed as EPBI 492.

**MPHP 494. Infectious Disease Epidemiology (3)**

(See EPBI 494.) Cross-listed as EPBI 494.

**MPHP 495. Psychiatric Epidemiology (3)**

(See EPBI 495.) Cross-listed as EPBI 495.
MPHP 499, Independent Study (1-18) XLIST: EPBI 499.

MPHP 500, Medical Elective Independent Study (1-6)
Students combine medical school Type A electives into a 3 credit hour graduate course by selecting from a pre-approved list (available in the MPH Office) of Type A electives deemed relevant to the public health curriculum. Students select 1-6 electives for the same number of credits and combine them to fit with their chosen MPH concentration track. Students attend the class, fulfill its requirements, and write a paper (for each Type A elective taken) addressing the public health aspects of the elective and connecting the elective to their chosen concentration track. The paper is turned into MPH Program Director who will evaluate the student’s performance in consultation with a specific Type A elective instructor. Students will also have to sign up for the course through the med school’s internal system in addition to registering for MPHP 500. Students’ choices of combination of Type A electives and credits to be approved prior to their registration for MPHP 500, so a permit must be required for course registration.

MPHP 501, Graduate Seminar (0)
Students and faculty have the opportunity to meet on a weekly basis to discuss papers in the literature. Each week a paper is reviewed in detail by a graduate student in a formal presentation. Discussion of the strengths and weaknesses of the work gives insight into the complexities of investigations in the Public Health arena. Cross-listed as EPBI 501.

MPHP 502, International Health Practice (3)
(See FAMD 502.) Cross-listed as FAMD 502.

MPHP 504, Public Health Capstone Seminar (0)
Year-long, weekly seminar course offered in conjunction with the core requirement MPHP 652 Capstone Experience. The seminar provides a forum for preparing students to select and support development of the capstone experience and a “think tank” for discussion of public health issues that evolve as relevant in current capstone placements. The seminar features speakers from community based Capstone sites, student presentations on public health topics related to Capstone projects, and debriefing and problem-solving sessions for current capstone experiences.

MPHP 508, Ethics, Law, and Epidemiology (3)
This course is designed to provide epidemiology students with basic knowledge about the ethical and legal principles underlying epidemiological research. This is not a public health law class. Issue papers are assigned on a weekly basis. Each issue paper requires that the student analyze the situation depicted and apply the principles learned. Some issue papers may require that the student draft a proposed rule, a portion of legislation, or a document such as an informed consent form. Other exercises may require that students critique an existing agency rule or legislation. Prereq: EPBI 490 and EPBI 491. Cross-listed as EPBI 508.

MPHP 652, Public Health Capstone Experience (3-9)
The Public Health Capstone Experience consists of a public health field practicum, involving a placement at a community-based field site, and a Master’s essay. The field placement will provide students with the opportunity to apply the knowledge and skills acquired through their Master of Public Health academic program to a problem involving the health of the community. Students will learn to communicate with target groups in an effective manner; to order priorities for major projects according to definable criteria; to use computers for specific applications relevant to public health; to identify ethical, social, and cultural issues relating to public health policies, research, and interventions; to identify the process by which decisions are made within the agency or organization; and to identify and coordinate use of resources at the placement site. The Master’s essay represents the culminating experience required for the degree program and may take the form of a research thesis, an evaluation study, or an intervention study. Each student is required to formally present the experience and research findings. This course is available only to Master of Public Health students.

Medical Scientist Training Program (MSTP)

A combined M.D./Ph.D. program in biomedical sciences, the Medical Scientist Training Program (MSTP), is available for students desiring research careers in medicine and related biosciences. This program takes seven to eight years to complete, depending on the time needed to complete the Ph.D. dissertation research. Financial assistance includes a stipend and full tuition support.

Candidates must meet established prerequisites for admission to both the School of Medicine and the School of Graduate Studies. Criteria include demonstrated capabilities in research and superior undergraduate academic credentials. Applicants must have either U.S. citizenship or permanent residency status to be considered for admission to the MSTP. Descriptive materials and applications can be obtained by contacting the MSTP program.

The program is administered by the MSTP Steering Committee, which consists of faculty from both basic science and clinical departments. Its functions include selecting candidates for admission, designing and administering the program curriculum, advising students, and evaluating student progress.

The MSTP director is Clifford V. Harding III, M.D., Ph.D., and the associate directors are George Dubyak, Ph.D., and Roger Marchant, Ph.D. The program manager is Deidre J. Gruning.

For more information, see the previous MSTP section in the School of Medicine section of this publication, under Programs Leading to the M.D.; write: MSTP, Case Western Reserve University School of Medicine, Room T-401, 10900 Euclid Avenue, Cleveland, Ohio 44106-4936; call (216) 368-3404; visit the Web site at http://mstp.case.edu; and/or e-mail mstp@case.edu.

Medical Scientist Training Program (MSTP)

Graduate Course

MSTP 400, Research Rotation in Medical Scientist Training Program (0)
All students must complete research rotations in a minimum of three different MSTP-approved laboratories and submit rotation reports and rotation evaluations for each to the MSTP office. All three of the rotations must be completed before the beginning of each student’s third year of the program. The main purpose of research rotations is to aid the student in selecting a laboratory for their thesis work. Prereq: Consent of MSTP Associate Director.

M.D./J.D.

This program, offered in conjunction with Case’s School of Law, may be completed in six years. The J.D. portion requires the completion of 88 credit hours of study. Admission is through the School of Medicine and the School of Law. For more information about the J.D. portion of the program, visit http://law.case.edu/academic, call the law school admissions office at (216) 368-3600 or (800) 756-0036, or e-mail lawadmissions@case.edu.

M.D./M.A. in Bioethics

The 27-credit-hour master of arts in bioethics program, including a 12-hour foundations course taken during the first year of medical school, emphasizes the interdisciplinary and interprofessional nature of the field. It is designed to provide advance training in bioethics for those who anticipate encountering ethical issues in the course of their primary careers. Medical school students complete the bioethics program while pursuing their medical degrees; no additional time is required. Admission for the master’s degree portion is through the School of Graduate Studies. For more information, visit http://www.case.edu/med/bioethics/masmenu.html, call (216) 368-6196, or e-mail bioethics@case.edu.
M.D./M.S. in Biomedical Investigation

This five-year dual degree program is designed for students who wish to prepare for careers in basic or clinical research at academic medical centers. The core components of this degree are three to six graduate courses in a specific track chosen by the student based on his or her interest, six graded credits of medical school coursework, a common seminar series, training in scientific integrity, and a full-year research project culminating in a written report and examination by faculty. Tracks include biochemistry, clinical investigation, epidemiology, exercise physiology, health services research, nutrition, pathology, and physiology and biotechnology. Each track has specific course requirements.

Application to the program is open to medical students in both the University Program (School of Medicine) and College Program (Cleveland Clinic Lerner College of Medicine of Case Western Reserve University). Students who wish to apply to the M.D./M.S. program may do so after arriving at the university, any time prior to their second year of medical school.

Students are expected to complete all or most of their graduate course requirements before entering the laboratory experience. During the research period, students are expected to participate in track-specific graduate activities, including retreats, student talks, journal clubs, and other program functions, as well as a common monthly seminar series. The seminar series is a unique feature of the program whereby students throughout the program meet to present their work and interact with speakers. Students in the program also participate in a year-end retreat and are required to present their work in a research forum such as the annual Irwin H. Lepow Student Research Day.

For more information, contact the program directors, William Merrick, Ph.D., Department of Biochemistry, (216) 368-3578 or william.merrick@case.edu, and Martha Cathcart, M.D., Department of Molecular Medicine, (216) 444-5222 or cathcam@ccf.org.

Ph.D. in Bioethics

Case is one of only two universities in the country to offer a pure bioethics doctorate program in addition to its master’s and joint degree programs with medicine, nursing, law, and genetics. Admission to the Ph.D. program is through the School of Graduate Studies. For more information, please contact the Department of Bioethics at (216) 368-6196, e-mail bioethics@case.edu, or see http://www.case.edu/med/bioethics/bioethics.html on the Web.

Ph.D. in Genetics/M.A. in Bioethics

The rapid pace of human genetic research has led to an ever-increasing number of complex ethical issues, making the need for combined training in genetics and bioethics more critical. This is the first joint degree program in Ohio to address this need.

The master of arts in bioethics degree program is a 27-credit-hour program. Required courses include a 12-hour foundations course, a three-credit-hour clinical ethics rotation, and 12 hours of electives. Admission to the master’s degree portion is through the School of Graduate Studies. Admission to the Ph.D. in genetics program is a separate process.

For more information, please contact the Department of Bioethics at (216) 368-6196, e-mail bioethics@case.edu, or see http://www.case.edu/med/bioethics/bioethics.html on the Web.

M.D./M.B.A.

This program, offered in conjunction with the Case’s Weatherhead School of Management, may be completed in five years. The M.B.A. portion requires the completion of 48 to 51 credit hours of study. Admission is through the School of Medicine and Weatherhead School of Management. For more information, visit http://weatherhead.case.edu/degree/experience/curriculum/mdmba.html on the Web, call the management school’s admissions office at (216) 368-2030 or (800) 723-0203, or e-mail questions@exchange.som.case.edu.

Certificate in Health Systems Management

This 15-credit-hour program is offered through Case’s Weatherhead School of Management. Students complete the program during the first two years of medical school, with the option of applying the credits toward the M.B.A. portion of the M.D./M.B.A. program. For more information, visit http://weatherhead.case.edu/degree/experience/curriculum/mdmba.html on the Web, call the management school’s admissions office at (216) 368-2030 or (800) 723-0203, or e-mail questions@exchange.som.case.edu.

M.D./M.S. in Applied Anatomy

The core curriculum of this 30-hour, non-thesis master of science master of science in applied anatomy degree program integrates aspects of modern molecular biochemistry, cell biology, and physiology with the traditional aspects of anatomical structure and nomenclature of cells, tissues, and organs. Electives allow students to pursue individual interests in special areas of research and health care. The program is excellent preparation for those preparing for biomedical careers or those planning to pursue a Ph.D. A thesis option is available.

For more information, visit http://case.edu/med/anatomy/msmd.html, call (216) 368-2433, or e-mail deborah.guzzo@case.edu.

M.S. in Exercise Physiology

This 34-hour master of science degree program offers students the opportunity to gain additional knowledge and training in the field of exercise physiology through course work, lab rotations and the completion of a thesis. In addition to medical students, the program attracts those seeking careers as health club counselors, personal trainers and clinical technicians in performance function laboratories,
as well as those planning to pursue the Ph.D. in physiology.

For more information, visit http://epbiwww.cwru.edu/phd.html#health or contact Program Director Randall D. Cebul, M.D., at (216) 778-3901 or randall.cebul@case.edu.

M.D./Ph.D. in Health Services Research
This program prepares students for careers in academic medicine, health policy, public health, and/or health care management. The program's focus is especially pertinent to candidates interested in research pertaining to the health and health care problems of urban and vulnerable populations.

Initial admission for the Ph.D. portion is through the University's School of Graduate Studies, with the Ph.D. completed within the Department of Epidemiology and Biostatistics and its division of health services research. Students typically complete the Ph.D. by the end of their fifth year after matriculation, with the M.D. awarded at the end of the seventh year. Support for tuition and a stipend is available for a limited number of students each year.

For more information, see http://epbiwww.cwru.edu/phd.html#health or contact Program Director Randall D. Cebul, M.D., at (216) 778-3901 or randall.cebul@case.edu.

Physician-Engineer Training Program (PETP)
The Physician-Engineer Training Program (PETP) is a dual-degree program leading to an M.D. and a Ph.D. in biomedical engineering. The total program takes seven to eight years to complete. Students receive full financial support throughout the entire program. This includes all tuition costs, health service fees, computer fees, and an annual stipend.

For more information, see http://bme.cwru.edu/petp/; write PETP Admissions, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7207; phone (216) 368-4094; or e-mail axb127@case.edu.

MEDICAL STUDENT ORGANIZATIONS
The list of organizations and activities available to medical students continually evolves to reflect the interests of current students. Here's a sampling of the organizations and activities available at press time.

Specialty Related Groups
Medical students have formed interest groups to explore and invite speakers to discuss:
- Bioethics
- Emergency medicine
- Geriatric medicine
- Hematology/oncology
- Internal medicine
- Military medicine
- Neurosciences
- Ophthalmology
- Orthopedics
- Pediatrics
- Radiology
- Surgery

Other Medical Student Groups and Activities
- Alpha Omega Alpha medical honor society
- American Medical Association
- American Medical Students Association
- Artists in Medicine
- Christian Medical and Dental Society Committee of Student Representatives
- Governmental group
- Docapella vocal performance group
- Doc Opera annual student/faculty parody show
- Gay Lesbian Bi-Sexual Transgender People in Medicine
- Hippocrates Ball black tie dance for students and faculty
- International Federation of Medical Student Association
- Medical Students for Choice
- Organization of Student Representatives
- Phi Delta Epsilon medical student fraternity
- Photo Journal Club
- Physicians for Human Rights
- Physicians for Social Responsibility
- Student National Medical Association
- Student National Medical Honor Society
- Student National Medical Society
- Student National Medical Student Association
- Student National Medical Society Health Sciences Chapter
- Student National Medical Student Association Women in Medicine

Graduate Programs
Department of Anatomy
Room W-520, School of Medicine
Phone (216) 368-2433
http://www.case.edu/med/anatomy/

The development of independence in research and experience in teaching are essential factors for scholars. The goal of the Department of Anatomy is to provide individuals with the skills and experiences that will allow them to develop and maintain successful careers as researchers and teachers. The strengths of both the faculty and students of the department help lead to the achievement of this goal. The graduate program in anatomy fulfills all requirements of the university's School of Graduate Studies. Graduate studies in the Department of Anatomy can lead to the master of science degree in applied anatomy and to the doctor of philosophy degree. The master's degree may be obtained as part of a joint degree program for qualified individuals participating in other programs at the university, such as the joint M.D./M.S. degree. Every graduate student in the Department of Anatomy must successfully complete 19 credits in the core curriculum of anatomical sciences, human gross anatomy, histology, neuroanatomy, and embryology. An additional two credits offered by the department in seminar and research presentations also are required. Elective course work and, for the thesis M.S. and Ph.D. students, laboratory rotations and research, complete the graduate students' program of study. Research areas of particular strength among faculty in the Department of Anatomy include biological anthropology, cell injury, control of respiration, and non-molecular developmental neurobiology. The department has existing collaborative research efforts with basic scientists in several clinical departments, including medicine, orthopaedics, pediatrics, neurology, and neurosurgery. Please see the Department of Anatomy Web site for additional information.
Undergraduate Courses

ANAT 312. Basic Histology (3)
Fundamental histology course covering microscopic structure, nomenclature, and function of normal cells, tissues, and selected organs (human emphasis).

ANAT 353. Anatomy for the Artist (3)
Reflecting the interdisciplinary nature of medical illustration, the course will have two complementary components. Morning sessions will involve instruction in human anatomy followed by direct observation and drawing of that anatomy from the cadaver. The entire body will be covered, including both the internal structures as well as those that directly impact the surface anatomy, to provide the student with a comprehensive understanding of the human body in its totality. Afternoon sessions will have students study the perceptual problems of drawing from the live model, focusing on the anatomical structure and functionality of the skeletal and muscular system. Muscle action and involvement in human movement and form will be analyzed and applied.

ANAT 375. Human Evolution: The Fossil Evidence (3)
This course will survey the biological and behavioral changes that occurred in the hominid lineage during the past five million years. In addition to a thorough review of the fossil evidence for human evolution, students will develop the theoretical framework in evolutionary biology. Prereq: ANTH 103 and BIOL 110 or equivalent. Cross-listed as ANTH 375.

ANAT 377. Human Osteology (4)
This course for upper division undergraduates and graduate students will review the following topics: human skeletal development and identification; and forensic identification (skeletal aging, sex identification and population affiliation). Cross-listed as ANTH 377.

ANAT 383. Evolutionary Anatomy (4)
This course will introduce graduate and advanced undergraduate students to primate comparative anatomy and will examine methods of reconstructing physiology and behavior from fossil remains. Prereq: ANTH 103 and BIOL 110 or equivalent. Cross-listed as ANTH 383.

ANAT 384. Development and Evolution of the Vertebrate Skull (3)
This course will approach vertebrate cranial diversity from the perspective of our rapidly improving knowledge of cranial phylogenetics. The course will thoroughly review craniofacial embryology, including new data regarding the genetics of pattern formation, and will cover all major events in vertebrate craniofacial evolution. Prereq: Permission of instructor.

ANAT 391. Embryology (3)
A detailed description of development will be presented, focusing mainly on the developing human. Discussions and presentations will also include several developing systems that have served as useful models in experimental embryology for deciphering mechanisms responsible for producing adult metazoan organisms. One or two sessions will be devoted to studying material with the light microscope. Prereq: BIOL 220 or equivalent.

ANAT 398. Anatomy Departmental Seminar (1)
During the first half of the course, the organization, preparation, and delivery of oral scientific presentations are discussed. During the second half of the course, students, faculty, and invited speakers give presentations. These presentations include literature reviews and/or summaries of individual research projects. Reports on current research opportunities and ethical issues will also be presented.

ANAT 399. Independent Study (1-4)
(Credit as arranged.) Student must obtain approval of a supervising professor before registration and list the professor's name on the schedule card.

Graduate Courses

ANAT 410. Medical Gross Anatomy (3)
An in-depth review and introduction to human gross anatomy. The course will be based on the curriculum at the Case School of Medicine and lectures will be given by the same faculty. One hour of lecture will precede 3 hours of dissection laboratory Monday through Friday. Lectures and dissection labs will cover all human anatomy, i.e., thorax, abdomen, pelvis and perineum, extremities and back, and head and neck. This is an intense course to which students should be prepared to devote more time than the scheduled hours of 1:00 to 5:00 p.m. Dissection labs are open 24 hours and a teaching assistant is available every morning. Prereq: Written permission of course director, B.A./B.S., or fourth year undergraduate.

ANAT 411. Gross Anatomy (2-6)
Dissection of the adult human cadaver. Prereq: Consent of instructor.

ANAT 412. Histology and Ultrastructure (4)
Comprehensive functional histology course integrating microscopic identification ('structure plus nomenclature') of normal cells, tissues, and organs with aspects of their cell biology, biochemistry, and physiology ('function'). Topical coverage includes complete ('head-to-toe') tissue and organ survey with human emphasis.

ANAT 413. General Histology Laboratory (2)
Microscopic structure of tissues and organs.

ANAT 414. Neurological Anatomy (3)
This course provides a current and comprehensive survey of the structure of the human nervous system. It covers concepts which will be of practical value to students needing an understanding of the working mechanisms of the nervous system. The viewpoints of three closely dependent fields, neuroanatomy, neurophysiology and neurology, are presented, not with a view to covering them exhaustively but in the belief that a truly useful understanding of the morphology of the nervous system can only be attained by bringing together these three disciplines.

ANAT 415. Neuroanatomical Laboratory (1)
This laboratory course provides an adjunct to ANAT 414. Neurological Anatomy. It affords the student the opportunity to learn the complex three-dimensional anatomy of the human central nervous system from photographs of brain slices and sections, from glass slides of human brain sections, from actual brain slices, and from dissection of the brain. The material will be approached not only through traditional methods of studying regional morphology but also by "following" the components of functional systems through the spinal cord, brain stem, and/or forebrain. Animated, three-dimensional, and color imagery will also be employed. Prereq or Coreq: ANAT 414.

ANAT 420. Forensic Pathology (3)
This course will introduce graduate and advanced undergraduate students to primate comparative anatomy and will examine methods of reconstructing physiology and behavior from fossil remains. Prereq: ANTH 103 and BIOL 110 or equivalent. Cross-listed as ANTH 377.

ANAT 429. Medical Microscopic Anatomy (3)
This course covers condensed material in a microscopic anatomy course in most U.S. medical school curricula. It is intended for students who are interested in professional schools of medicine, dentistry, nursing or allied health sciences or who simply want to learn the structure and functions of cells, tissues and organs of the human or mammalian body. It is for students who want to learn the subject material in a shorter summer session. It also serves as a review course for health professional students. The course will cover basic biology of cells and tissue types of the body. It will further cover how cells and tissues are organized to perform specific functions in organs and organ systems. The format includes lectures followed by laboratory sessions on the same topic using microscope slides and PowerPoint presentations. Optional weekly or biweekly review sessions will be scheduled for students who need these extra sessions.

ANAT 431. Statistical Methods I (3)
(See EPBI 431.) Cross-listed as EPBI 431.

ANAT 435. Morphometrics of Biological Shape (3)
Morphometrics is the measurement of biological shape. This course will focus on the collection of data, especially landmarks, from biological forms directly and especially via imaging. We will use best fit and interpolant algorithms (Geometric Morphometrics) to compare two and three dimensional landmark configurations of an individual over time, different individuals to each other, and individuals to average forms. The results are interpreted with standard multivariate statistical techniques. These tools are especially relevant to applications in medical imaging and other areas of biodometrics. Background in linear algebra and basic statistics is desirable.
ANAT 462. Advanced Principles of Developmental Biology (3)  
(See BIOL 462.) Cross-listed as BIOL 462.

ANAT 475. Human Evolution: The Fossil Evidence (3)  
(See ANAT 375.) Prereq: ANTH 103 and BIOL 110 or equivalent. Cross-listed as ANTH 475.

ANAT 477. Human Osteology (4)  
(See ANAT 377.) Cross-listed as ANTH 477.

ANAT 483. Evolutionary Anatomy (4)  
(See ANAT 383.) Cross-listed as ANTH 483.

ANAT 484. Development and Evolution of the Vertebrate Skull (3)  
(See ANAT 384.) Prereq: Graduate standing or permission of instructor.

ANAT 491. Embryology (3)  
A detailed description of development will be presented, focusing mainly on the developing human. Discussions and presentations will also include several developing systems that have served as useful models in experimental embryology for deciphering mechanisms responsible for producing adult metazoan organisms. One or two sessions will be devoted to studying material with the light microscope. Prereq: BIOL 220 or equivalent.

ANAT 497. Scientific Presentations (1)  
These courses provide a foundation and experience for making scientific presentations. The two courses are scheduled simultaneously and students from both courses are present, but the requirements for passing differ. Students must take ANAT 497: Scientific Presentations before ANAT 498: Departmental Seminar. Each semester will begin with an initial series of lectures by the instructors to describe and exemplify how to make presentations. Oral presentations by students taking ANAT 498 will occur during the class periods for the remainder of the semester. Students taking ANAT 497 and ANAT 498 must participate in these discussions.

ANAT 498. Anatomy Departmental Seminar (1)  
During the first half of the course, the organization, preparation, and delivery of oral scientific presentations are discussed. During the second half of the course, students, faculty, and invited speakers give presentations. These presentations include literature reviews and/or summaries of individual research projects. Reports on current research opportunities and ethical issues will also be presented.

ANAT 499. Independent Study (1-4)

ANAT 503. Readings and Discussions (1-18)  
In-depth consideration of special selected topics through critical evaluation of the literature.

ANAT 513. Surgical Anatomy of the Thorax and Abdomen (4)  
This course is intended for graduate and fourth-year medical students interested in surgery and surgical subspecialties. This integrated course will review basic gross anatomy, provide advanced training in gross and surgical anatomy, introduce common clinical problems and their anatomical consequences, and basic surgical approaches.

ANAT 516. Head and Neck Surgery Dissection: Advanced Anatomy and Embryology (3)  
Students will build on their understanding of basic gross, histological, pathologic, and embryonic anatomy of the head and neck. Human cadaveric dissection, radiographic aids, and clinical case reports of head and neck pathologies will be studied as to how they can inform the surgical approach to lesion removal and other therapeutic surgical interventions. Students conduct weekly surgical interventions on live dogs, followed by a discussion in a “grand rounds” atmosphere. Surgical approaches covered include: cranial cavity, skull base, orbit, maxillofacial, oral, otic, pharyngeal, and airway. Students are required to attend and participate in lectures, dissection (live and cadaveric), and discussions. A pre-course and final essay examination. Prereq: ANAT 411, ANAT 412, ANAT 414, and ANAT 491.

ANAT 517. Optical Microscopy and Imaging for Biologists (2)  
This intense lecture and laboratory-based course will cover basic concepts of light microscopy and introduce advanced techniques relevant to modern cell and molecular biology. Students will gain extensive hands-on experience with state-of-the-art equipment for optical imaging guided by experienced academic instructors. The latest and most advanced instrumentation for light microscopy, image detection, and computerized image analysis will be available for use in the laboratory part of the course. Cross-listed as PHOL 517.

ANAT 523. Histopathology of Organ Systems (3)  
Comprehensive course covering the underlying basic mechanisms of injury and cell death, inflammation, immunity, infection, and neoplasia followed by pathology of specific organ systems. Material will include histological (“structure”) and physiological (“function”) aspects related to pathology (human emphasis). Prereq: ANAT 412 or permission of instructor.

ANAT 599. Visually Interpreting the Cadaver (1)  
This course is designed to facilitate prolonged focus on drawing from the cadaver. The main objectives are to enhance the student’s knowledge of human anatomy, to gain better proficiency at rendering the full range of human tissues, and to enhance the ability to “breathe life” into dead tissue. Visual communication skills with regard to interpreting the visual field into a meaningful visual statement are also emphasized.

ANAT 601. Research (1-18)  
(Credit as arranged.)

ANAT 610. Oxygen and Physiological Function (2)  
Lecture/discussion course which explores the significance and consequences of oxygen and oxygen metabolism in living organisms. Oxygen transport may be covered in the context of exercise and athletic performance. Prereq: ANAT 412 and ANAT 413, and permission of instructor.

ANAT 611. Practicum in Human Gross Anatomy (1-3)  
A course of study designed especially for the preparation of teachers that involves the supervised practical application of previously studied theory. The graduate student will administer all laboratory sessions, assisting students with identification of structures and with understanding the functional aspects of neuroanatomical pathways. The graduate student will meet with the course director once per week to discuss the student’s performance and progress and to plan for upcoming class sessions. The course director will assist the student in developing the organizational skills necessary to be a course director as the student learns to anticipate questions, define problematic areas, and recognize varying learning styles. The graduate student will be evaluated by the course director with reference to the graduate student’s overall progress and performance as a teacher. Prereq: ANAT 414.

ANAT 651. Thesis M.S. (1-9)  
Master’s Thesis Plan A.

ANAT 691. Practicum in Embryology (1)  
A course of study designed especially for the preparation of teachers that involves the supervised practical application of previously studied theory. The first half of the course, the graduate student will meet with small groups of three to four students on a twice-weekly basis to guide them in preparing their weekly classroom presentations. Each week, the graduate student will meet with the course director to evaluate the organization and quality of the classroom presentations and to discuss an organizational plan for the presentations scheduled for the next week. In the second half of the course the graduate student will deliver at least two but no more than four lectures covering basic and advanced topics in human embryology. At least one week prior to each lecture, the graduate student will meet with the course director to review the material to be presented and to plan the lecture. The course director will be evaluated by the students in ANAT 491 with reference to the help they received in preparing their class room presentations in the first half of the course. The course director will be evaluated by both the students and the course director with respect to the lectures the graduate student presents in the second half of the course.
ANAT 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)
ANAT 703. Dissertation Fellowship (1-8)

Department of Anesthesiology
2536 Lakeside Hospital Building
Phone (216) 844-8077

The master of science degree in anesthesiology is open to applicants who have an undergraduate degree from an institution recognized by Case Western Reserve University. Undergraduate degrees in biology, chemistry, and physics are preferred, although not required. All applicants must have completed an undergraduate curriculum consisting of at least two years of biology with laboratory (including one semester each of human anatomy and human physiology), two years of chemistry with laboratory (including one year of organic chemistry), one year of physics with laboratory, one year of higher-level math/statistics (including at least one semester of calculus for the life sciences), and one year of English (including one semester of expository writing). Applicants who have not satisfied the aforementioned requirements will not be considered for admission.

Applicants interested in obtaining admission to the program should present an undergraduate GPA greater than or equal to 3.0 and complete the Medical College Admission Test (MCAT) with a composite score greater than or equal to 20. International applicant admission requirements also include TOEFL (Test of English as a Foreign Language) and Education Credential Evaluation Report for foreign transcripts. Students will be selected by an intradivisional committee that will review academic credentials, test scores, and previous clinical experience; assess work or non-academic experiences/expertise; and conduct personal interviews.

The program is six semesters (24 months), beginning in June and coinciding with the university calendar for graduate studies. The first three semesters include clinical instruction coupled with basic science and clinical didactic course work. During the remaining semesters, students complete one-month clinical rotations in all subspecialties of anesthesiology. The program of study consists of 59 graduate credit hours.

The program is accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP). Graduates may practice as anesthesiologist assistants and are qualified to take the National Certification Examination for Anesthesiologist Assistants sponsored by the National Commission for Certification of Anesthesiologist Assistants (NCCAA) and co-validated by the National Board of Medical Examiners (NBME).

ANESTHESIOLOGY (ANES)

Graduate Courses
ANES 403. Physical Methods for Anesthesiologist Assistants (3)
Basic concepts in electricity, gas/liquid interfaces, acid/base balance, immunology, hematology, statistics, and computer systems needed for subsequent work. Prereq: Consent of department.
ANES 440. Patient Monitoring and Instrumentation I (2)
Students are taught the proper balance between circuits and engineering concepts and the clinical application of anesthesia instrumentation. Monitors and devices used in the operating room are studied with respect to principles of operation, calibration, and interpretation of data. A hands-on laboratory is utilized to maximize direct contact to the instrumentation of the profession. Prereq: Consent of department.
ANES 460. Patient Monitoring and Instrumentation II (3)
Continuation of ANES 440. Prereq: ANES 440.
ANES 456. Applied Physiology for Anesthesiologist Assistants I (3)
Basic and applied human systems physiology with emphasis on topics and areas of special concern to the anesthetist. Prereq: Consent of department.
ANES 458. Applied Physiology for Anesthesiologist Assistants II (3)
Continuation of ANES 456. Prereq: ANES 456 and ANES 458.
ANES 460. Introduction to Anesthesia (2)
Introduction to basic concepts dealing with clinical anesthesia. Medical terminology, human anatomy, medical chart interpretation and drug dosage calculations. Prereq: Consent of department.
ANES 461. Orientation to Clinical Experience (3)
Introduction to experience in the operating room with emphasis on the fundamental procedures and techniques used in administering an anesthetic. Preparative assessment, IV placement techniques, airway management, intraoperative patient care and postoperative management are all emphasized in this course. Prereq: Acceptance in the M.S.A. program.
ANES 462. Anesthesia Clinical Correlation I (1)
A series of conferences presented by students that applies to anesthetic theory as it relates to the clinical experience. Specific anesthetic situations are emphasized. Prereq: ANES 460.
ANES 463. Anesthesia Clinical Experience I (2-4)
A continuation of the preparation, observation, and hands-on learning format initiated in ANES 461. Patient management and technical skills are refined with close attention to the didactic course work. A comprehensive clinical examination is administered at the end of the semester. BLS (Basic Life Support) certification is required for course completion. Prereq: ANES 461.
ANES 464. Anesthesia Clinical Correlation II (1)
A spectrum of case presentation conferences presented by the students dealing with basic and major problems in anesthesia management. Medical and surgical history of individual patients and the outcomes of anesthesia and surgery are emphasized. Journal Club and Morbidity and Mortality conferences are included. Prereq: ANES 462.
ANES 465. Anesthesia Clinical Experience II (2-4)
A continuation of ANES 463. A comprehensive clinical examination is administered at the end of the semester. PALS (Pediatric Advanced Life Support) and ACLS (Advanced Cardiac Life Support) certification is required for course completion. Prereq: ANES 463 and BLS certification.
ANES 467. Anesthesia Clinical Experience III (4)
Extended exposure to all of the clinical subspecialties of anesthesiology (obstetrics, pediatrics, neurosurgery, cardiovascular, etc.). Students alternate through rotations at several area hospitals. Prereq: ANES 465 and ACLS certification.
ANES 468. Anesthesia Clinical Correlation III (1)
The second-year equivalent of ANES 462. Prereq: ANES 464.
ANES 469. Anesthesia Clinical Experience IV (8)
A continuation of ANES 467. A comprehensive clinical examination is administered at the end of the semester. Prereq: ANES 467.
ANES 470. Anesthesia Clinical Correlation IV (1)
The second-year equivalent of ANES 464. Prereq: ANES 468.
ANES 471. Anesthesia Clinical Experience V (8)
A continuation of ANES 469. A comprehensive clinical examination is administered at the end of the semester. Prereq: ANES 469.
ANES 475. Pharmacology for Anesthesiologist Assistants (2)
Pharmacodynamics, pharmacokinetics, uptake, distribution and action of the volatile and intravenous anesthetics, muscle relaxants, narcotics, hypnotics and other pharmaceuticals used in the administration of an anesthetic. Prereq: Consent of department.
ANES 477. Electrocardiography for Anesthesiologist Assistants (2)
Diagnosis and practical applications of electrocardiography and echocardiography as monitoring techniques in the operating room. Prereq: Consent of department.
ANES 480. Fundamentals of Anesthetic Sciences I (1)
A continuum of courses over the fall and spring semesters that covers a series of topics in basic medical science with special emphasis on the effect of anesthetics on normal physiology. An examination is administered
at the end of each semester. Prereq: Consent of department.

**ANES 490. Psychology, Law, and Ethics for Anesthesiologist Assistants (2)**

Detailed study into three areas of Anesthesiologist Assistant practice: 1) Psychological considerations in providing anesthesia care, 2) Legal obligations of anesthesiists, and the rights of their patients, and 3) Ethical considerations in medicine. Grading consists of role-playing, case analysis, and a comprehensive final exam. Prereq: Consent of department.

**ANES 499. Clinical Remediation (1-10)**

(Credit as arranged.) Course offered to the student one time during the program of study which remediates “C” or below work in a clinical course. Prereq: Consent of department.

**ANES 580. Fundamentals of Anesthetic Sciences II (1)**

The second-year equivalent of ANES 480. An examination is administered at the end of each semester. Prereq: ANES 480.

**ANES 599. Clinical Remediation (1-10)**

(Credit as arranged.) Course offered to the student one time during the program of study which remediates “C” or below work in a clinical course. Prereq: Consent of department.

**ANES 651. Thesis (M.S.) (1-9)**

---

**Department of Biochemistry**

Room W-427, School of Medicine  
Phone (216) 368-3344  
Fax (216) 368-3419  
http://www.case.edu/med/biochemistry/  
Michael Weiss, M.D., Ph.D., Chair

Biochemistry is the study of the molecular basis of cellular function, making it a central discipline in the biological sciences. Biochemists ask the question, “How do life processes work on the molecular level?”

The Department of Biochemistry offers undergraduate programs leading to the bachelor of arts degree and bachelor of science degree in biochemistry and graduate programs leading to the master of science, doctor of philosophy, and combined doctor of medicine/doctor of philosophy. Many interdisciplinary and interdepartmental programs available with other departments in the School of Medicine and at Case Western Reserve University provide many additional avenues of study.

Research interests within the department include a broad spectrum of modern biochemical topics in six broad areas: enzymology, protein chemistry, structural biology, gene expression, cell biology, and molecular medicine/gene therapy. These areas are described in detail later in this section. The department has state-of-the-art equipment and facilities for research in modern biochemistry. More complete information about the undergraduate and graduate programs may be obtained by contacting the departmental office.

**UNDERGRADUATE PROGRAMS**

Please see the College of Arts and Sciences section of this publication.

**GRADUATE PROGRAMS**

**Master's Degrees**

The master's of science degree programs provide advanced training for students who wish to continue beyond the B.A. or B.S. degree without committing themselves to the Ph.D. curriculum. Two lines of study are offered: the three-year research program leading to the master's of science in biochemical research and the two-year course work program leading to the master's of science in biochemistry.

**Master's of Science Degree in Biochemical Research**

The program leading to the M.S. degree in biochemistry research is uniquely designed to provide interested students with sufficient background and laboratory experience to enable them to function as senior research assistants and eventually as laboratory supervisors in university departments, research institutes, or industrial laboratories. Students in this three-year program receive a stipend, and tuition costs are covered by the department. The student pursues a flexible and individually designed schedule related to his or her research career and interests, which leads to an independent research project. The program simultaneously develops background knowledge and technical skills in modern biochemistry, which can be applied to several career paths. A more complete description of the program, admission policies, and financial aid is available from the departmental office.

**Ph.D. in Biochemistry**

The aim of the Ph.D. in biochemistry program is to prepare students for careers in teaching and research in biochemistry. The emphasis of the doctoral program is on research culminating in the completion of an original independent research project under the guidance of a faculty member in the biochemistry department. The research areas in the department are described later in this section.

In addition to the research activities, graduate students participate in formal courses both within and outside the department, formal and informal seminars, and discussions of current literature. Schedules are flexible and are individually tailored to each student's needs. Although students choose from the various tracks within the department, they are broadly trained in modern aspects of biochemistry and become familiar with techniques and literature in a variety of areas. Many collaborative projects with other departments also are available to broaden the spectrum of training offered. Most students select a multidepartmental, integrated curriculum in cellular and molecular biology in ad-
Most Ph.D. students in biochemistry are admitted through the Biomedical Sciences Training Program (BSTP). This program, which combines 13 graduate programs in the School of Medicine, is described under a separate listing in this publication. A complete description of the program, including research activities, admission policies, and financial aid, may be obtained from the departmental office or the BSTP coordinator.

Integrated Graduate Program in Biochemistry

Undergraduate biochemistry majors in the College of Arts and Sciences are eligible to apply for an Integrated Graduate Program in Biochemistry. This program allows Case Western Reserve biochemistry majors to enter graduate school at the end of the junior year and to obtain the B.A. degree while completing the first year of graduate school at the University. The first year of course work in graduate school substitutes for the last year of undergraduate course work. The admitted student takes the same course work and chooses a thesis advisor from among the faculty in the same fashion as do other Ph.D. students. The program is highly competitive, and only one or two outstanding graduates may be selected in any year.

Biochemistry Medical Scientist Training Program

Students may pursue a Ph.D. in biochemistry as part of the combined M.D./Ph.D. program. Information on this program may be obtained from the departmental office or the Medical Scientist Training Program coordinator. Please see the separate listing in this publication for information on the MSTP program.

RESEARCH AREAS

Research of Department of Biochemistry faculty members covers a broad spectrum of topics from events at the level of electron movement in biochemical reactions to the intracellular trafficking of proteins. Research in the department is broadened by collaborations with faculty in other University departments and with scientists at other Cleveland research institutions. The specific areas of active research within the department are outlined below.

Proteins and Enzymes

Proteins are components of all living tissue, and their function is critical for life processes. Understanding the chemical mechanisms of enzymatic catalysis is essential for determining the role of individual proteins in human disease. Biochemistry faculty study a variety of proteins and enzymes ranging from growth factors to oncogenes.

Structural Biology

The function of a protein is determined by its three-dimensional structure and interactions. Faculty apply many modern techniques to the determination of macromolecular structure, including x-ray crystallography, multidimensional heteronuclear NMR, and fluorescence, Raman, and circular dichroism spectroscopy. Macromolecules under investigation include the serotonin receptor, transcarboxylase, ribosomes, DNA-protein complexes, and neurochemical enzymes.

Regulation of Gene Expression

The elucidation of mechanisms regulating gene expression is a major goal of modern biology. Biochemistry faculty study the control of transcription by hormones and other regulatory molecules, the interaction between proteins and DNA, the function of oncogenes, the basal and hormone mediated transcripational machinery, and the processing and translation of RNA.

Cell Biology

The control of the metabolism, differentiation and cell signaling within and between cells is an area of active investigation. Research in the department is focused on G-protein coupled receptor trafficking and signaling in response to antagonists and agonists and on enzyme regulation in metabolism.

Metabolic Regulation

Biochemistry faculty investigate the control of metabolism in animals, such as dietary and hormonal regulation of gene expression. Transgenic murine technology allows the study of the impact of gene ablation on metabolic processes.

BIOCHEMISTRY (BIOC)

Undergraduate Courses

(See College of Arts and Sciences.)

Graduate Courses

BIOC 407. General Biochemistry (4)
Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. One semester of biology is recommended. Prereq: CHEM 223 or CHEM 224. Cross-listed as BIOL 407.

BIOC 408. Molecular Biology: Genes and Genetic Engineering (4)
An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of development. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Prereq: BIOL 215 or BIOC 307. Cross-listed as BIOL 408.

BIOC 409. Biochemistry of G-Protein Coupled Receptors (5)
G-protein coupled receptors (GPCRs) represent a large multi-gene family of proteins which are essential for the actions of a large number of pharmaceuticals. Participants in this course will gain a detailed understanding of the structure and function of GPCRs. Particular emphasis will be placed on gaining a working knowledge of the quantitative aspects of GPCR biochemistry and pharmacology. In particular, mathematical modeling techniques for understanding receptor binding and activation will be emphasized. Additionally, participants will become familiar with most major technologies currently used to study GPCRs. Prereq: BIO 453, CBIO 454, CBIO 455, and CBIO 456.

BIOC 410. Advanced Topics in GPCRs: Signal Transduction, Structure, and Function (3)
G-protein coupled receptors (GPCRs) represent the largest multi-gene family of proteins in the genome. GPCRs are essential for the actions of a large number of pharmaceutical agents and disease processes. Participants in this course will gain an advanced understand-
which involve interactions between viral proteins and course also covers viral mechanisms of oncogenesis and study oncogenes and tumor suppressor genes. This the mechanisms of mutational change. Discussions genes that are the targets of oncogenic mutations and inheritance and in the sense of causation by somatic cancer as a genetic disease in the Mendelian sense of mutations, this course provides an in-depth analysis of using a combination of lectures and student presentations, this course provides an in-depth analysis of cancer as a genetic disease in the Mendelian sense of inheritance and in the sense of causation by somatic mutation. The objectives of the course are to examine both the proto-oncogenes and tumor suppressor genes that are the targets of oncogenic mutations and the mechanisms of mutational change. Discussions emphasize experimental approaches used to identify and study oncogenes and tumor suppressor genes. This course also covers viral mechanisms of oncogenesis which involve interactions between viral proteins and the products of cellular proto-oncogenes or tumor suppressor genes. Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456. Cross-listed as MBIO 420 and MVIR 420.

**BIOC 430. Advanced Methods in Structural Biology I (3)**

Provides students with an in-depth introduction to biophysical techniques used to quantify macromolecular structures. A major part of the course will deal with the use of nuclear magnetic resonance to derive a 3-D structures of macromolecules in solution. Other topics include electron spin resonance, absorption, fluorescence and circular dichroism spectroscopies, Raman and infrared spectroscopies and methods used in modeling. Offered with BIOC 431. “Advanced Methods Biology II” in alternate years. BIOC 430 deals with protein hydrodynamics and thermodynamics, crystallography, and mass spectrometry. The course will be mostly lecture based. This course will provide an extensive overview for graduate students specializing in structural biology. Cross-listed as CHEM 430 and PHRM 430.

**BIOC 431. Advanced Methods in Structural Biology II (3)**

This course provides an introduction to biophysical techniques for graduate students who are interested in structural biology and biophysical chemistry. Offered with BIOC 430, “Advanced Structural Biology I” in alternate years. Advanced Methods I (430) focuses on NMR and optical spectroscopies. Advanced Methods II deals with protein hydrodynamics and thermodynamics, crystallography, and mass spectrometry. Cross-listed as CHEM 430 and PHRM 430.

**BIOC 434. Structural Biology (3)**

(See BIOC 434.) Cross-listed as BIOL 434.

**BIOC 446. Host-Virus Interactions (3)**

(See MVIR 446.) Cross-listed as MVIR 446.

**BIOC 452. Nutritional Biochemistry and Metabolism (3)**

Mechanisms of regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Prereq: BIOC 307 or equivalent. Cross-listed as NTRN 452.

**BIOC 460. Introduction to Microarrays (3)**

Microarray technology is an exciting new technique that is used to analyze gene expression in a wide variety of organisms. The goal of this course is to give participants a hands-on introduction to this technology. The course is intended for individuals who are preparing to use this technique, including students, fellows, and other investigators. This is a hands-on computer-based course, which will enable participants to conduct meaningful analyses of microarray data. Participants will gain an understanding of the principles underlying microarray technologies, including: theory of sample preparation, sample processing on microarrays, familiarity with the use of Affymetrix Microarray Suite software and generation of data sets. Transferring data among software packages to manipulate data will also be discussed. Importation of data into other software (GeneSpring and DecisionSite) will enable participants to mine the data for higher-order patterns. Participants will learn about the rationale behind the choice of normalization and data filtering strategies, distance metrics, use of appropriate clustering choices such as K-means, Hierarchical, Self Organizing Maps. Prereq: CBIO 455 or equivalent.

**BIOC 515. Endocrine Pharmacology (3)**

(See PHRM 515.) Prereq: Consent of instructor. Cross-listed as PHRM 515.

**BIOC 521. Chromatin Structure and Transcription (3)**

(See GENE 521.) Cross-listed as GENE 521.

**BIOC 523. Advanced NMR Spectroscopy in Structural Biology (3)**

(See PHOL 523.) Cross-listed as PHOL 523.

**BIOC 555. Emerging Concepts in Cell Regulation (3)**

(See PATH 555.) Prereq: CBIO 453. Cross-listed as PATH 555.

**BIOC 601. Biochemical Research (1-18)**

(Credit as arranged.) Prereq: BIOC 407.

**BIOC 605. Independent Project in Biochemical Research (1-18)**

(Credit as arranged.) Limited to students in the M.S. program in biochemical research. Prereq: BIOC 407 and BIOC 601.

**BIOC 611. Biochemistry Seminar I (1)**

Discussion of current research. Prereq: BIOC 407.

**BIOC 612. Biochemistry Seminar II (1)**

Discussion of current research. Prereq: BIOC 407.

**BIOC 617. Special Topics in Biochemistry (3)**

Special topics courses on areas of current interest in biochemistry. Prereq: BIOC 407.

**BIOC 618. Special Topics in Biochemistry (3)**

Special topics courses on areas of current interest in biochemistry. Prereq: BIOC 407.

**BIOC 620. Transcription and Gene Regulation (3)**

(See MBIO 620.) Cross-listed as MBIO 620.

**BIOC 641. Proposition I (2)**

Design of research proposal. Prereq: BIOC 407.

**BIOC 643. Proposition II (2)**

Design of research proposal. Prereq: BIOC 407.

**BIOC 651. Thesis M.S. (1-6)**

(Credit as arranged.)

**BIOC 701. Dissertation Ph.D. (1-18)**

(Credit as arranged.)

**BIOC 703. Dissertation Fellowship (1-8)**
obtain information about the master’s degree and Ph.D. programs, and learn about department and faculty activities: http://www.case.edu/med/bioethics/bioethics.html.

MASTER OF ARTS DEGREE IN BIOETHICS

The Department of Bioethics offers a program leading to the master of arts degree in bioethics, emphasizing the interdisciplinary and interprofessional nature of the field. This graduate program is designed to provide advance training in bioethics for students and professionals who anticipate encountering ethical issues in the course of their primary careers.

The 27 credit-hour degree can be earned full time in one year or part time in up to three years. Core courses are taught by department faculty and are scheduled so that part-time students can continue their professional responsibilities while completing the degree.

The master of arts program provides students with a firm understanding of the intellectual content of the study of bioethics, of bioethical literature, and of the underlying philosophical arguments and empirical assumptions that inform it. Students are taught to understand the institutions and structures of health care and the ethical issues that arise in medical practice. They are trained to identify and analyze a range of clinical ethics issues.

All students pursuing a master of arts degree in bioethics are required to complete the interdisciplinary core of 12 credit hours (the equivalent of four courses) in the first two semesters of their first year of study.

The courses, BETH 401: Foundations in Bioethics I, and BETH 402: Foundations in Bioethics II, each six credits, examine 10 basic topic areas in bioethics: death and dying, the therapeutic relationship, method and theory in bioethics, organ transplantation, health care justice, defining health care needs, reproduction and fertility, families, babies and children, research ethics, and genetics. Classes meet two evenings per week for seminar sessions (two hours per session).

Another required course is BETH 405: Clinical Ethics Rotation (three credits). This course requires a minimum of 10 hours of clinical experience per week during two 10-week rotations. Although there are some didactic and seminar sessions, students spend most of their time observing rounds in relevant services (intensive care units, pediatrics, geriatrics, etc.) with leading clinicians at several area hospital sites. Students must complete rotations at two sites. At the conclusion of each rotation, students are familiar with the clinical, psychological, social, professional, and institutional contexts in which ethical problems arise. Also, they are able to identify, analyze, and understand ethical issues as they develop.

In addition, all students must complete 12 credit hours of electives. Electives are selected in consultation with a faculty adviser. Electives must enhance the student’s understanding of bioethical issues and must be relevant to the student’s academic goals.

The department currently offers dual degree programs with the School of Medicine (M.D./M.A.), the School of Medicine’s Department of Genetics (Ph.D./M.A.), the School of Law (J.D./M.A.), the Frances Payne Bolton School of Nursing (M.S.N./M.A.), and the Weatherhead School of Management (M.B.A./M.A.) at Case. Students must apply and be accepted to each program to qualify.

Admission policies conform to those of Case’s School of Graduate Studies. In general, an applicant for admission and concurrent financial consideration must have completed application forms on file by March 1 for the fall semester.

PH.D. IN BIOETHICS

The increasing complexity of the health care system has resulted in a growing need for investigators who can conduct research to address pressing social problems in bioethics. The objective of the bioethics doctoral program is to train scholars who will have specific expertise in the conceptualization, design and conduct of empirical research concerning bioethics questions. Graduates will:

- obtain grounding in the philosophical basis of bioethics to conceptualize and analyze moral problems;
- develop a theoretical perspective to guide their research;
- be proficient in empirical methodologies (both qualitative and quantitative) so that they can conduct research in bioethics problems; and
- become researchers who can develop and conceptualize timely and meaningful research questions in bioethics.

Graduates of the program have a wide range of opportunities, including careers as independent investigators, serving as a bridge between colleagues in the traditional medical humanities and those in clinical and basic-science departments, and employment in academic bioethics centers, clinical, and basic science departments in medical schools and schools of public health, government agencies, and public policy institutes.

Each student will receive a full scholarship and a $20,000-per-year graduate assistantship.

Course of Study

- Minimum of 51 credit hours of course work for candidates with bachelor’s degrees; minimum of 42 credit hours for candidates with master’s degrees
- 18 credit hours of dissertation course work
- 125 research hours (supervised research experiences with Department faculty)
- Training in research ethics
- Comprehensive examination preceding advancement to candidacy
- Defense of dissertation proposal
- Completion of dissertation
- Defense of dissertation
Core course work (see course descriptions for more information)

- Foundations in Bioethics I & II
- Clinical Ethics Rotation
- Advanced Seminar on Methods in Normative Bioethics I & II
- Empirical Research Methods and Design in Bioethics I & II
- Statistical Methods and Data Management in Bioethics I & II
- Grant Writing
- Critical Readings in Bioethics

Research hours

Additional course work: three credit hours each in advanced statistics, methods and study design, and theory from the social sciences, and six credit hours of elective courses

Enrollment in the Doctoral Program

The doctoral program is highly selective. Candidates should have a strong theoretical background in the social sciences or philosophy, preferably in the form of a master's degree in a relevant discipline or a clinical degree. Candidates also must demonstrate an ability to work with quantitative data and demonstrate promise of integrating theory and empirical application.

Applicants must complete an interview and submit:

- Transcripts (undergraduate and graduate if applicable)
- GRE scores — verbal, analytic, and quantitative sections. Scores will be considered in relation to the applicant’s other credentials. Applicants may submit scores of other standardized tests in addition to the GRE.

- Three letters of recommendation
- A letter to the admission committee detailing the applicant’s general interests in bioethics and the candidate’s past training and current research interests
- Completed Case Western Reserve University graduate school application form

For more information about the Department of Bioethics and its programs, contact:

Coordinator for Graduate Programs
Department of Bioethics
School of Medicine
10900 Euclid Ave.
Cleveland, Ohio 44106-4976
Phone: (216) 368-8718
E-mail: bioethics@case.edu

BIOETHICS (BETH)

Undergraduate Course

BETH 271. Bioethics: Dilemmas (3)
We have the genetic technology to change nature and human nature, but should we? We have the medical technology to extend almost any human life, but is this always good? Should we clone humans? Should we allow doctor-assisted suicide for the terminally ill? This course invites students from all academic disciplines and fields to examine current and future issues in bioethics—e.g., theory and methods in bioethics; death and dying; organ transplantation; genetics; aging and dementia; fertility and reproduction; distributive justice in health care access. The course will include guest lecturers from nationally-known Bioethics faculty. Cross-listed as PHIL 271 and RLGN 271.

Graduate Courses

BETH 401. Foundations in Bioethics I (6)
The first of the two required seminar courses, this course covers five basic topic areas in bioethics: death and dying; health professional-patient relationship; method and theory in bioethics; organ transplantation; and ethics and children. The course meets twice weekly and is taught in seminar format by Center faculty members who are experts on specific topics. Preentry.

BETH 402. Foundations in Bioethics II (6)
This course completes the required seminar core and covers the basic bioethics topic areas: health care justice; defining ‘health care needs’; reproduction and fertility ethics; research ethics; and ethics in genetics. The course meets twice weekly and is taught in seminar format by Center faculty members who are experts on specific topics. Prereq: BETH 401.

BETH 405. Clinical Ethics Rotation (1.5-3)
In this course students will become familiar with the clinical, psychological, social, professional, and institutional context in which ethical problems arise. This course exposes students to clinical cases, to hospital ethics committees and ethics consultation programs, to institutional review boards (IRB), and to hospital policies covering the “do not resuscitate” orders (DNR), advance directives, withdrawal of artificial feeding, organ procurement and transplantation, and medical futility. Requires minimum of 10 total hours of rotation experience per week during two semester 10-week rotations. Locations for this course include: MetroHealth Medical Center, University Hospitals of Cleveland, and the Hospice of the Western Reserve. Prereq: BETH 401 or concurrent enrollment.

BETH 411. Bioethics: Public Intellectuals (3)
This course will provide a small number of students (limit 15) with an opportunity to study in depth those thinkers in the field of bioethics whose work has achieved wide and sustained public recognition and influence. In this particular offering of the course, we will examine representative works by Peter Singer, Leon Kass, Daniel Callahan, Sissela Bok, Stephen J. Carter, Edmund Pellegrino, and several others who achieved the status of public intellectual over the last two decades. We will, as background, examine several salient essays on the nature of the public intellectual with regard to motivation, style, constituency, and influence.

BETH 412. Ethical Issues in Genetics/Genomics (3)
This course is designed to familiarize graduate students with the major controversies over the generation and use of new human genetic information. Topics will include the spread of predictive genetic testing, prenatal diagnosis, genetic discrimination, human genetic variation research, eugenics, genetic counseling, and the limits of human gene therapy. The course will be conducted as a seminar, involving discussions of readings, guest speakers, and student presentations.

BETH 413. Consumerism and Medicine (3)
Course is designed to investigate the role of consumerism and commercialism in contemporary biomedical research and practice. Also, the course will look historically at the changing norms and ethos of medicine and medical professionals. Topics include the history of the professionalization of medicine, the rise of the consumer health movement, the commodification of health and health products, medicine and consumer culture, commercial interests in prescription drugs, direct-to-consumer advertising of drugs and services, e-medicine, gender and consumption, and entrepreneurialism in the medical sciences.

BETH 440. Science and Society Through Literature (3)
(See PHRM 440.) Cross-listed as PHRM 440.

BETH 452. Models of Mind, Mental Disorders, and Bioethics (3)
Discussions of basic theories in the philosophy of mind with analysis and application of these theories to issues raised by real mental disorders and case studies in psychiatry. Emphasis on the interaction between philosophical understandings of the mind and society, with examples from psychiatric writings and general literature on the philosophy of mind. Advance reading is necessary. Classes include a combination of lecture presentation, student presentations from pre-reading, and discussion around key questions.

BETH 463. Anthropology and Bioethics (3)
This course will review theoretical work on anthropology and values, the discipline of bioethics, its philosophical roots, the body of anthropological work in bioethics, and critically examine a number of current bioethical issues in the United States and internationally. Cross-listed as ANTH 463.

BETH 496. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

BETH 501. Advanced Seminar in Bioethics (3)
Special topics of interest, such as advanced studies in theory and method in bioethics, ethics and reproduction, the ethics of research with human subjects, religion and medicine, historical perspectives on medical ethics, cross-cultural issues in bioethics, or ethics in applied settings such as hospitals and long term care facilities. Seminar typically taught by visiting professor in intensive format. Consult the term roster of courses for the specific topic. Prereq: BETH 401 or concurrent enrollment.

BETH 505. Methods in Normative Bioethics I (3)
The first of the two required Methods seminars is designed to give graduate students an intensive introduction to the modes of moral reasoning that have been adopted and adapted by contemporary Bioethics, and
and ethics and children. The course meets twice weekly
method and theory in bioethics; organ transplantation;
and dying; health professional-patient relationship;
course covers five basic topic areas in bioethics: death
The second of the two required seminar courses, this
BETH 507. Research Design in Bioethics I (3)
The first of two empirical research courses will
introduce students to theoretical and methodological
approaches in the design and implementation of em-
pirical research on topics in biomedical ethics. Students
will be provided with a comprehensive and robust
exploration of empirical models for the development of
bioethics research and the skills for critically assessing
the optimal methods for designing studies relevant to
ethical issues in biomedicine.

BETH 508. Research Design in Bioethics II (3)
The second of two empirical research courses will
introduce students to theoretical and methodological
approaches in the design and implementation of em-
pirical research on topics in biomedical ethics. Students
will be provided with a comprehensive and robust
exploration of empirical models for the development of
bioethics research and the skills for critically assessing
the optimal methods for designing studies relevant to
ethical issues in biomedicine.

BETH 509. Statistical Methods in Bioethics I (3)
The first of two required Statistical Methods will focus
on basic concepts of distributions of random variables,
point and interval estimation, statistical hypotheses,
correlation and regression; and survey of statistical
methods in analysis of variance, categorical data analy-
sis, survival data analysis, non-parametric methods,
generalized linear model and multivariate techniques.
Students will also be introduced to data management
strategies and computer applications in database
management. Topics in the use of statistical packages
will be introduced and used to solve data-intensive
problems and projects.

BETH 510. Statistical Methods in Bioethics II (3)
The second of two required Statistical Methods will focus
on basic concepts of distributions of random variables,
point and interval estimation, statistical hypotheses,
correlation and regression; and survey of statistical
methods in analysis of variance, categorical data analy-
sis, survival data analysis, non-parametric methods,
generalized linear model and multivariate techniques. Students will also be introduced to data management
strategies and computer applications in database
management. Topics in the use of statistical packages
will be introduced and used to solve data-intensive
problems and projects. Prereq: BETH 509.

BETH 520. Foundations in Bioethics I - Ph.D. (3)
The first of the two required seminar courses, this
course covers five basic topic areas in bioethics: death
and dying; health professional-patient relationship;
method and theory in bioethics; organ transplantation;
and ethics and children. The course meets twice weekly
and is taught in seminar format by Center faculty
members who are experts on specific topics.

BETH 521. Foundations in Bioethics II - Ph.D. (3)
The second of the two required seminar courses, this
course covers five basic topic areas in bioethics: death
and dying; health professional-patient relationship;
method and theory in bioethics; organ transplantation;
and ethics and children. The course meets twice weekly

BETH 506. Methods in Normative Bioethics II (3)
The second of the two required Methods seminars is
designed to give graduate students an intensive intro-
duction to the modes of moral reasoning that have
been adopted and adapted by contemporary Bioethics,
and the major critical perspectives that have been
brought to bear upon them.

BETH 602. Special Topics in Bioethics (1-3)
Students will explore particular issues and themes in
biomedical ethics in depth through independent study
and research under the direction of a faculty member.
Prereq: Consent of instructor.

Biomedical Sciences Training Progam

The Biomedical Sciences Training Program (BSTP) offers graduate studies leading to the Ph.D. degree. The pro-
gram is designed to prepare qualified and motivated students for careers in research and teaching.
The BSTP is comprised of 14 graduate programs in the School of Medicine and the College of Arts and Sciences. These programs have more than 200 faculty,
based in both basic science and clinical departments. The research of this faculty covers the entire range of biomedical
research. Students in the BSTP have the opportunity to study within any research discipline represented in the training
programs. This opportunity gives students a tremendous range of research choices. It also provides a distinct advantage over tra-
ditional programs, which restrict choices of research area and faculty advisers.

THE FIRST YEAR

Course Work

Students take an integrated series of courses in cell and molecular biology (CBIO 453 and 455). This one-semester
course emphasizes the molecular approach that forms the basis of modern biology. Qualified students may also take more
specialized elective courses.

Research Rotations

The research rotations allow the student to sample areas of research and become familiar with faculty members and their
laboratories. The main purpose of these rotations is to aid the student in selecting a laboratory for the thesis work. Students are
encouraged to begin their rotations in July. Doing so gives them the opportunity to complete one rotation during the
summer before classes begin at the end of August. A minimum of three rotations must be completed during the year.

Choosing a Thesis Adviser

During the first year, students select an advisor for the dissertation research. Each student also joins the training program
with which the advisor is affiliated. Once a student has chosen a program, the specific requirements of that program are fol-
lowed to obtain the Ph.D. The emphasis of the Ph.D. work is on research, culminating in the completion of an original,
independent research thesis.

Participating Training Programs

Anatomy
Biochemistry
Biology
Cell Biology
Developmental and Human Genetics
Developmental Biology
Environmental Health Sciences
Molecular Biology
Molecular and Cellular Basis of Disease
Molecular Virology
Neuroscience and Bioengineering
Neurosciences
Nutritional Sciences
Pharmacological Sciences

Training faculty, course offerings, and individual degree requirements are described in detail in the separate listings for
each of these programs.

BIOMEDICAL SCIENTIST TRAINING PROGRAM (BSTP)

Graduate Course

BSTP 400. Research Rotation in Biomedical Sciences Training Program (0-6)
Prereq: Consent of BSTP program coordinator.
Cell Biology Program

115 Pathology Institute
Phone (216) 368-5544
E-mail alan.tartakoff@Case.edu
http://www.case.edu/med/cellbiology

The Cell Biology Program provides educational and research opportunities through its journal clubs and colloquia and through graduate training toward the Ph.D. degree. The research environment includes all the basic science departments of the School of Medicine, the Department of Biology, and several laboratories at University Hospitals of Cleveland and the Cleveland Clinic Foundation. These departments collectively cover a diverse set of areas of contemporary interest in the cell biology of higher animals, plants, yeast and other microorganisms. These include the extracellular matrix, secretion and endocytosis, cell adhesion, the cytoskeleton, the nuclear envelope, and others. Many of these areas interface with local research in biochemistry, genetics, immunology, molecular biology, neuroscience, pharmacological sciences, and physiology and biophysics.

First-year graduate students follow the Correlated Curriculum in Cell and Molecular Biology (CBIO 453-456, 12 credit hours) along with students from all graduate departments. They also complete three laboratory rotations (starting July 1) among the laboratories of training faculty, which span the entire campus. The goal of the rotations is to guarantee that the student has sufficient breadth of familiarity with cell biology faculty to allow him or her to make the best choice of a permanent research laboratory. In all cases, this selection must be made, with the consent of the sponsor and his or her department, before nine months have elapsed. First-year students also actively participate in the weekly Cell Biology Journal Club and attend the cell biology colloquia.

During the subsequent years, students devote most of their time to laboratory research, while also attending courses, seminars, and journal clubs and participating in occasional national/international Cleveland cell biology symposia organized by the program. Past or planned topics include Membrane Traffic in Health and Disease (1996), Cell Biology of Huntington's Disease and Related Disorders (2000), Perspectives on the Fragile X Syndrome (2001), and Regulation of Functions of the Nucleus (2004).

The elective courses may be given by any department or program on campus. Students must take a total of 36 credit hours of courses and maintain a B average.

Preparation for the qualifying exam and the writing of research proposals and the dissertation match the norm of the department in which the student elects to do his or her thesis work; however, the content of the exams and proposal(s) must have a clear emphasis on cell biology itself.

All efforts should be made to complete the Ph.D. within four years. It is expected that the student will be the first author on at least two articles accepted for publication in highly regarded scientific journals.

PARTICIPATING FACULTY


Required (first year)

CBIO 453-456. Correlated Curriculum in Cell and Molecular Biology (12 credits) Electives are listed on the Cell Biology Program Web site.

CLBY 701 Dissertation (credit as arranged)

CELL BIOLOGY (CBIO)

Graduate Courses

CBIO 453. Cell Biology I (4) Part of the first semester curriculum for first year graduate students along with CBIO 455. This course is designed to give students an intensive introduction to prokaryotic and eukaryotic cell structure and function. Topics include membrane structure and function, mechanisms of protein localization in cells, secretion and endocytosis, the cytoskeleton, cell adhesion, cell signaling and the regulation of cell growth. Important methods in cell biology are also presented. This course is suitable for graduate students entering most areas of basic biomedical research. Undergraduate courses in biochemistry, cell and molecular biology are excellent preparation for this course. Prereq: BIOC 307 or BIOC 407.

CBIO 455. Molecular Biology I (4) Part of the first semester curriculum for first year graduate students along with CBIO 453. This course is designed to give students an intensive introduction to prokaryotic and eukaryotic molecular biology. Topics include protein structure and function, DNA and chromosome structure, DNA replication, RNA transcription and its regulation, RNA processing, and protein synthesis. Important methods in molecular biology are also presented. This course is suitable for graduate students entering most areas of basic biomedical research. Undergraduate courses in biochemistry, cell and molecular biology are excellent preparation for this course. Prereq: BIOC 307 or BIOC 407.

CBIO 518. Signaling via Cell Adhesion (2) (See MBIO 518.) Cross-listed as MBIO 518.

CLBY 416. Fundamental Immunology (3) (See PATH 416.) Cross-listed as PATH 416.

CLBY 417. Cytokines: Function, Structure and Signaling (3) (See PATH 417.) Cross-listed as BIOL 417 and PATH 417.

CLBY 466. Cell Signaling (3) (See PHOL 466.) Cross-listed as PHOL 466.

CLBY 468A. Membrane Physiology I (3) (See PHOL 468A.) Cross-listed as PHOL 468A.

CLBY 487. Cell Biology of the Nucleus (3) (See PATH 487.) Prereq: CBIO 453 and CBIO 454 or consent of instructor. Cross-listed as PATH 487.

CLBY 488. Yeast Genetics and Cell Biology (3) (See MBIO 488.) Cross-listed as MBIO 488.

CLBY 518. Cell Surfaces and Matrices (3) Lecture and discussion course emphasizing current advances in cell-cell and cell-substrate interactions. Cross-listed as NEUR 518.

CLBY 519. Molecular Biology of RNA (3) (See MBIO 519.) Cross-listed as MBIO 519.

CLBY 525. Transport and Targeting of Molecules in Health and Disease (3) (See PATH 525.) Cross-listed as PATH 525.


CLBY 601. Special Problems (1-18) This is the listing for independent research. Students should enroll in this course once they have selected their laboratory for Ph.D. research. The number of credit hours depends on how many didactic courses they are following at the same time. Once they have
The Department of Environmental Health Sciences is devoted to the study of the fundamental mechanisms responsible for disease processes initiated or aggravated by environmental agents. Indoor and outdoor environments consist of complex interacting systems. These systems require the development of new approaches to understanding the basis of their action. This realization was the impetus for the creation of the department. Current research interests of the faculty include chemical and environmental carcinogenesis, genetic and reproductive toxicology, cytogenetics, radiation biology, and clinical and forensic toxicology.

The Department of Environmental Health Sciences participates in the integrated Biological Sciences Training Program (BSTP) and offers M.S. and Ph.D. degrees. In addition to participating in the flexible program and offering research opportunities to medical students, the department sponsors an M.D./M.S. program for students who have received formal acceptance to the School of Medicine and are interested in expanding their training in the area of environmental health sciences. This program allows students to complete the requirements for both degrees within a four-year period.

**GRADUATE PROGRAMS**

The master of science and doctor of philosophy degree programs are designed to increase the student's knowledge of environmental health science as well as to provide a firm foundation in the life sciences. The programs are multidisciplinary and emphasize cancer biology, environmental toxicology, and nutrition and toxicology. They are based on a core classroom curriculum in the biological sciences, including biochemistry, biostatistics, microbiology, genetics, molecular biology, pharmacology, epidemiology, and toxicology.

### Master's Degree Programs

**Thesis (Plan A) and non-thesis (Plan B)** master of science degree programs are offered to students who have completed an undergraduate degree program from an accredited university or college. Course schedules are arranged to accommodate individuals who wish to enroll on a part-time basis. Both programs require a total of 27 semester hours at the 400 level or higher. A minimum of 27 semester hours of formal course work is required for the non-thesis degree, and a minimum of 18 semester hours is required for the thesis degree. The remaining nine hours required for completion of Plan A must be fulfilled with research credits (EVHS 651). Students enrolled in Plan B must pass a comprehensive examination before being awarded the degree. The requirements for the master's program must be completed within five consecutive calendar years after matriculation.

**Ph.D. Program**

Admission to the doctoral degree program may follow successful completion of the undergraduate degree or master's degree program. A minimum of 36 semester hours of graduate study is required for students entering with an undergraduate degree, and 18 semester hours typically are required for students who have completed an M.S. degree program. A proposal-type examination is required before admission to candidacy. Award of the Ph.D. degree is dependent on completion of the course work requirements, 18 hours of dissertation research credit (EVHS 701 or 702), and an original, independent research project under the guidance of a faculty adviser, as well as the submission and defense of a written dissertation. There is no foreign language requirement.

**FINANCIAL SUPPORT**

Financial support is available for Ph.D. candidates and for a limited number of full-time master's degree candidates.

For more information, Those interested in obtaining applications should contact Karen E. Hendershott, department administrator, at 10900 Euclid Ave., Cleveland, Ohio 44106-4940, telephone (216) 368-5959, or e-mail karen.hendershott@case.edu, or contact Carole S. Jackson, department assistant, at (216) 368-5961 or carole.jackson@case.edu. For further information, contact Karen E. Hendershott by the aforementioned means or Martina L. Veigl, Ph.D., at 11001 Cedar Ave., Cleveland, Ohio 44106-7047, telephone (216) 844-7525, or e-mail martina.veigl@case.edu.

**ENVIRONMENTAL HEALTH SCIENCES (EVHS)**

**Graduate Courses**

**EVHS 401A. Fundamentals of Environmental Health Sciences: Biochemical Toxicology (1.5)**

This core course details the fundamentals of biochemical toxicology. Specific topics include oxidations, reductions, phase I and II xenobiotic metabolism, and mechanisms of cellular toxicity.

**EVHS 401B. Effects of Exposure to Environmental Mutagens (1.5)**

This course provides an overview of compounds found in the environment. The toxicity, mutagenicity, carcinogenicity, and teratogenicity of these environmental agents and the potential for human exposure to these agents through environmental, occupational and medicinal routes are discussed. Prereq: EVHS 402A.

**EVHS 402A. Fundamentals of Environmental Health Sciences: Risk Assessment (1.5)**

This course provides an overview of the scientific approaches used to determine whether environmental agents are potentially dangerous to people. In this course, criteria utilized for establishing exposure limits are presented and short term assays, epidemiology studies and clinical trials are discussed which are used to assess the impact of environmental exposure on normal and genetically susceptible individuals.

**EVHS 402B. Fundamentals of Environmental Health Sci: Biochemical Toxicology II (1.5)**

This core course focuses on pharmacology. General principles of pharmacology drug transport and absorption, drug metabolism, neuropharmacology, immunopharmacology, and pharmacokinetics are discussed. (See EVHS 402A.)
EVHS 403A. Radiation Biology: Cells, Tissues, Organisms (1.5)
Major emphasis on cellular and molecular radiation biology. Includes discussion of the physics and chemistry of radiation; factors that modify the cellular response to radiation; molecular and genetic effects of radiation on cells, individuals, and populations; analysis of risks vs. benefits of diagnostic and therapeutic radiation, the molecular biology of the radiation response.

EVHS 401B. Cellular and Molecular Radiation Oncology (1.5)
Topics include: time, dose, dose rate, and fractionation in the therapeutic use of radiation; molecular biology of the radiation response and manipulation of the response for therapeutic benefit; the physics, chemistry, biology, and molecular biology of alternate treatment modalities, including hyperthermia and photodynamic therapy.

EVHS 502. Genetic Toxicology II: DNA Damage and Repair (3)
This course provides an in-depth consideration of agents which alter DNA directly or indirectly through effects on its synthesis and examines the mechanisms and repair processes through which cells respond to this damage. The class consists of formal lectures which introduce each topic, and analysis of up-to-date literature on topics representative of major current areas of interest in this field. Topics covered include fidelity of DNA replication, excision repair, mismatch repair, transcription-linked repair, SOS repair and recombination repair. Other DNA damage responses controlling decision points between DNA repair and apoptosis are also considered. Agent-specific DNA damage, such as that caused by agents leading to bulky adducts, AP sites, base-base mismatches and damage to DNA bases, are considered in the context of specific repair processes responding to these DNA insults in prokaryotes and eukaryotes. Prereq: EVHS 401A, EVHS 401B, EVHS 402A, and EVHS 402B.

EVHS 506. Independent Study in Environmental Health Sciences (1-6)

EVHS 510. Molecular Oncology (3)
This course explores the role of environmental factors in causing alterations in cellular mechanisms which lead to cancer. Emphasis is placed on genetic and other regulatory alterations leading to cell transformation. The possible role of oncogenes and suppressor genes in these processes and the mechanisms through which chemotherapy and immunotherapy manifest toxicity for cancer cells are considered.

EVHS 651. Master's Thesis Research (1-9)

EVHS 701. Dissertation Ph.D. (1-9)
(Credit as arranged.)

EVHS 703. Dissertation Fellowship (1-8)

### Department of Epidemiology and Biostatistics

Room W-G57, School of Medicine
Phone (216) 368-3197
http://epbiwww.case.edu/

The Department of Epidemiology and Biostatistics offers graduate programs leading to the master of science, doctor of philosophy, M.D./Ph.D., and master of public health degrees. Students may select a division in one of the following programs: biostatistics, epidemiology, genetic and molecular epidemiology, health services research, and public health.

Epidemiology is the study of the distribution and determinants of disease in human populations. Epidemiologic studies are concerned with the determination of risk factors for a particular disease, such as cigarette smoking and bladder cancer. After risks are determined, epidemiologists concern themselves with interventions to prevent, treat, or change the behavior to reduce the probability of disease.

The study of biostatistics includes design and analysis of experimental studies such as clinical trials and non-experimental studies, theory of probability and statistics, mathematical and statistical modeling, and knowledge of methodology used to evaluate the properties of statistical procedures. It also includes a competency in computers, which encompasses programming, statistical software use, and database management. Biostatistical methods are utilized in almost all medical research.

Genetic and molecular epidemiology encompasses the study of genetic and environmental factors that determine the distributions and dynamics of health outcomes in populations. Investigating such outcomes entails using tools from both the field of human genetics and the field of epidemiology. Numerous human disorders appear to result from the joint action of genes and environment, providing the genetic epidemiologist with ample opportunity for making important contributions to the study of human disease.

According to the Institute of Medicine, health services research is a “multidisciplinary field of inquiry, both basic and applied, that examines the use, costs, quality, accessibility, delivery, organization, financing, and outcomes of health care services to increase knowledge and understanding of the structures, processes, and effects of health services for individuals and populations.” The health services research division prepares professionals to design and implement sophisticated studies of complex health services issues and problems using a wide range of quantitative and qualitative analytic techniques. Graduates are prepared for careers in academia, industry, and an array of health-oriented organizations and agencies.

A master of public health degree is designed to prepare students to address the broad mission of public health, defined as “enhancing health in human populations, through organized community effort,” utilizing education, research, and community service. Public health practitioners are prepared to identify and assess the health needs of different populations, and then to plan, implement, and evaluate programs to meet those needs. It is the task of the public health practitioner to protect and promote the wellness of humankind. For more information about the master of public health degree program, please see “Other Degree Programs” in the medical school section of this General Bulletin or contact the department.

Department faculty are nationally recognized and have more than $11 million in grants that support projects including HIV/TB research in Uganda, the search for genes that cause disease, cancer prevention and control, studies of interventions to change human behaviors that promote good health, design of clinical trials, studies to change high-risk behaviors related to AIDS, studies of public policies concerning the health of the elderly, and cost/benefit studies of medical interventions. The department has offices at the university, the Memory and Aging Center, the Louis Stokes Cleveland Department of Veteran’s Affair Medical Center, and MetroHealth Medical Center, the latter nationally recognized as a premier public hospital. The department also maintains a scientific computer center comprised of 15 servers. Several very large national health care and demographic databases (including Medicare, Medicaid, and Vital Statistics databases) are stored on the servers and are used for faculty and student research and educational projects.
EPIDEMIOLOGY AND BIOSTATISTICS

Graduate Courses

EPBI 407. Basic Biostatistics for Medical Scientists
A survey course designed to introduce residents and fellows of clinical departments to the terminology, concepts and methods of biostatistics as applied to clinical and basic medical research. Medical examples will illustrate statistical concepts and methods including descriptive statistics and graphical presentation, estimation and hypothesis testing, power and sample size considerations, statistical analysis on continuous and categorical data, parametric and nonparametric methods, regression and correlation and basics of statistical modeling and survival analysis.

EPBI 408. Public Policy and Aging

EPBI 411. Introduction to Behavioral Medicine
Using a biopsychosocial perspective, an overview of the measurement and modeling of behavioral, social, psychological, and environmental factors related to disease prevention, disease management, and health promotion is provided. Cross-listed as MPH 411.

EPBI 414. Introduction to Statistical Computing
This course introduces the use of computers in epidemiologic investigations and biostatistical applications. Topics covered include the computer operating system UNIX, the use of the Internet to access and obtain databases, and database and spreadsheet computing, along with instruction in the use of several useful software packages (SAS and S-Plus) for database management, spreadsheet construction, statistical analysis, and graphics. Primary emphasis is on developing the knowledge and familiarity required for running these particular programs in connection with data collection, analysis, and presentation of results in clinical studies. Students will be required to complete assignments using personal computers and UNIX systems maintained by the departments of basic and clinical sciences. Prerequisites to this course are computer literacy and the use of UNIX systems. Cross-listed as MPH 411.

EPBI 420. Structured Computer Programming
This course introduces structured computer programming as a discipline beginning with the precise statement of a problem, development and stepwise refinement of an algorithm using pseudo-code, and the final expression of the algorithm in a modern high-level programming language. Emphasis is placed on both the process of algorithm development and the details of the high-level, structured programming language in which the final algorithm is expressed. Students will be required to complete assignments using personal computers and UNIX systems maintained by the department.

EPBI 431. Statistical Methods I (3)
Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions. Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year.

EPBI 432. Statistical Methods II (3)

EPBI 433. Community Interventions and Program Evaluation (3)
This course prepares students to design, conduct, and assess community-based health interventions and program evaluation. Topics include assessment of need, evaluator/stakeholder relationship, process vs. outcome-based objectives, data collection, assessment of program objective achievement based on process and impact, cost-benefit analyses, and preparing the evaluation report to stakeholders. Prereq: EPBI 490, EPBI 431, or MHPH 405. Cross-listed as MHPH 433.

EPBI 435. Survival Data Analysis (3)
Basic concepts of survival analysis including hazard function, survival function, types of censoring: non-parametric models; extended Cox models: time dependent variables, piece-wise Cox model, etc.; sample size requirements for survival studies. Prereq: EPBI 432.

EPBI 441. Biostatistics I (3)
Sampling techniques and statistical methods applicable to data derived from sampling surveys. Principles of random sampling, stratification, systematic sampling, and cluster sampling. Emphasis on sampling problems encountered in surveying human populations. Prereq: EPBI 432.

EPBI 442. Biostatistics II (3)
This course deals with the basic concepts and applications of nonparametric statistics. Topics will include distribution-free statistics, one sample rank test, the Mann-Whitney and Kruskal Wallis tests, one sample and two sample U-statistics, asymptotic relative efficiency of tests, distribution-free confidence intervals, point estimation and linear rank statistics. Prereq: EPBI 441. Cross-listed as MHPH 442.

EPBI 443. Applied Multivariate Analysis (3)
Starts with review of matrix algebra as it pertains to multivariate statistics, then proceeds to study inference about multivariate means: Hotelling’s T2, Manova, Mancova, growth curves, and other linear models, such as simultaneous confidence interval, and linear discriminant analysis and its relationship to logistic model. Prereq: EPBI 432.

EPBI 446. Theory and Methods of Experimental Design (3)
This course deals with basic problems of experimental design. Topics will include completely randomized and balanced incomplete block designs, parallel groups designs, Youden and Latin squares, repeated measurements studies, factorial experiments and designs for biosays and response surfaces. Prereq: EPBI 432. Cross-listed as STAT 466.

EPBI 448. Genetic Analysis Programs (3)
Theory underlyng software developed specifically for the genetic analysis of family data. The course will focus mainly on the programs in the S.A.G.E. (Statistical Analysis for Genetic Epidemiology) program package, but will also cover other programs that are available. Use of these programs to determine genetic components of complex traits and writing up reports summarizing the results. Prereq: EPBI 452 and EPBI 457.

EPBI 450. Clinical Trials and Intervention Studies (3)
Issues in the design, organization, and operation of randomized, controlled clinical trials and intervention studies. Emphasis on long-term multicenter trials. Topics include legal and ethical issues in the design; application of concepts of controls, masking, and randomization; steps required for quality data collection; monitoring for evidence of adverse or beneficial treatment effects; elements of organizational structure; sample size calculations and data analysis procedures; and common mistakes. Cross-listed as MHPH 450.

EPBI 451. Principles of Genetic Epidemiology (3)
A survey of the basic principles, concepts and methods of the discipline of genetic epidemiology, which focuses on the role of genetic factors in human disease and their interaction with environmental and cultural factors. Many important human disorders appear to exhibit a genetic component; hence the integrated approaches of genetic epidemiology bring together epidemiologic and human genetic perspectives in order to answer critical questions about human disease. Methods of inference based upon data from individuals, pairs of relatives, and pedigrees will be considered. Prereq: EPBI/MPHP 431 or MHPH 405, EPBI/MPHP 490. Cross-listed as GENE 451 and MHPH 451.

EPBI 452. Statistical Methods for Genetic Epidemiology (3)
Analytic methods for evaluating the role of genetic factors in human disease, and their interactions with environmental factors. Statistical methods for the estimation of genetic parameters and testing of genetic hypotheses, emphasizing maximum likelihood methods. Models to be considered will include such components as genetic loci of major effect, polygenic inheritance, and environmental, cultural and developmental effects. Topics will include familial aggregation, segregation and linkage analysis, ascertainment, linkage disequilibrium, and disease marker association studies. Prereq: EPBI 431 and EPBI 451.

EPBI 453. Categorical Data Analysis (3)
Descriptive and inferential methods for categorical data with applications: bivariate data; models for binary and multinomial response variables, with emphasis on logit models; loglinear models for multivariate data; model fitting using the maximum likelihood approach; model selection and diagnostics; and sample size and power considerations. Topics in repeated response data as time allows. Prereq: EPBI 441.

EPBI 454. Population Genetics for Genetic Epidemiology (3)
This course will cover basics of population genetics (mutation, migration, natural selection) as well as topics such as random mating populations and inbred populations. Emphasis will be placed on migration studies and on linkage disequilibrium mapping. Measures on linkage disequilibrium, methods for linkage disequilibrium mapping of disease genes and the use of isolated versus outbred population in linkage of disequilibrium mapping will be discussed. Prereq: EPBI 431.

EPBI 455. Genetic Epidemiology of Complex Diseases (3)
This course gives an integrated view to the process of genetic epidemiology as applied to complex diseases. To provide a basis, we initially study concepts of logic and causality. We then investigate the steps involved with a coherent approach to deciphering complex diseases in genetic epidemiology. In particular, the course covers: migrant studies, familial aggregation,

EPBI 457. Genetic Linkage Analysis (3) Methods of analyzing human data to detect genetic linkage between disease traits, discreet and continuous, and polymorphic markers. Both model-based maximum likelihood (lod score) and model-free robust methods will be discussed. Additional topics covered will include measures of informativeness, multipoint analysis, numerical methods and mod score analysis. Prereq: EPBI 452.

EPBI 458. Statistical Methods for Clinical Trials (3) This course will focus on special statistical methods and philosophical issues in the design and analysis of clinical trials. The emphasis will be on practically important issues that are typically not covered in standard biostatistics courses. Topics will include: randomization techniques, intent-to-treat analysis, analysis of compliance data, equivalency testing, surrogate endpoints, multiple comparisons, sequential testing, and Bayesian methods. Prereq: EPBI 432 or MHPH 432. Cross-listed as MHPH 458.

EPBI 459. Longitudinal Data Analysis (3) This course will cover statistical methods for the analysis of longitudinal data with an emphasis on application in biological and health research. Topics include: exploratory data analysis, response function analysis, growth curve models, mixed-effects models, generalized estimating equations, and missing data. Prereq: EPBI 432.

EPBI 460. Health Research Methods I (3) This is a course in research methods focusing on practical issues in the conduct of health services research studies. Topics include: an overview of health services research; ethics in health services research; proposal writing and funding; the relationship between theory and research; formulating research questions; specifying study design and study objectives; conceptualizing and defining variables; validity and reliability of measures; scale construction; operationalizing health research relevant variables using observation, self and other report, and secondary analysis; formatting questionnaires; developing analysis plans; choosing data collection methods; sampling techniques and sample size; carrying out studies; preparing data for analysis; and reporting of findings. Cross-listed as MHPH 460.

EPBI 461. Health Research Methods II (3) Focus on measurement strategies for key health services research concepts including case mix, severity of illness, functional status, and patient outcomes. Examine the interplay between physician practice patterns, geography, standards of care, and practice guidelines and patient management and outcomes. Statistical methods especially useful in health services research (e.g., cost-effectiveness and cost/benefit analysis, conjoint analysis, utility assessment, and meta-analysis) will be introduced as well as examining approaches to the assessment of care quality. Prereq: EPBI 460.

EPBI 462. Computation Methods in Genetic Epidemiology (3) Methods for computing genetic likelihoods and estimating genetic parameters; Elston-Stewart algorithm, IBD computation; Markov chain Monte Carlo methods; Gibbs sampling; Newton-Raphson; E-M algorithm. Prereq: EPBI 457 and EPBI 482.

EPBI 463. Survey Design and Data Collection in Health Research (3) This course takes an in-depth look at survey questionnaire design and issues related to collecting and using survey data. Specifically, the course focuses on four major areas: (a) survey design; (b) developing and writing survey questions; (c) assessing reliability and validity; and (d) scale development and psychometric exploration (factor analyses). Students receive practical experience at writing survey questions, as well as analyzing survey data using existing databases. Basic statistical background is required for this course. Prereq: EPBI 431. Cross-listed as MHPH 463.

EPBI 464. Decision Support Systems (3) Review of methods for decision support in medicine. Discussion of the need for such methods motivated by psychological literature on human perceptual and judgmental limitations. Review of existing methods for aiding decisions including artificial intelligence and statistical methods to enhance diagnostic accuracy (Bayesian methods, classical multivariate analysis, dynamic screening (Markov) models). Methods for improving the display of information. Theoretical and empirical limitations of these decision aids. Prereq: MATH 491.

EPBI 465. Clinical Decision Analysis (3) Application of decision trees to clinical problems, estimation and revision of probabilities including Bayes theorem, utility analysis, cost benefit and cost-effectiveness, sensitivity analysis, ROC curves, and microcomputer programs for clinical decision analysis.

EPBI 466. Economics in Health Services Research (3) This course is aimed at developing students’ knowledge of economic theory and to give them an awareness of how economic models can be applied in health services research. Students will develop an understanding of the economics of consumer, firm, and social choice. Each area of theory will be reinforced with an examination of several applied papers in health services research that use, test, or develop the theory. Topics will include: 1) Consumer choice; 2) Firm theory; 3) Competition and market equilibrium; 4) Welfare and market failure; 5) Risk and uncertainty; and 6) Human capital theory. While there will be some lecturing in the class, the majority of time will focus on student led discussion of the applied reading. While some knowledge in economics would be beneficial to students, there is no prerequisite for this class. Those without economic background may benefit from reading an elementary economics text such as Hayne, P (2003) The Economic Way of Thinking, 10th Edition, Prentice Hall: Upper Saddle River, NJ. Cross-listed as MHPH 466.

EPBI 467. Cost-Effectiveness Analysis in Health Care (3) Evaluation of alternative medical treatments and drug therapies. Topics include cost-benefit, cost-effectiveness and cost-utility analysis. Measuring cost, benefits and health outcomes. Quality of life and other measures of effectiveness will also be addressed. Emphasis on cost analyses, course project, and evaluation of publications. Some decision analysis and policy implications will also be included. Cross-listed as MHPH 467.

EPBI 468. The Continual Improvement of Healthcare: An Interdisciplinary Course (3) The focus of this course is on collaborative work for the benefit of patients and community. Seminar classwork is combined with a field project, in which interdisciplinary student teams apply what they have learned to the improvement activities of a local health care organization. Successful completion of the course depends on participation in seminar sessions and completion of the interdisciplinary student team project. Prereq: Consent of instructor. Cross-listed as MHPH 468 and NURS 468.

EPBI 469. Stated Preference Evaluation (3) This course focuses on an important health services research literature that focuses on stated preference techniques, a range of methods that can be used to evaluate health care interventions. Stated preference techniques value whole interventions, the differences between two or more interventions and/or the marginal benefits of a particular attribute of an intervention. This is either done directly by asking individuals to value a particular intervention or attributes, or by asking them to express a preference for a particular intervention. The course will focus on four key elements of stated preference research. These are: 1) the necessary qualitative research needed to design stated preference instruments; 2) willingness to pay and other contingent valuation techniques; 3) conjoint analysis and other discrete choice stated preference techniques; and 4) the necessary economics and econometrics needed to design, analyze, and interpret stated preference instruments. Cross-listed as MHPH 469.

EPBI 471. Special Topics in Biostatistics (3) Sampling methods, bioassay, statistical genetics, multivariate analysis, sequential analysis, and stochastic models. Prereq: EPBI 442.

EPBI 472. Special Topics in Statistical Genetics (1-4) Various topics in statistical genetics will be discussed, depending on student interest and needs. Examples of topics are: genome and linkage analysis, path analysis for genetic epidemiology, the analysis of racial admixture and modeling such phenomena as imprinting and anticipation. The course will consist of four modules. A student may, in consultation with the instructor, elect to take 1 - 4 modules for the corresponding amount of credit. Prereq: EPBI 452.

EPBI 473. Biomathematical Analyses of DNA Data (3) This is a research level, data-driven, project-focused, computer-based course of biomathematical modeling in the analysis of DNA microarray data. Computer simulation test-beds of various biochemical system models described in the literature will be developed in Matlab and used to create metabolic time course predictions from publicly available DNA microarray data; Biochemical Systems Theory, Metabolic Control Theory, and dynamical systems of rational polyno- mial reaction rate laws will each be described. Gene regulatory networks and chromosomal patterns of gene expression will also be described. Statistical methods such as clustering and the Significance Analysis of Microarrays will be introduced as needed. The ultimate goal of this course is to produce a priori unobvious, scientific inferences from DNA microarray data. Prereq: Consent of instructor.

EPBI 477. Internship at Health-Related Government Agencies (3) This independent study course will incorporate a one-semester-long internship at health-related government agencies (Ohio Department of Health, Ohio Department of Job and Family Services, or Cleveland City Health Department). The choice of the agency will depend on the student’s academic interests and research goals. The objective is to develop a level of familiarity with the organizational and operational aspects of such agencies, and to gain an understanding of agencies’ and bureaus’ interactions with the legislative body, as well
as the processes of developing, implementing, managing, and monitoring health initiative. The instructor and the liaison persons at the agencies will be responsible for planning structured encounters of interns with key administrators and policy makers, and to select a research project, based on the inter's research interests and the agencies' research priorities. Interns will be required to submit a draft of the report to the instructor at the end of the semester. The approved, final report will be submitted to the agency. The project will be evaluated for its methodological soundness and rigor. Students will be required to be at the agency one day a week. Prereq: EPBI 515. Cross-listed as MPH 477.

EPBI 480. Introduction to Mathematical Statistics (3)
An introduction to statistical inference at an intermediate mathematical level. The concepts of random variables and distributions, discrete and continuous, are reviewed. Topics covered include: expectations, variance, moments, the moment generating function; Bernoulli, binomial, hypergeometric, Poisson, negative binomial, normal, gamma and beta distribution; the central limit theorem; Bayes estimation, maximum likelihood estimators, unbiased estimators, sufficient statistics; sampling distributions (chi-square, t) confidence intervals, Fisher information; hypothesis testing, uniformly most powerful tests and multi-decision problems. Prereq: EPBI 431.

EPBI 481. Theoretical Statistics I (3)

EPBI 482. Theoretical Statistics II (3)
(See STAT 446.) Prereq: MATH 223 or STAT 445 or consent of instructor. Cross-listed as STAT 446.

EPBI 486. Seminar in the Epidemiology of Violence (2)
Graduate standing only. Epidemiology of injuries caused by violent behavior based on analysis of current literature with emphasis on use of epidemiologic tools in studying fatal and nonfatal injuries. Consideration of: (1) methods of surveillance of injuries; (2) epidemicologic analytic studies; (3) development and evaluation of interventions, using national and local databases. Students and field workers will give oral and written presentations.

EPBI 487. Pharmacoepidemiology (3)
Basic principles underlying pharmacoepidemiology, including study design and sample size; ethical issues in drug testing and approval; the use of large databases for research; and pharmacoconomics. Prereq: EPBI 490 and EPBI 491.

EPBI 488. Gender, Ethnicity, and Health Research (3)
This course is designed to acquaint students with the literature addressing the constructs of race, ethnicity, and social class; to examine critically the contexts in which these constructs are often applied; and to assess the relationship between each of these constructs and access to health care, quality of care, and health outcome. Cross-listed as MPH 488.

EPBI 490. Epidemiology: Introduction to Theory and Methods (3)
Epidemiologic principles and methods needed to understand population-based statements of illness and health. Descriptive epidemiology, analytic epidemiology, and epidemiologic inference. Classification, morbidity and mortality rates, sampling, screening, epidemiologic models, field trials, controlled epidemiologic surveys, sources of bias, and causal models. Prereq: STAT 201 or STAT 207 or STAT 312 or equivalent. Cross-listed as MPH 490.

EPBI 491. Epidemiology: Application of Theory/Methods (3)
This course will cover the methods used in the conduct of epidemiologic research. Topics include: case control studies, cohort studies, clinical trials, cross-section studies, exposure measurement, subject selection, validity, reliability, sample size and power, effect modification, confounding, bias, chance, risk assessment, frequency matching, matching meta-analysis. Analysis of data sets will be given as well. A statistical package will be used to analyze all data sets. Prereq: EPBI 431, EPBI 490, MPH 431, MPH 490. Cross-listed as MPH 491.

EPBI 492. Epidemiology: Statistical Methods (3)
The course focuses on regression methods for model building including logistic, Poisson, and Cox regression methods. Topics include the analysis of cohort and case-control studies where the emphasis is on risk estimation. Students are expected to analyze a database obtained from a cohort study and from a related nested case-control study. The analysis of survival data focuses on parametric and non-parametric techniques. In addition to regular class assignments, students are expected to write a report on each of the databases analyzed and present results to the class. Prereq: EPBI 432 and EPBI 491. Cross-listed as MPH 492.

EPBI 493. Epidemiology of Cardiovascular Disease (3)
Prereq: EPBI 490.

EPBI 494. Infectious Disease Epidemiology (3)
The epidemiology, prevention and control of representative infectious disease models. Emphasis on the triad of agent, host and environment and the molecular and genetic basis of agent and host interaction in the population. Prereq: EPBI 490, EPBI 491, and a microbiology course or consent of instructor. Cross-listed as MPH 494.

EPBI 495. Psychiatric Epidemiology (3)
This course provides an overview of various topics in the area of psychiatric epidemiology. These include a history of psychiatry as it is relevant to psychiatric epidemiology, methodological issues critical to research in this area, the social, ethical, and legal context of research in this area, and the epidemiology of various psychiatric disorders. Cross-listed as MPH 495.

EPBI 496. Mathematical Models of Disease (3)
This course covers introductory concepts of stochastic processes, with particular emphasis on Poisson, renewal and Markov processes. Examples highlight the art of modeling, focusing on models of chronic and infectious disease progression and infectious disease transmission. Simulation methods are used to obtain solutions. Prereq: EPBI 492 and EPBI 420.

EPBI 497. Epidemiologic Studies of Cancer Etiology and Prevention (3)
Descriptive epidemiology of most major types of cancer. Current knowledge of the role that host factors, lifestyle, chemicals, radiation, viruses, familial factors, and benign diseases play in the etiology of various cancers, as determined from studies of human populations. Applications of epidemiologic principles to programs of primary and secondary cancer prevention. Prereq: EPBI 490.

EPBI 498. Cancer Data Analysis (3)
Practical experience in analysis of cancer data including defining a hypothesis, conducting a literature search, designing appropriate analyses, analyzing the data, and reporting the findings. Students analyze cancer data sets currently on file, such as National Cancer Institute's surveillance, epidemiology, and end results (see program data, using contemporary epidemiologic methods as taught in EPBI 432 and EPBI 491). Prereq: EPBI 432 and EPBI 492.

EPBI 499. Independent Study (1-18)
Prereq: EPBI 501. Graduate Seminar (0)
Students and faculty have the opportunity to meet on a weekly basis to discuss papers in the literature. Each week a paper is reviewed in detail by a graduate student in a formal presentation. Discussion of the strengths and weaknesses of the work gives insight into the complexities of investigations in the Public Health Arena. Cross-listed as MPH 501.

EPBI 502. Seminar in Genetic Epidemiology (0)
Presentation of original research or recent journal publications by faculty and students.

EPBI 503. Seminar in Biostatistics (0)
Presentation of original research or recent journal publications by faculty and students in the area of Biostatistics.

EPBI 508. Ethics, Law, and Epidemiology (3)
This course is designed to provide epidemiology students with basic knowledge about the ethical and legal principles underlying epidemiological research. This is not a public health law class. Issue papers are assigned on a weekly basis. Each issue paper requires that the student analyze the situation depicted and apply the principles learned. Some issue papers may require that the student draft a proposed rule, a portion of legislation, or a document such as an informed consent form. Other exercises may require that students critique an existing agency rule or legislation. Prereq: EPBI 490 and EPBI 491. Cross-listed as MPH 508.

EPBI 514. Advanced Statistical Computing (3)
Computational aspects of statistics and statistical modeling, including both graphical and analytic methods. The S-Plus programming language. The use of S-Plus and other computational tools to explore and analyze data in ways that are difficult to accomplish with standard statistical packages. Prereq: EPBI 414 and EPBI 420 and EPBI 482.

EPBI 515. Secondary Analysis of Large Health Care Data Bases (3)
Development of skills in working with the large-scale secondary data bases generated for research, health care administration/billing, or other purposes. Students will become familiar with the content, strength, and limitations of several data bases; with the logistics of obtaining access to data bases; the strengths and limitations of routinely collected variables; basic techniques for preparing and analyzing secondary data bases and how to apply the techniques to initiate and complete empirical analysis. Prereq: EPBI 414 or equivalent; EPBI 431 or EPBI 460 and EPBI 461 (for HSR students).

EPBI 535. Topics in Advanced Survival Analysis (3)
Topics or current research interest in survival analysis. Topics may change from year to year. Prereq: EPBI 435.

EPBI 563. Pattern Recognition Techniques in Biomedical Research (3)
Overview of pattern recognition. Supervised learning using parametric and non-parametric statistics, linear discriminant functions, discrete and binary classification problems. Introduction to artificial neural networks. Neural approaches to supervised and
unsupervised learning. Neural pattern associators and matrix approaches. Applications relevant to biomedical research. Prereq: EPBI 414 and EPBI 443 and EPBI 481.

EPBI 592. Selected Topics in Epidemiology (1-10)
Vaccine development; epidemic models; nutritional epidemiology; genetic epidemiology; opportunistic infections; nosocomial infections; prevention strategies.

EPBI 601. Master’s Project Research (1-18)
EPBI 602. Practicum (1-3)
EPBI 651. Thesis M.S. (1-18)
Prereq: Departmental prospectus form.
EPBI 701. Dissertation Ph.D. (1-18)
EPBI 703. Dissertation Fellowship (1-8)

**Department of Family Medicine**

The Department of Family Medicine offers a master’s degree in family medicine. The program includes basic training in biostatistics, epidemiology and research methods, with a specific emphasis on the family. The department is a national leader in primary care research and is one of three national research centers funded by the American Academy of Family Physicians.

**FAMILY MEDICINE (FAMD)**

Graduate Courses
FAMD 431. Applied Statistics in Medical Education (3)
FAMD 502. International Health Practice (3)
This course aims to provide practical knowledge to prepare students to serve and study for international health work particularly in complex humanitarian emergencies. The course is organized and discussed from the perspective of health care professional. This course is intended for graduate-level students in medicine, nursing, public health, social work, and medical anthropology. Historical development of the discipline, key methodological issues, and essential principles in key topics will be discussed in multidisciplinary approach. Cross-listed as MPH 502.

FAMD 601. Independent Study (1-18)
FAMD 651. Thesis M.S. (1-18)

**Division of General Medical Sciences**

The Division of General Medical Sciences at the School of Medicine was established in 1986 to provide an organizational unit with interdisciplinary research and educational objectives. Special centers—with individual directors and missions—currently based in the division include the Case Comprehensive Cancer Center, the Center for Adolescent Health, the Center for Bio-architectonics, the Center for Global Health and Diseases, the Center for Psychanalytic Child Development, the Center for RNA Molecular Biology, and the Center for Science, Health and Society.

**CASE COMPREHENSIVE CANCER CENTER**
Phone (216) 844-8797
http://cancer.case.edu
James K.V. Willson, M.D., Robert W. Kellermeyer, M.D. ’55, Professor of Oncology and Director of the Center

The Case Comprehensive Cancer Center is an interdisciplinary research program that promotes interactions of researchers and clinicians at the School of Medicine, University Hospitals of Cleveland, the Cleveland Clinic Foundation, and throughout the university. Its purpose is to translate basic science advances as rapidly as possible into clinical activities and to provide new and better options in cancer prevention, diagnosis, and treatment to the people of Northeast Ohio. The center is one of the 38 National Cancer Institute-designated comprehensive cancer centers.

Researchers and clinicians associated with the Case Comprehensive Cancer Center participate in one or more of eight organized interdisciplinary programs, each focused on a different area of cancer research: signal transduction processes of cancer, hormone responsive malignancies and apoptosis, cancer virology, hematopoietic and immune cell biology, developmental therapeutics, and cancer prevention, control, and population research. These research efforts are facilitated by shared resource facilities supported by the center. Also, the cross-disciplinary interactions catalyzed by these research programs create a rich training environment, and members participate in five National Cancer Institute-sponsored interdisciplinary training programs.

**CENTER FOR ADOLESCENT HEALTH**
Room W-G48, School of Medicine
Phone (216) 368-3770
http://www.case.edu/med/adolescenthealth/blah.html
Barbara A. Cromer, M.D., Director and Frederick C. Robbins, M.D., Professor of Child and Adolescent Health

The School of Medicine established the Center for Adolescent Health in 1990 in recognition of the multidimensional biopsychosocial problems of contemporary youth. It was formed by educators and researchers from a variety of disciplines seeking to bring their expertise to bear on the serious problems facing youth. The center seeks to address these issues through an integrated, transdisciplinary approach that incorporates research, professional education, programmatic intervention, and collaboration between Case and community agencies and programs.

This unique program has four objectives:

1) To promote and coordinate collaborative research activities relevant to adolescents;

2) To provide interdisciplinary educational training at undergraduate, post-baccalaureate, and post-graduate levels for professionals interested in adolescent health;

3) To serve as a resource for Greater Cleveland community agencies that provide services for adolescents; and

4) To help promote the development of rational public policies addressing health and social issues that concern youth.

For information about the adolescent health track of the master of public health degree, please see “Other Degree Programs” in the medical school section of this General Bulletin or contact the center. A certificate in adolescent health also is offered; please contact the center for more information.

Although based at the School of Medicine, the center has developed relationships with other schools and departments at Case and the community at large. In addition, the center is the umbrella organization for Cuyahoga County’s
Adolescent Consortium, a networking organization for more than 100 local youth-serving agencies. The center also provides program evaluation services and consultation to community-based youth-serving projects.

Current research interests of the faculty include adolescent health promotion and resilience, sexuality, mental health, substance abuse prevention, and the establishment of a health-risk behavior database for adolescents in Cuyahoga County.

ADOLESCENT HEALTH (ADHT)

Graduate Courses
ADHT 485. Adolescent Development (3)
Adolescent Development can be viewed as the over-riding framework for approaching disease prevention and health promotion for this age group. This course will review the developmental tasks of adolescence and identify the impact of adolescent development on youth risk behaviors. It will build a conceptual and theoretical framework through which to address and change adolescent behavior to promote health. Prereq: Consent of instructor. Cross-listed as MPH 485.

ADHT 486. Adolescent Health Care Policies (3)
The focus of the course is a critical analysis of health care policies that impact the public health care needs of adolescent populations. Legal and ethical implications will be discussed. Prereq: Consent of instructor. Cross-listed as MPH 486.

ADHT 487. Launching a Program: Reaching Goals in Research and Community Projects (3)
This course will provide students opportunities to study in both didactic and applied methods the steps needed to launch a program in adolescent health in a community setting. Such concepts as needs assessments, strategic planning, community coalition formation, literature searches, grants (private foundation/federal), internal review boards, budgeting, evaluations, and 501-C3s will be considered. Cross-listed as MPH 487.

ADHT 499. Independent Study in Adolescents (1-12)
This course will provide the student interested in adolescent health with the opportunity to work independently and in depth in an area pertaining to adolescents in a community or other institutional setting. The designation ADHT 499 will be used for field placements, internships, or capstone experiences. Prereq: Consent of instructor.

CENTER FOR BIO-ARCHITECTONICS
Room BRB B-17, School of Medicine
Phone (216) 368-2390
Raymond J. Lasek, Ph.D. (Anatomy), Professor and Director of Center

Bio-architectonics is the study of complex biological architectures. The center was established in 1986 to explore biological architectures in medicine, and it has focused specifically on the teaching of medical anatomy.

CENTER FOR GLOBAL HEALTH AND DISEASES
Fourth Floor, Iris S. and Bert L. Wolstein Research Building
Phone (216) 368-6321
James W. Kazura, M.D., Professor of Global Health & Diseases, and Medicine, and Director of Center

The Center for Global Health and Diseases in the School of Medicine was established in 2002. Its predecessor, the Center for International Health, was formed in 1987 to link the numerous international health resources of the university, its affiliated institutions, and the northern Ohio community in multidisciplinary programs of research and education related to global health. The challenges presented by world health problems are enormous, and the opportunities presented to the university community are great. In meeting these challenges and in responding to these opportunities at the university, those affiliated with the center have the opportunity to promote health in the world and to enrich the community. The recent name change reflects the increased commitment of the center and its faculty to basic and applied biomedical research on diseases of developing countries as well as interdisciplinary studies of microbial threats to the American public, including agents of bioterrorism. Thus, the scope of the center now includes not only its historical commitment to education and service but also basic and clinical investigation of human health and disease.

Faculty members have primary appointments in the center, which is an administratively independent unit within the Division of General Medical Sciences of the School of Medicine. Secondary appointments are held in various departments, including medicine, genetics, epidemiology and biostatistics, and pathology. Members of the faculty with secondary appointments in the center have primary appointments in a variety of departments in the School of Medicine and at the university.

The center endeavors to foster programs that encourage creative people from many disciplines and cultures to work toward solutions of global health and disease issues. Its efforts are built on a strong base of specialized strengths from many academic disciplines. The center is currently a national leader in National Institutes of Health-supported studies of the major infectious diseases of developing countries. Faculty use cutting-edge approaches to examine the molecular, genetic, and immunologic basis of susceptibility to infectious diseases such as malaria, river blindness, lymphatic filariasis, schistosomiasis, and leishmaniasis. Center faculty recently have been successful in expanding the scope of their work to major viral diseases that threaten not only populations of developing countries but also American civilian and military populations. Examples include smallpox, Rift Valley fever, dengue, HIV, and Epstein-Barr virus, the agent that underlies Burkitt’s lymphoma, the major childhood cancer of the tropics. Faculty with primary appointments in the center have major overseas research collaborations in Kenya, Papua New Guinea, and Brazil. Faculty with secondary appointments in the center, from the division of infectious diseases in the Department of Medicine, division of pediatric infectious diseases in the Department of Pediatrics, and the Department of Epidemiology and Biostatistics, have long-standing research and educational activities in Uganda and Brazil focused on tuberculosis and HIV infection.

Educational programs sponsored by the center include an annual course in international health, electives in international health and overseas rotations for medical students, and training programs at the university for visiting students and scholars from developing countries. In the Greater Cleveland community, substantial international expertise and experience exists in corporate, private, institutional, and voluntary agency sectors. Citizen interest and commitment is high. The center seeks to provide a focal point...
for this interest, encouraging cooperative activities among these groups and academic units of the university.

Specific objectives of the center:

1) Linkages. To foster interdisciplinary and intercultural linkages related to international health in the university and the community.

2) Training. To promote training programs throughout the university that will equip a cadre of scientists from diverse backgrounds to address global health issues.

3) Research. To conduct and facilitate collaborative, multidisciplinary research programs focused on major diseases of public health significance in developing countries as well as the United States.

4) Application. To work with institutions and agencies in developing countries to help design and establish research and education programs that meet their needs and function as models of sustainable health systems.

INTERNATIONAL HEALTH (INTH)

Graduate Course

INTH 801. Annual Course in International Health (4)
Comprehensive, intensive course in international health given the entire month of July with approximately 27 classroom hours each week. Modalities of primary healthcare and the major infectious and parasitic diseases of developing countries are considered in depth. Lectures, including presentations by internationally recognized expert visiting faculty, as well as Case faculty, are supplemented by problem solving exercises and laboratories. The course presumes an M.D. degree; other health professionals or health science students may be admitted with consent of the course director. Prereq: Permission of course director.

CENTER FOR RNA MOLECULAR BIOLOGY

Room W-113, School of Medicine
Phone (216) 368-1606
http://www.mrnaresearch.org
Timothy W. Nilsen, Ph.D., Professor and Director of Center

Formally established in 2001, the goal of the Center for RNA Molecular Biology is to create a focus of excellence in the study of all aspects of RNA metabolism, including molecular biology and cell biology, and to investigate the potential clinical and commercial applications of these studies. The center strives for an national reputation for excellence in research and training of both graduate students and medical students, while maintaining interactions with other departments, centers and programs at Case Western Reserve, University Hospitals of Cleveland, and the Cleveland Clinic.

The primary faculty in the center and secondary faculty housed in other university departments and the Cleveland Clinic Foundation form a highly cohesive group. Current research areas include the roles of protein factors in cis- and trans-splicing of mRNA, mechanisms of cis- and trans-splicing in nematodes, protein-dependent RNA catalysis, RNA-RNA and RNA-protein interactions studied by nuclear magnetic resonance, apolipoprotein B RNA editing, RNA editing in Physarum, the structure and catalytic function of RNA, RNA helicases, alternative pre-mRNA processing, the subcellular organization of RNP in mammals, mRNA splicing in S. cerevisiae, mRNA transport in S. cerevisiae, pre-mRNA splicing by the major and minor spliceosomes, alternative splicing in Drosophila, and the control of gene expression and protein folding.

Center faculty participate in teaching first-year graduate and medical student courses, as well as special-topics graduate courses. Graduate students are encouraged to apply directly to the Biomedical Sciences Training Program or to the Department of Biochemistry or to the Department of Molecular Biology and Microbiology; see the listings for these areas elsewhere in the School of Medicine section of this publication.

CENTER FOR SCIENCE, HEALTH AND SOCIETY

1st Floor, Health Sciences Library
Robbins Building, School of Medicine
Phone: (216) 368-2059
http://www.case.edu/med/cshs/index.htm
Nathan A. Berger, M.D., Director of Center and Hanna-Payne Professor of Experimental Medicine

Recognizing that the successful futures of Case Western Reserve University, the city of Cleveland, and Cuyahoga County are integrally related, the Center for Science, Health and Society (CSHS) was created in 2002 to focus the efforts of
the university and the city in a significant new collaboration to impact the areas of health and health care delivery systems through community outreach, education and health policy. The center, based in the School of Medicine, with university-wide associations is engaging the many strengths of the university and the community to accomplish three main goals:

1. Improve the health of the community;
2. Educate and empower community members to become better consumers of health care and more informed and stronger advocates for health care policy and legislation in their own interests; and
3. Excite and encourage members of the community to prepare for employment and careers in the biomedical workforce and health care professions.

The center engages the community at the level of the individual and the neighborhood, in public and private schools, at civic and faith-based organizations, and at the level of governmental agencies and community leadership to assess needs and establish partnerships with the university faculty and organizations to develop and initiate a series of interventions to accomplish these goals.

The center seeks to identify community problems, perceptions, assets and resources and advise the community of faculty skills, assets, and expertise that may be used to benefit community interests and promote mutual enhancement. The center encourages community service-based scholarship and education by both students and faculty and pursues opportunities for students, faculty members, and institutions to give back to the community.

Department of Genetics
School of Medicine
Biomedical Research Building
Phone (216) 368-3431
http://genetics.case.edu/

The Department of Genetics embraces a unified program devoted to outstanding research and teaching in all areas of genetics, with particular emphases on genomics, human genetics and animal models, development, and chromosome structure and function. Faculty conduct internationally recognized research programs in each of these areas. The also are committed to training the next generations of leading genetics researchers. The department has three special programs: the Center for Human Genetics, the Center for Computational Genomics, and the Center for Translational Genomics (descriptions appear later in this narrative).

Programs offered lead to the Ph.D., combined M.D./Ph.D. degree, or M.S. with a special emphasis in either genetic counseling or bioinformatics and systems biology. Students are encouraged to pursue a program of research and study that meets their goals and interests. Advanced courses are offered in specialized areas as outlined later in this section.

Students participate in ongoing journal clubs, research seminars, and grand rounds. A program of departmental and interdepartmental seminars by outstanding visiting scientists provides regular exposure to a broad range of current research in genetics.

The department accepts direct applications to the doctoral program by those who have significant prior research experience in genetics and are committed to careers in genetics research. Direct admission into the program provides an accelerated course of study in one of the more than 15 laboratories. Alternatively, the department also participates in the integrated Biomedical Sciences Training Program (BSTP, please see separate listing in this publication). Students interested in pursuing the combined M.D./Ph.D. program are admitted through the Medical Scientist Training Program (MSTP, please see separate listing in this publication). Those students interested in careers in genetic counseling may apply directly to the Genetic Counseling Training Program in the department.

The Center for Human Genetics is an integral part of the Department of Genetics and consists of both research and clinical laboratories involved in human and clinical genetics. This center supports research and clinical programs focusing on chromosome structure and behavior, human genome mapping, the molecular basis of inherited disease, and the genetic dissection of complex disease, as well as providing clinical care and training for postdoctoral fellows and genetic counseling students.

The Center for Computational Genomics is an interdisciplinary research and training program involving faculty in the Department of Epidemiology and Biostatistics in the School of Medicine and in the Department of Electrical Engineering and Computer Science in the School of Engineering. The center provides opportunities to combine research in genomics, genomics, epidemiology, biostatistics, computer science, and systems biology.

The Center for Translational Genomics is a joint program involving the Cleveland Clinic Foundation and Case. Its emphasis involves translating discoveries in basic and clinical research to clinical practice. The mission is to exploit the discoveries in genomics, epidemiology, ethics, pharmacology, genetics, and physiology to revolutionize the practice of medicine. This is a new program, and a search for a director was under way at press time.

GENETICS (GENE)

Graduate Courses
GENE 451. Principles of Genetic Epidemiology (3)
A survey of the basic principles, concepts and methods of the discipline of genetic epidemiology, which focuses on the role of genetic factors in human disease and their interaction with environmental and cultural factors. Many important human disorders appear to exhibit a genetic component; hence the integrated approaches of genetic epidemiology bring together epidemiologic and human genetic perspectives in order to answer critical questions about human disease. Methods of inference based upon data from individuals, pairs of relatives, and pedigrees will be considered. Prereq: EPBI 431 and EPBI 490 or consent of instructor. Cross-listed as EPBI 451.

GENE 488. Yeast Genetics and Cell Biology (3)
This seminar course provides an introduction to the genetics and molecular biology of the yeasts S. cerevisiae and S. pombe by a discussion of current literature focusing primarily on topics in yeast cell biology. Students are first introduced to the tools of molecular genetics and special features of yeasts that make them important model eukaryotic organisms. Some selected topics include cell polarity, cell cycle, secretory pathways, vesicular and nuclear/cytoplasmic transport,
mitochondrial import and biogenesis, chromosome segregation, cytoskeleton, mating response and signal transduction. Cross-listed as MBIO 488.

**GENE 500. Advanced Eukaryotic Genetics I (3)**
Fundamental principles of modern genetics; transmission, recombination, structure and function of the genetic material in eukaryotes, dosage compensation, behavior and consequences of chromosomal abnormalities, mapping and isolation of mutations, gene complementation and genetic interactions. Prereq: BIOL 362.

**GENE 503. Readings and Discussions in Genetics (0-3)**
(Credit as arranged.) In-depth consideration of special selected topics through critical evaluation of classic and current literature.

**GENE 504. Advanced Eukaryotic Genetics II (3)**
Fundamental principles of modern genetics; population and quantitative genetics, dissection of genome organization and function, transgenics, developmental genetics, genetic strategies for dissecting complex pathways in organisms ranging from Drosophila and C. elegans to mouse and human. Prereq: GENE 500 or permission of instructor.

**GENE 508. Bioinformatics and Computational Genomics (3)**
The course is designed to provide an understanding of theory and application of computational methods for molecular biology research. The course will be divided into four primary sections: DNA methods, protein methods, structure analysis (RNA and protein) and phylogenetic analysis. Special emphasis will be placed on the use and development of tools to search and analyze large amounts of sequence data generated as part of the Genome Projects in human, Drosophila and other eukaryotic organisms. The course offers extensive hands-on computational training using UNIX, Web and PC-based software. As such, for every hour of lecture material there will be two corresponding hours of computational laboratory time. In the initial year, enrollment will be limited to five students. Preference will be given to senior-level genetics graduate students or post-doctoral fellows. Prereq: GENE 500 and GENE 504 or permission of instructor.

**GENE 509. Complex Genetic Traits (3)**
A combination of lecture, readings-based, and discussions that survey the origins of variation and disease and the genetic and phenotypic analysis of complex traits. The course emphasizes the sources of variation, genetic and phenotypic analysis of complex traits, and gene families and physiological pathways. Prereq: GENE 500 and GENE 504 or permission of instructor.

**GENE 510. Advanced Human Genetics (3)**
Comprehensive course surveying major areas of contemporary human genetics, including population genetics, Mendelian genetics, chromosome abnormalities, genetic disease, genomics, and molecular genetics. Prereq: GENE 500.

**GENE 511. Critical Analysis of the Scientific Literature (3)**
Presentation and discussion of any aspect of human genetics but emphasizing recent molecular insights into defects in humans. Both classical and recent papers are analyzed and critiqued.

**GENE 512. Structural Analysis of Complex Genomes (3)**
Lectures, readings and discussion course surveying the status of mapping and sequencing the human genome and those of model organisms. Prereq: GENE 500 and GENE 504.

**GENE 513. Developmental Genetics (3)**
This course focuses on the genetic control of animal development. Topics covered include the organization of genetic regulatory circuits which govern the determination of embryonic axes, germ layers and cell fates as well as the cell interactions and cell movements which lead to emergence of the basic body plan of the organism. Emphasis is placed on the use of the genetic approach and genetic tools to uncover the molecular basis of these developmental processes. Prereq: GENE 500 and GENE 504.

**GENE 514. Mammalian Cytogenetics (3)**
Overview of classical and molecular cytogenetic methods available to study mammalian chromosomes with interphase and metaphase preparations, and a summary of the origin, etiology and phenotypic consequences of chromosome abnormalities, primarily in the human. Prereq: GENE 500 and GENE 504 or permission of instructor.

**GENE 515. Chromosome Structure and Function (3)**
An advanced literature-based course examining specific topics relating to the structure and function of eukaryotic chromosomes. Topics will vary from year to year. Examples include: chromosome and chromatin organization; centromeres and kinetochores; chromosome segregation, recombination, and nondisjunction; genomic imprinting, its molecular mechanisms, and its effect on gene expression; heterochromatin and position effect variegation; and molecular mechanisms of chromosome abnormalities. Prereq: GENE 500 and GENE 504.

**GENE 516. Introduction to Clinical Genetics (3)**
The major focus of this course is to allow graduate students in Human Genetics to become familiar with the medical genetics and counseling aspect of the genetics evaluation and counseling process. It provides the student an opportunity to see an application of bench research in the clinical arena as well as to observe and appreciate the various functions, roles and responsibilities of different members of the medical genetics team. Course includes seminars and clinical observations. Prereq: Consent of instructor.

**GENE 517. Principles of Biomedical Technology Development (3)**
Analyses of strategies employed by biomedical companies in identifying and developing new technologies, highlighting genomics and gene therapy companies. Topics of discussion will include the financial analysis of new gene-based technologies, the challenges of developing technologies in-house versus licensing, and the impact of intellectual property (especially patent law) on gene-based product development. An overview of relevant federal regulatory law will also be provided, concentrating on current FDA requirements for new drugs and devices. Prereq: GENE 500 and GENE 504 or permission of instructor.

**GENE 519. The Genetics of Emerging Infectious Diseases (3)**
This course will survey the genetics, transmission and life cycle of emerging infectious agents. Lecturers will include local and visiting scientists internationally recognized as experts in infectious disease research. Prereq: Consent of instructor.

**GENE 521. Chromatin Structure and Transcription (3)**
A critical review of selected topics and current literature on the role of chromatin structure in the regulation of gene expression. Cross-listed as BIOL 521.

**GENE 522. Genetics of the Cardiovascular System (3)**
The course covers the newest concepts in the development and function of the cardiovascular system. Topics include the genetics of cardiovascular diseases in humans and the comparative genetics and biology of animal models of cardiovascular diseases. Prereq: GENE 500.

**GENE 523. Embryonic Patterning in Development (3)**
This course will focus on current understanding of patterning mechanisms in animal development. The seminal contributions of Turning, Sten, Crick, Lawrence, Wolpert, and Lewis will be covered, as will the most recent advances in the field. Models and theory will be considered, in addition to experimental analysis and the identification of patterning molecules. The course will end with a consideration of how development changes to create different adult morphologies over the course of evolution. Prereq: Permission of instructor.

**GENE 524. Advanced Medical Genetics: Cytogenetics (2-3)**
Fundamental principles regarding clinical cytogenetics including discussion of autosomal numerical and structural abnormalities; sex chromosome abnormalities; population cytogenetics; mosaicism; uniparental disomy; contiguous gene deletions, and cancer cytogenetics. Prereq: Consent of instructor.

**GENE 525. Advanced Medical Genetics: Clinical Genetics (2-3)**
Fundamental principles regarding congenital malformations, dysmorphology and syndromes. Discussion of a number of genetic disorders from a systems approach: CNS malformations, neurodegenerative disorders, craniofacial disorders, skeletal dysplasias, connective tissue disorders, hereditary cancer syndromes, etc. Discussions also include diagnosis, etiology, genetics, prognosis and management. Prereq: Consent of instructor.

**GENE 526. Advanced Medical Genetics: Molecular and Quantitative Genetics (2-3)**
Molecular: Fundamental principles of gene structure; mechanisms, detection and effects of mutations; imprinting; triplet repeat disorders; X-chromosome inactivation; application of molecular analysis to genotype/phenotype correlations and gene therapy. Quantitative: Fundamental principles of pedigree analysis, segregation analysis, Bayes theorem; linkage analysis and disequilibrium; risk assessment in consanguinity. Prereq: Consent of instructor.

**GENE 527. Advanced Medical Genetics: Biochemical Genetics (2-3)**
Fundamental principles of metabolic testing; amino acid disorders; organic acid disorders; carbohydrate disorders; peroxisomal disorders; mitochondrial disorders; etc. Discussion of screening principles and newborn screening as well as approaches to diagnosis, management and therapy for metabolic diseases. Prereq: Consent of instructor.

**GENE 528. Principles and Practices of Genetic Counseling (3)**
Fundamental principles needed for the practicing genetic counselor. Topics include skills in obtaining histories (prenatal, perinatal, medical, developmental, psychosocial and family); pedigree construction and analysis, physical growth and development; the genetic evaluation; the physical examination and laboratory analyses; prenatal issues, prenatal screening and diagnosis; and teratogenicity. Prereq: Consent of instructor.
and their impact on the genetic counseling session are diagnosis, chronicity, death and loss. Cultural issues family. Topics include the genetic counseling interview psychological and social impact on the individual and social aspects of genetic disease and birth defects, its informed consent; use of the NSGC Code of Ethics is they relate to genetic issues, such as autonomy and principles of ethics are explored in some depth as legal, religious, and cultural concepts. Fundamental genetic counseling are addressed, including ethical, professional issues inherent in medical genetics and actual interviewing situations. Prereq: Consent of instructor.

GENE 530. Ethical and Professional Issues in Genetic Counseling (2) Professional issues inherent in medical genetics and genetic counseling are addressed, including ethical, legal, religious, and cultural concepts. Fundamental principles of ethics are explored in some depth as they relate to genetic issues, such as autonomy and informed consent; use of the NSGC Code of Ethics is emphasized. Genetic counseling roles and responsibilities and aspects of a career as a professional are explored. Prereq: Consent of instructor.

GENE 532. Clinical Practicum in Genetic Counseling (1-6) This clinical practicum provides the student an opportunity to function as a genetic counselor by preparing for cases; obtaining appropriate histories; determining risks; performing psychosocial assessments; discussing disease characteristics, inheritance, and natural history; providing anticipatory guidance and supportive counseling; using medical and community resources; and follow-up. Students rotate through four clinical areas and one laboratory and will register for a total of 12 hours over the course of the program. Prereq: Admission to Genetic Counseling Training Program.

GENE 533. Genetics of Aging (3) This course will focus on our current understanding of the genetic mechanisms underlying cellular and organismal aging as well as age-related diseases. Theories of aging will be covered as well as the most recent experimental analysis in a variety of systems (yeast, worms, flies, mice, and humans). While aging research has long been primarily descriptive in nature, the most recent genetic-based experiments are providing the first insights into the molecular pathways involved with striking similarities across model systems. Prereq: GENE 500, GENE 504, or consent of instructor.

GENE 534. Neurogenetics (3) This course will explore how principles of genetics can be used as tools to study the complex organization of the nervous system. Examples will be drawn from all relevant model organisms including nematode, fruit fly, mouse, and human. Meant primarily for students with an interest in neuroscience, this course will offer a strong foundation in genetic principles using examples drawn from the neuroscience literature. Students in other disciplines, especially genetics, will benefit from the examples to learn important aspects of the neurosciences ranging from behavior to development. These interdisciplinary features make this course unique in its offerings and a valuable addition to many students’ course of study. Prereq: CBIO 453 and CBIO 455. Cross-listed as NEUR 534.

GENE 601. Research in Genetics (1-9) (Credit as arranged.)

GENE 651. Thesis M.S. (1-9) (Credit as arranged.) Master’s Thesis Plan A.
GENE 701. Dissertation Ph.D. (1-9) (Credit as arranged.)
GENE 703. Dissertation Fellowship (1-8)

Institute for Public Health Sciences

Department of Epidemiology and Biostatistics Room W-G57, School of Medicine Phone (216) 368-3195 E-mail gradpro@hal.cwru.edu Alfred A. Rimm, Ph.D., Director of the Institute The Institute for Public Health Sciences, located at MetroHealth Medical Center and at the School of Medicine, incorporates the disciplines of epidemiology and biostatistics, bioethics, and environmental health sciences to form the scientific foundation for public health research and education at the School of Medicine. The institute faculty are engaged in numerous research projects in the complementary disciplines and conduct collaborative studies with the basic and clinical science departments in the School of Medicine.

GRADUATE PROGRAMS

Biostatistics (M.S. and Ph.D.) The biostatistics track deals with concepts underlying the scientific method in biomedical research, the interpretation of medical and biological data, and both the theory and the practical realities of study design, data collection, statistical analysis and computing, and the reporting of results. An important activity involves the design and analysis of randomized clinical trials and intervention studies, either for prevention or treatment of disease in humans.

Epidemiology (M.S. and Ph.D.) The epidemiology track includes the search for factors causing disease in humans and the study of the occurrence and distribution of diseases in human populations. The field of epidemiology also is concerned with the education of the public and strategies for adopting good health behavior practices.

Genetic and Molecular Epidemiology (M.S. and Ph.D.) The track in genetic and molecular epidemiology involves the role of genetic factors in the etiology of disease in human populations, including investigation of their interactions with environmental and cultural factors as part of the disease process. Its integrated approach brings together genetic and epidemiologic perspectives to answer critical questions about human disease.

Health Services Research (M.S. and Ph.D.) The health services research track focuses on the description, analysis, and evaluation of the organization; staffing; financing; utilization; and delivery of health care, with emphasis on equity of access, cost/effectiveness, and certainty of quality of care to all individuals.

Public Health (M.P.H.) A master of public health degree is designed to prepare students to address the broad mission of public health, defined as “enhancing health in human populations, through organized community effort,” utilizing education, research, and community service. Public health practitioners are prepared to identify and assess the health needs of different populations, and then to plan, implement, and evaluate programs to meet those needs. It is the task of the public health practitioner to protect and promote the wellness of humankind. A master of public health degree requires education in knowledge basic to public health, including biostatistics, epidemiology, environmental health sciences, health services administration, and social and behavioral sciences.

For information and an application to the graduate programs of the Institute of Public Health Sciences, contact:
The courses do not provide specialized re-
science and medicine for graduate credit.

two years of the School of Medicine to

Integrated
Biological
Sciences
Room T-401, School of Medicine
Phone (216) 368-3404

These courses primarily are open only to students in combined M.D./Ph.D. programs such as the Medical Scientist Training Program (MSTP) and the Health Services Research Program. The courses use the curriculum of the first two years of the School of Medicine to provide a general education in biomedical science and medicine for graduate credit. The courses do not provide specialized research training, which is provided by the curricula of specific graduate programs. Please see the separate listings for these programs in this publication for more information or contact:

Program Manager
Medical Scientist Training Program
School of Medicine
10900 Euclid Ave.
Cleveland, Ohio 44106-4936
Phone: (216) 368-3404
E-mail: mstp@case.edu

INTEGRATED BIOLOGICAL SCIENCES (IBIS)

Graduate Courses

IBIS 401. Integrated Biological Sciences I (1-9)
A four-semester sequence encompassing anatomy, biochemistry, physiology, pharmacology, pathology, and microbiology.

IBIS 402. Integrated Biological Sciences II (1-9)
A continuation of IBIS 401.

IBIS 403. Integrated Biological Sciences III (1-9)
A continuation of IBIS 402.

IBIS 404. Integrated Biological Sciences IV (1-9)
A continuation of IBIS 403.

IBIS 405. Integrated Biological Sciences I (1-9)

IBIS 406. Integrated Biological Sciences II (1-9)

IBIS 407. Integrated Biological Sciences III (1-9)

IBIS 408. Integrated Biological Sciences IV (1-9)

IBIS 411. Clinical Science I (2)

IBIS 412. Clinical Science II (2)

IBIS 413. Clinical Science III (2)

IBIS 414. Clinical Science IV (2)

IBIS 415. Clinical Science I (1-9)

IBIS 416. Clinical Science II (1-9)

IBIS 417. Clinical Science III (1-9)

IBIS 418. Clinical Science IV (1-9)

INTEGRATED BIOLOGICAL STUDIES (IBMS)

IBMS 500. Being a Professional Scientist (0)
The goal of this course is to provide graduate students with an opportunity to think through their professional ethical commitments before they are tested, on the basis of the scientific community’s accumulated experience with the issues. Students will be brought up to date on the current state of professional policy and federal regulation in this area, and, through case studies, will discuss practical strategies for preventing and resolving ethical problems in their own work. The course is designed to meet the requirements for “instruction about responsible conduct in research” for BSTP and MSTP students supported through NIH/ADAMHA institutional training grant programs at Case. The course will meet on four consecutive mornings, and attendance is required. Prereq: BSTP enrollment.

Department of Molecular Biology and Microbiology

Room W-235, School of Medicine
Phone (216) 368-3420
http://www.case.edu/med/microbio/mbio.htm

The Department of Molecular Biology and Microbiology provides teaching and research related to the structure, regulation, and expression of genes. The organisms under study in the laboratories of the faculty include viruses, prokaryotic and eukaryotic microorganisms (bacteria and yeast), and human and animal cells grown in culture. The department is expanding its interests in human virus and bacterial pathogenic model systems.

Members of the department participate in the teaching of first-year medical students in several committees. In the cell biology committee, department faculty present material on the molecular basis for gene action and its relationship to human dis-

case, emphasizing the methods and results that have led to the recent explosion of knowledge in this area. In the biological basis for disease committee, faculty review mechanisms of bacterial and viral pathogenesis. Faculty also offer special courses as options specifically designed for medical students.

GRADUATE PROGRAMS

The Department of Molecular Biology and Microbiology participates in the Biological Sciences Training Program (BSTP, please see separate listing in this publication) and offers a program of study leading to the Ph.D. or M.D./Ph.D. degrees. The program emphasizes direct research participation under the guidance of a faculty mentor. Its goal is to produce scientists who will function as independent researchers at the forefront of biomedical science. Students may pursue their thesis research in several areas of eukaryotic or prokaryotic molecular biology, and molecular biology, including a variety of viral and animal pathogenic model systems. Didactic course work is included in the first two years to provide a base of knowledge for selecting a research area and to prepare the students to read and critically interpret the primary literature.

First-year students are admitted to the BSTP and may choose laboratory rotations within the department. They participate in the integrated cellular and molecular biology sequence (CBIO 453, 454, 455 and 456) and in department seminars. Near the end of the first semester, students select a thesis advisor and are assigned to a department.

After successful completion of the first-year curriculum, students are expected to complete a minimum of 12 credit hours of advanced course work. Any combination of courses from within or outside the department can fulfill the requirement as long as it has the approval of the student’s committee. Students take a qualifying examination to determine their readiness for advancement to candidacy. This exam consists of oral and written components and is given near the end of the second
year. In subsequent years, students pursue their research activities full-time.

Each laboratory is fully equipped for state-of-the-art research in molecular biology and microbiology. In addition, several major instrument systems (cell and molecular imaging, radiation imaging, flow cytometry, gene array analyses, laser capture microdissection, high-resolution microscopy, and other advanced pieces of equipment) are available to all members of the department.

Current research programs: post-transcriptional modification of RNA and its role in gene expression; mechanisms of viral and cellular messenger RNA transcription and processing; retrovirus: host interactions, including HIV; measles virus replication and long-term pathogenic mechanisms; regulation of viral and cellular oncogene expression; animal cell adhesion and signaling mechanisms; bacterial cell division; bacterial cellular physiology; and mechanisms of bacterial pathogenesis. Extensive interdepartmental collaborations with the Center for AIDS Research, the Case Comprehensive Cancer Center, and several basic science departments in the School of Medicine ensure that a broad range of resources are available to every student.

MOLECULAR BIOLOGY AND MICROBIOLOGY (MBIO)

Undergraduate Course

MBIO 399. Undergraduate Research (1-3)
Permits qualified undergraduates to work in a faculty member's laboratory.

Graduate Courses

MBIO 420. Molecular Genetics of Cancer (3)
(See BIOC 420.) Cross-listed as BIOC 420 and MVIR 420.

MBIO 434. Mechanisms of Drug Resistance (3)
Resistance to drugs is an important health concern in the new millennium. Over the past century, modern medicine has developed and prescribed drugs for various ailments and diseases with known therapeutic benefit. Since the discovery of antibiotics by Dr. Fleming, we have struggled with a new complication to chemotherapeutic agents, and resistance to anti-}

malarial drugs (e.g., chloroquine). Cross-listed as MVIR 434 and PHRM 434.

MBIO 435. Seminar in Molecular Biology/ Microbiology (1)
Graduate students will attend the departmental seminar given by all graduate students in the Department of Molecular Biology and Microbiology, as well as give a seminar on their own thesis research. Students will be evaluated by the faculty member in charge of that student's seminar with input from the students' own thesis committee. After each seminar, the student presenter will meet with other graduate students for peer-review of the content, delivery, and style of the seminar. Peer reviewers will also be evaluated for the quality of their input. Prereq: CBIO 453 and CBIO 455.

MBIO 437. Contributions of Model Organisms (1)
Seminar format featuring distinguished outside speakers to provide an introduction to research with four major model organisms; yeast, nematode, fruit fly and mouse. In addition, students will also write a brief paper.

MBIO 461. Prokaryotic Molecular Biology (3)
Basic techniques and research topics of microbial genomics and pathogenesis. Lecture and discussion format.

MBIO 488. Yeast Genetics and Cell Biology (3)
This seminar course provides an introduction to the genetics and molecular biology of the yeasts S. cerevisiae and S. pombe by a discussion of current literature focusing primarily on topics in yeast cell biology. Students are first introduced to the tools of molecular genetics and special features of yeasts that make them important model eukaryotic organisms. Some selected topics include cell polarity, cell cycle, secretory pathways, vesicular and nuclear/cytosplasmic transport, mitochondrial import and biogenesis, chromosome segregation, cytoskeleton, mating response and signal transduction. Cross-listed as CLBY 488, GENE 488, and PATH 488.

MBIO 518. Signaling via Cell Adhesion (3)
Molecular mechanisms by which cells interact with and are regulated by extracellular matrices and other cells. Prereq: CBIO 453 and CBIO 455. Cross-listed as CBIO 518 and NEUR 518.

MBIO 519. Molecular Biology of RNA (3)
Selected topics regarding editing, enzymatic function, splicing, and structure of RNA. Cross-listed as CLBY 519.

MBIO 520. Principles of Microbiology (3)
This course provides lectures and small group discussions of the cellular and molecular mechanisms by which certain bacteria, viruses, and parasites execute normal and pathologic conditions in human hosts. The biology, genetics, and physiological properties of these infectious agents are considered in light of the mechanisms by which they induce pathogenic conditions in their human hosts. The course is intended for graduate students advanced beyond the core curriculum of course work in molecular biology and microbiology areas of specialization. Prereq: CBIO 453 and CBIO 455.

MBIO 521. HIV and AIDS: Research and Care (3)
AIDS and HIV disease represent a continuing medical challenge. Currently there are over 25 million worldwide who are living with AIDS. Basic research into HIV also represents one of the major focuses of contemporary virus and immunological research. This course will expose M.D. and Ph.D. students to the major problems in HIV research. Due to the multidisciplinary nature of AIDS research, the course will span the spectrum from fundamental molecular biology to clinical translational research. All students will be given an opportunity to participate in outpatient HIV care and in a scientific research project. Prereq: CBIO 453 and CBIO 455.

MBIO 601. Research in Molecular Biology and Microbiology (1-18)

MBIO 620. Transcription and Gene Regulation (3)
This course covers mechanisms of transcription that play critical roles in biological processes. It is designed to develop scientific thinking in designing experiments and evaluating the merits of research papers. Students will be able to present two to three 30-minute talks. Topics include: 1) structure and function of RNA polymerases; 2) accessory factors involved in initiation, elongation, and termination; 3) regulation transcription; 4) transcriptional coactivators and corepressors; 5) regulation of transcription factor activity. A take-home exam will be conducted at the final week. Grades will be based on presentations and take-home exam. Prereq: CBIO 453 and CBIO 455. Cross-listed as BIOC 620.

MBIO 651. Thesis M.S. (1-18)

MBIO 701. Dissertation Ph.D. (1-18)

MBIO 703. Dissertation Fellowship (1-8)

Molecular Medicine (MMED)

Department of Molecular Medicine
Cleveland Clinic Lerner College of Medicine of Case Western Reserve University
9500 Euclid Ave., NB21
Cleveland, Ohio 44195
(216) 444-5849
Paul E. DiCorleto, Ph.D., Chair

Graduate Course

MMED 401. Fundamentals of Molecular Medicine and Translational Research (8)
Overview of Molecular Biology and Cell Biology with emphasis on areas of relevance to human health and disease. Topics include: basic cell structure; protein structure and function; genomic organization and expression, including basic genetics, DNA repair and recombination, transcriptional regulation, RNA processing and translation; membrane structure and function, including membrane protein biosynthesis and function; cell signaling pathways, including hormone and drug action; metabolism and energetics. Prereq: Consent of department.

Molecular Virology Program

The last two decades have witnessed the development of molecular virology as one of the most productive, rewarding and clinically important avenues of biomedical research. The study of viruses has nev-
er been more important than it is today due to the recognition of human immunodeficiency virus as the etiological agent of AIDS and to the role of viruses, such as other retroviruses and human papillomaviruses, in causing cancer. Molecular virology, however, is no less exciting on a purely scientific level. The relatively small sizes of viral genomes coupled with their use of most cellular machinery to replicate has led to the selection of viruses as model systems to study biological processes such as transcription, translation, splicing, and DNA replication. Furthermore, because viruses introduce genetic material into cells as part of their life cycle, they are being used as vectors for gene therapy. Areas of strength of molecular virology program faculty include viral replication; virus-cell interactions, including mechanisms of interferon action; viral oncogenesis; and the use of viral vectors for gene therapy. Advanced-course subjects include RNA viruses, DNA viruses, immunology of infectious diseases, and RNA and DNA biosynthesis.

The Molecular Virology Program is part of the Biomedical Sciences Training Program. For more information about the Molecular Virology Program, please visit the Biomedical Sciences Training Program Web site at http://www.case.edu/med/BSTP/index.html; write Biomedical Sciences Training Program, School of Medicine, Case Western Reserve University, 10900 Euclid Ave., Cleveland, Ohio 44106-4934; call (216) 368-3347; or e-mail Deborah Noureddine, BSTP coordinator, at deborah.noureddine@case.edu.

MOLECULAR VIROLOGY (MVIR)

Graduate Courses

MVIR 420. Molecular Genetics of Cancer (3)
Using a combination of lectures and student presentations, this course provides an in-depth analysis of cancer as a genetic disease in the Mendelian sense of inheritance and in the sense of causation by somatic mutation. The objectives of the course are to examine both the proto-oncogenes and tumor suppressor genes that are the targets of oncogenic mutations and the mechanisms of mutational change. Discussions emphasize experimental approaches used to identify and study oncogenes and tumor suppressor genes. This course also covers viral mechanisms of oncogenesis which involve interactions between viral proteins and the products of cellular proto-oncogenes or tumor sup-

pressor genes. Prereq: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Cross-listed as BIOC 420 and MBIO 420.

MVIR 434. Mechanisms of Drug Resistance (3)
Resistance to drugs is an important health concern in the new millennium. Over the past century, modern medicine has developed and prescribed drugs for various ailments and diseases with known therapeutic benefit. Since the discovery of antibiotics by Dr. Fleming, we have struggled with a new complication in infectious diseases, development of drug resistance. This course will focus on and compare the drug resistant mechanisms selected by viruses, bacteria, parasites, fungi, and tumor cells. Topics to be covered include antiretroviral resistance (e.g., AZT and protease inhibitors), antibiotic resistance (e.g., B-lactams), resistance to chemotherapeutic agents, and resistance to antimarial drugs (e.g., chloroquine). Cross-listed as MBIO 434 and PHRM 434.

MVIR 445. Molecular Biology and Pathogenesis of RNA and DNA Viruses (3)
Through a combination of lectures by Case faculty and guest lecturers, along with student discussion of current literature, this course emphasizes mechanisms of viral gene expression and pathogenesis. RNA viruses to be discussed include positive, negative, and retroviruses. DNA viruses include SV40, adenovirus, herpes, papilloma, and others. Important aspects of host defense mechanisms, antiviral agents, and viral vectors will also be covered. Students will be evaluated based on their quality of presentation of course papers assigned to them and their overall participation in class discussions. Prereq: CBIO 453, CBIO 454, CBIO 455, and CBIO 456.

MVIR 446. Host-Virus Interactions (3)
This course will explore both historical and contemporary literature with emphasis on: control of cell cycle, transformation, and cellular differentiation by viruses; viral manipulation of signal transduction, how viruses control cell apoptosis, viral manipulation of cytokine and cellular immune responses, and persistent viral infections. The format will be both lecture- and paper-based seminars. Grades are based upon class participation, a final examination, and a written proposal on a subject of interest chosen by the student. Prereq: CBIO 453, CBIO 454, CBIO 455; and CBIO 456. Cross-listed as BIOC 446 and PATH 446.

MVIR 481. Immunology of Infectious Diseases (3)
(See PATH 481.) Prereq: Introductory immunology course or consent of instructor. Cross-listed as PATH 481.

MVIR 601. Research (1-18)
Grade of S/U only.

MVIR 611. Seminar (1)
Discussion of current research.

MVIR 612. Seminar (1)
Discussion of current research.

MVIR 641. Proposition (2)
Design of research proposal. Grade of S/U only.

MVIR 642. Proposition (2)
Design of research proposal. Grade of S/U only.

MVIR 701. Dissertation (1-18)
Grade of S/U only.

MVIR 703. Dissertation Fellowship (1-8)

Neuroscience and Biomedical Engineering Program

Departments of Neurosciences and Biomedical Engineering
Schools of Medicine and Engineering
Case Western Reserve University
Phone (216) 368-6974
E-mail narlene.brown@case.edu

This program was developed to provide training to graduate students interested in pursuing research that merges traditional neurobiology with engineering methodologies. Often these research projects quantitatively explore the mechanisms that underlie neuronal function at the single-cell or systems levels. Projects also can include applying computational techniques to important biological questions or, conversely, using biologically inspired neuronal networks to solve engineering problems. Students in this program also may work on problems related to interfacing external devices to the nervous system. Faculty associated with the program generally have their primary academic appointments in the Neurosciences, Physiology and Biophysics, Biology, or Biomedical Engineering departments. Affiliated faculty are organized around five general areas: (1) neural tissue engineering and development, (2) neural interfacing, (3) cellular neurophysiology, (4) molecular neurobiology, and (5) systems neuroscience. Students in the program are expected to take a series of core and elective courses from both primary departments. Interested students should contact the Department of Neurosciences at the e-mail address listed above to obtain a brochure that describes this program in detail.

Department of Neurosciences
Room E-653, School of Medicine
Phone (216) 368-6251
http://neurowww.case.edu/

Neurosciences are the last great frontier in the biological sciences. How the nervous
system functions to process information and mediate behavior and how it forms during embryonic development and is modified to encode experience are central questions in the neurosciences. Answering these questions requires a multidisciplinary approach combining the tools of electrophysiology, anatomy, biochemistry, and molecular biology in studies of animals and tissue culture models.

The department offers a Ph.D. program that provides interdisciplinary training in modern neurosciences through a combination of course work, seminars and research experience. Medical students are encouraged to pursue research projects with neurosciences faculty and/or to make neurosciences an area of concentration.

Neuroscientists at Case are using state-of-the-art techniques and instrumentation to study several aspects of nervous system function, including neural circuitry and plasticity, development and regeneration, and cellular and molecular neurobiology. Techniques used include patch and voltage clamping neuronal membranes to study ion channels, gene cloning, sequencing and other molecular and genetic approaches to study the structure, function and regulation of neuronal proteins; electron microscopy, confocal and other imaging methods to study development and function of synapses; immunocytochemical techniques to study the molecular and biochemical basis of nervous system development and plasticity; and traditional anatomical, biochemical, and physiological techniques.

NEUROSCIENCES (NEUR)

Graduate Courses

NEUR 402. Principles of Neural Science (3) Lecture/discussion course covering concepts in cell and molecular neuroscience, principles of systems neuroscience as demonstrated in the somatosensory system, and fundamentals of the development of the nervous system. This course will prepare students for upper level Neuroscience courses and is also suitable for students in other programs who desire an understanding of neurosciences. Prereq: CBIO 453. Cross-listed as BIOL 402.

NEUR 405. Cellular and Molecular Neurobiology (3) Cell biology of nerve cells, including aspects of synaptic structure, physiology and chemistry. The application of molecular biological tools to questions of synaptic function will be addressed. Prereq: BIOL 473.

NEUR 406. Systems Neurosciences (4) A comprehensive course designed to give graduate students a wide-ranging introduction to the organization and function of the nervous system. Topics to be covered include the anatomy, physiology and function of the mammalian central nervous system, as well as the organization of simple nervous systems. Lectures, laboratories and student presentations of classical papers will be used.

NEUR 408. Functional Neuroanatomy (3) This course is designed to give students a broad appreciation of the various subdivisions, nuclear groups, and axon tracts in the human brain and spinal cord. There will not only be an emphasis on the understanding of the 3-dimensional arrangement of neuroanatomical pathways that constitute the major circuits in the CNS but also a current perspective of their functions. Lectures in this course will be a selected subgroup of those that constitute the Nervous System Committee of the 2nd year medical school curriculum. Students taking NEUR 408 will also participate in selected review session, small group conferences as well as lab, which includes a dissection of a human brain. Prereq: Consent of instructor.

NEUR 411. Neurobiology of Disease (1) Designed to show how basic research in neuroscience has contributed to the management of clinical problems in human neurology and to discuss some of the further challenges posed by human disease for research in neurobiology. The general format will include clinical descriptions of patient presentation, discussion of the disease mechanisms and an analysis of contributions of cellular and systems neuroscience to understanding of the human disorder. Specific topics to be discussed include myasthenia gravis, dementia (including Alzheimer’s disease), multiple sclerosis, Duchenne’s muscular dystrophy, polyomyelitis, seizures and strokes. Prereq: NEUR 405 or NEUR 406.

NEUR 415. Neuroscience Seminars (1) Current topics of interest in neuroscience. Students attend weekly seminars. From this series, students prepare critiques. No credit is given for less than 75% attendance.

NEUR 427. Neural Development (3) Topics include cell commitment, regulation of proliferation and differentiation, cell death and trophic factors, pathfinding by the growing nerve fiber, synapse formation, relationships between center and periphery in development and the role of activity. Cross-listed as BIOL 427.

NEUR 432. Biochemical and Molecular Aspects of Vision (3) Increasingly, progress in the study of visual science is requiring multidisciplinary approaches that draw from the areas of biochemistry, genetics, molecular biology, neuroscience and pathology. We have recognized this fact and have adapted this course to fit the needs of tomorrow’s scientists. This course encompasses the basic science aspects of the eye. Subjects include retinal anatomy and function; biochemical, molecular aspects of retinal disease and cataract; cellular and molecular neuroscience aspects pertinent to the visual system. Cross-listed as PATH 432 and PHRM 432.

NEUR 435. Vision: Molecules to Perception (3) The organization, physiology, and function of the vertebrate visual system are considered in detail. The visual pathway from retina to LGN and visual cortex is described with an emphasis on circuits that produce successively more complex receptive field properties. Classic papers and current literature form the basic course material. Assessment is based on student presentations, class participation, and a term paper. Prereq: NEUR 402 or consent of department.

NEUR 440. Synaptic Transmission (3) This course will explore the basic mechanisms of synaptic transmission that operate at central and peripheral synapses. Students will read and present a mixture of historical and modern papers that established the fundamental principles of synaptic transmission and plasticity. The course will begin with a brief review of cellular neurophysiology and the techniques used to study synaptic potentials. We will then read classic papers by Katz and colleagues that defined the mechanisms controlling transmitter release at the neuromuscular junction. Next we will consider the role of calcium in regulating the release of neurotransmitters and in short-term modulation of synaptic potentials. We will then explore pre- and post-synaptic processes such as receptor saturation and vesicle dynamics that govern the amplitude and time course of post-synaptic potentials. Quantal analysis and silent synapses will be discussed in the context of the present-day controversies regarding long-term potentiation at central synapses. We will also consider the relationship between short- and long-term synaptic plasticity and behavioral functions such as learning and memory. Occasional faculty lectures will complement student presentations on primary research articles. Student grades will be based on two short (5 page) essays and class participation. Prereq: Permission of the course director.

NEUR 473. Introduction to Neurobiology (3) (See BIOL 473.) Cross-listed as BIOL 473.

NEUR 474. Neurobiology of Behavior (3) (See BIOL 374.) Cross-listed as BIOL 474.

NEUR 476. Neurobiology Laboratory (3) (See BIOL 476.) Cross-listed as BIOL 476.

NEUR 478. Computational Neuroscience (3) Computer simulation of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theories for the analysis of neurons and neural circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as EECS 478.

NEUR 479. Seminar in Computational Neuroscience (3) Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Cross-listed as BIOL 479.

NEUR 482. Drugs, Brain, and Behavior (3) (See BIOL 482.) Cross-listed as BIOL 482.

NEUR 518. Signaling via Cell Adhesion (3) (See MBIO 518.) Cross-listed as MBIO 518.

NEUR 534. Neurogenetics (3) This course will explore how principles of genetics can be used as tools to study the complex organization of the nervous system. Examples will be drawn from all relevant model organisms including nematode, fruit fly, mouse, and human. Meant primarily for students with an interest in neuroscience, this course will offer a strong foundation in genetic principles using examples

578 • School of Medicine Case Western Reserve University General Bulletin 2004–2006
drawn from the neuroscience literature. Students in other disciplines, especially genetics, will benefit from the examples to learn important aspects of the neuroscience ranging from behavior to development. These interdisciplinary features make this course unique in its offerings and a valuable addition to many students' course of study. Prereq: CBIO 453 and CBIO 455. Cross-listed as GENE 534.

NEUR 601. Research in Neuroscience (1-18)
NEUR 701. Dissertation Ph.D. (1-18)
NEUR 703. Dissertation Fellowship (1-8)

Department of Nutrition
Room 201, School of Dental Medicine
Building
Phone (216) 368-2440
Fax (216) 368-6644
http://www.case.edu/med/nutrition/
Henri Brunengraber, M.D., Ph.D., chair
Edith Lerner, Ph.D., vice chair

The department’s focus is on human nutrition and the application of the science of nutrition to the maintenance and improvement of health. Undergraduate programs are designed for students interested in nutritional biochemistry and metabolism, molecular nutrition, professional study in dietetics, public health nutrition, medicine, dentistry, or nursing. Graduate programs emphasize dietetics, public health nutrition, nutritional biochemistry, and molecular nutrition.

The Department of Nutrition offers programs leading to the bachelor of science degree in nutrition, bachelor of arts degree in nutrition, bachelor of arts degree in nutritional biochemistry and metabolism, bachelor of science degree in nutritional biochemistry and metabolism, master of science degree in nutrition, master of science degree in public health nutrition, and doctor of philosophy degree. A nutrition minor is available. Specialty programs are available in areas such as maternal and child nutrition or gerontology. The specialty is in addition to the basic graduate degree.

Special announcements describing the various programs and providing additional information are available from the department.

UNDERGRADUATE PROGRAMS

Please see the College of Arts and Sciences section in this publication.

GRADUATE PROGRAMS

Master of Science Degree in Nutrition

This degree program offers two options. For those pursuing the thesis option, 30 semester hours of a planned program of study are required, including six to nine semester hours of research, as well as a final oral defense of the thesis. The non-thesis option requires 30 semester hours and a final written, comprehensive examination.

All candidates are required to take 15 semester hours of nutrition, including six hours of advanced human nutrition. In addition, students are encouraged to pursue complementary studies in the biomedical, social, and behavioral sciences. The plan of study may vary considerably depending on the education, goals, and specific interests of each student. Students may elect to focus on nutritional biochemistry and metabolism, and molecular nutrition. The individual program also may be planned to fulfill the academic requirements for dietetic registration (Didactic Program in Dietetics).

Master of Science Degree in Public Health Nutrition/Internship

The primary goal of this program is to prepare nutrition specialists to function in public health/community agencies. A minimum of 32 semester hours of combined academic work and field experience is required to earn the degree. Course work focuses on human nutrition, dietetics, and the public health sciences. Field experience is concurrent with course work utilizing local community agencies for direct application of theory to practice. The final phase of the program is an eight-week, full-time experience with a public health agency that has a strong nutrition component. The student works closely with an advisor throughout the program, on an individual basis.

In addition to the general public health program, students may elect to specialize in maternal and child nutrition or gerontology. The gerontology specialty is certified through the Center on Aging and Health located on campus. Each specialty requires additional semester hours of academic work. A portion of the field experience is specified for either population group.

For students wishing to become eligible to take the registered dietitian (R.D.) examination, the program also currently is granted accreditation by the Commission on Accreditation for Dietetics Education (CADE) of the American Dietetic Association as an internship. CADE is a specialized accrediting body recognized by the Commission on Recognition of Post-secondary Accreditation and the United States Department of Education.

Coordinated Dietetic Internship/Master’s Degree Program

The Coordinated Dietetic Internship/Master’s Degree Program combines academic work with clinical practice at either of the dietetic internships at University Hospitals of Cleveland or the Louis Stokes Cleveland Department of Veterans Affairs Medical Center. A minimum of 27 semester hours is required. Admission is contingent on the student’s being selected and matched to one of the hospitals. Appointment to these internships follows the admission procedure outlined by the Commission on Accreditation for Dietetics Education of the American Dietetic Association. Contact the Department of Nutrition for information regarding application.

Doctor of Philosophy Degree in Nutrition

The Doctor of Philosophy degree in nutrition is awarded for study and research in nutrition. Areas of concentration are nutritional biochemistry and metabolism, and molecular nutrition.

Additional information about graduate degree programs may be obtained from the department.
NUTRITION (NTRN)

Undergraduate Courses
(See please College of Arts and Sciences)

Graduate Courses

NTRN 433. Advanced Human Nutrition I (4)
Emphasis on reading original research literature in energy, protein and minerals with development of critical evaluation and thinking skills. Prereq: NTRN 201 and CHEM 223 and BIOL 348 or equivalent.

NTRN 434. Advanced Human Nutrition II (3)
Emphasis on reading original research literature on vitamins with development of critical evaluation and thinking skills. Prereq: NTRN 433 or consent.

NTRN 435. Maternal and Child Nutrition (3)
Study of current research literature on nutrition for pregnancy, lactation, infancy and childhood, including assessment and requirements. Prereq: Nutrition major or consent of instructor.

NTRN 437. Evaluation of Nutrition Information for Consumers (3)
Reading and appraisal of food and nutrition literature written for the general public, including books, periodicals, and audio and visual sources. Prereq: Nutrition major or consent of instructor.

NTRN 438. Trends in Diet Therapy (3)
Evaluation and interpretation of modern concepts of nutrition related to abnormalities requiring dietary modifications. Prereq: NTRN 365 or equivalent.

NTRN 440. Nutrition for the Aging and Aged (3)
Consideration of the processes of aging and needs which continue throughout life. The influences of food availability, intake, economics, culture, physical and social conditions and chronic disease as they affect the ability of the aged to cope with living situations. Prereq: Nutrition major or consent of instructor.

NTRN 446. Advanced Maternal Nutrition: Special Topics (3)
Analysis of the problems commonly associated with high-risk pregnancies and fetal outcome. Discussion of causes, mechanisms, management and current research. Prereq: NTRN 435 or consent.

NTRN 451. Food Service Systems Management (3)
Application of organizational theory and skills in the preparation and service of quantity food. Laboratory experiences in professional food services are included. Students will analyze one aspect of food service management in depth. Prereq: Nutrition Major or consent.

NTRN 452. Nutritional Biochemistry and Metabolism (3)
Mechanisms of regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Prereq: BIOC 307 or equivalent. Cross-listed as BIOC 452.

NTRN 454. Isotope Tracer Methodology (3)
Stable and radioactive isotopes in metabolic research concentrating on the design of in-vitro and in-vivo investigative protocols using mostly stable isotopes and mass spectrometric analysis; critical interpretation of data from the recent literature; and pathway identification and kinetics. Prereq: BIOC 407.

NTRN 455. Molecular Nutrition (3)
Nutrient control of gene expression in mammalian cells and deregulation of expression of these genes. The molecular basis of nutrition-related diseases, such as diabetes mellitus, PKU, and LDL-receptor deficiency, will be discussed. The application of genetic manipulation to metabolism and nutrition will be evaluated. Prereq: BIOC 407.

NTRN 460. Sports Nutrition (3)
Study of the relationships of nutrition and food intake to body composition and human performance. Laboratory sessions include demonstrations of body composition and fitness measurements and participation in a research project. Prereq: NTRN 363 or NTRN 433 or consent.

NTRN 516. Seminar in Dietetics I (4)
Study of scientific basis for clinical and community nutrition practice and developments in food service systems management. Prereq: Dietetic internship.

NTRN 517. Seminar in Dietetics II (4)
Study of scientific basis for clinical and community nutrition practice and developments in food service systems management. Prereq: Dietetic internship.

NTRN 528. Introduction to Public Health Nutrition (3)
Philosophy, objectives, organization, and focus of government and voluntary agencies with emphasis on nutrition components. Prereq: Public health nutrition majors only.

NTRN 530. Public Health Nutrition (3)
Analysis of public health programs in government and voluntary health agencies and the effect of legislation. Emphasis on integration with other disciplines working in public health settings and the role of a public health nutritionist. Prereq: Consent of instructor.

NTRN 531. Public Health Nutrition Field Experience (1-6)
Individually planned public health experience. May be concurrent with course work in local agencies or in blocks of full-time work with a city, county, or state health agency. Prereq: Open to public health nutrition students only.

NTRN 532A. General Nutrition Care (1-3)
Individually arranged clinical experience.

NTRN 532C. Specialized Public Health Nutrition Field Experience (1-3)
Individually arranged clinical experience. Prereq: Public Health Nutrition students only.

NTRN 532D. Hospital Dietetics (1-3)
Individually arranged clinical experience.

NTRN 532E. Clinical Research: Methods in Nutrition and Metabolism (3)
Individually arranged.

NTRN 533. Nutritional Care of Neonate (3)
Nutritional assessment and management of high-risk newborns with emphasis on prematurity and low birth weight. Review of current literature coordinated with clinical experience in the neonatal intensive care unit. Issues on follow-up included. Prereq: NTRN 435 or consent.

NTRN 550A. Advanced Community Nutrition (3)
Development of skills needed by the community dietitian. Emphasis on effective tools for service development and delivery. Recommended courses of action for the professional.

NTRN 550B. Seminar: Dietetics (1)

NTRN 551. Seminar in Advanced Nutrition (2-3)

NTRN 561. Investigative Methods in Nutrition (1-4)
Research methods appropriate for nutrition. Methods for conducting research in nutrition and food sciences, food service management and dietetics. Designing research proposals. Prereq: Nutrition major or consent of instructor.

NTRN 601. Special Problems (1-18)

NTRN 651. Thesis M.S. (1-18)

NTRN 701. Dissertation Ph.D. (1-18)

NTRN 703. Dissertation Fellowship (1-8)

Department of Pathology

Institute of Pathology
2085 Adelbert Road
Phone (216) 368-2480
http://www.case.edu/med/pathology/

The Case Department of Pathology is located in several primary locations, including four located in University Circle (basic sciences, Cuyahoga County Coroner’s Office, University Hospitals of Cleveland, Louis Stokes Cleveland Department of Veterans Affairs Medical Center), and Cleveland’s MetroHealth Medical Center. The two buildings in which the basic sciences facilities are housed, the Institute of Pathology and the Biomedical Research Building, are advantageously located adjacent to University Hospitals of Cleveland. Outstanding library facilities include Case’s Health Science Library, Allen Memorial Medical Library, Kelvin Smith Library, and the department’s own library.

World-class research is conducted in the department in the areas of biomaterials biocompatibility, cancer biology, immunology, neurobiology, outcomes research, and tissue injury and healing, with many faculty being leaders in their field. Striking is the cooperation and collaboration within the department and the Case community.

For information about graduate programs, please see http://www.case.edu/med/pathology/grad_prog/gradprogmenu.htm.
Undergraduate Courses

PATH 390. Undergraduate Research in Cancer Biology, Immunology, or Pathology (1-3)

Students undertake a research project directly related to ongoing research in the investigator's/instructor's laboratory. Written proposal outlining research topic, a schedule of meetings and format and length of final written report to be prepared prior to registration for credit. Prereq: One year of college chemistry and consent of instructor.

PATH 395. Selected Readings in Immunology, Cancer Biology, or Pathology (1-3)

Relevant readings and literature search on particular immunology, cancer biology or pathology topic(s) chosen by the student and directed by the instructor. Written proposal outlining chosen topic, type of work to be done, a schedule of meetings and format and length of final written report to be prepared prior to registration for credit. Prereq: Consent of instructor.

Graduate Courses

PATH 410. Aging and the Nervous System (1)

Lectures and discussion on aspects of neurobiology of aging in model systems; current research on Alzheim er’s, Parkinson’s, and Huntington’s diseases. Prereq: Consent of instructor.

PATH 412. Theories of Aging and Longevity (1)

Insight into current theories of aging of molecules, cells, extracellular elements and their relationship to lifespan in human beings and other vertebrates. Lecture/journal club format. Prereq: Consent of instructor.

PATH 415. Cytoskeleton and Disease (1)

Discussion of recent papers that have added to knowledge of normal cytoskeletal functions and their alterations in disease. Prereq: Consent of instructor.

PATH 416. Fundamental Immunology (3)

Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, cell-cell interactions, cell-mediated immunity and basic molecular biology of B and T lymphocytes. Lectures emphasize experimental findings leading to the concepts of modern immunology. Prereq: BIOL 210 or BIOL 215, graduate standing and consent of instructor. Cross-listed as BIOL 416 and CLBY 416.

PATH 417. Cytokines: Function, Structure, and Signaling (3)

Regulation of immune responses and differentiation of leukocytes is modulated by proteins (cytokines) secreted and/or expressed by both immune and non-immune cells. Course examines the function, expression, gene organization, structure, receptors, and intracellular signaling of cytokines. Topic include regulatory and inflammatory cytokines, colony stimulating factors, chemokines, cytokine and cytokine receptor gene families, intracellular signaling through STAT proteins and tyrosine phosphorylation, clinical potential, and genetic defects. Lecture format using texts, scientific reviews and research articles. Prereq: PATH 416 or equivalent. Cross-listed as BIOL 417 and CLBY 417.

PATH 418. Tumor Immunology (2)

Interactions between the immune system and tumor cells. Topics include the historical definition of tumor specific transplantation antigens, immune responses against tumor cells, the effects of tumor cell products on host immune responses, molecular identification of tumor specific transplantation antigens and recent advances in the immunotherapy of human cancers. Prereq: PATH 416.

PATH 419. Reproductive Immunology (3)

This will be a lecture and literature-based course that will include classic and recent publications. The course will cover subjects related to the cellular and molecular biology of fertilization and development of the placenta and fetus in humans and how this process is affected by the maternal immune system. Specific areas of discussion will include mechanisms by which the antigenically foreign placenta and fetus create an apparent state of maternal immune tolerance, the physiologic role of endogenous retroviruses in trophoblast differentiation, the participation of maternal and placental cytokines in pregnancy, the effects of maternal alloimmunity and autoimmune responses on differentiation of the trophoblast and development of the placenta/fetus, the development and effects of fetal lymphocyte microchimerism in maternal tissues, and a variety of current controversies in Reproductive Immunology. Prereq: PATH 416 or equivalent, or permission of the instructor.

PATH 421. Electron Microscopy in Medicine (3)

The goal of this course is to implement of modern electron microscopic techniques for biology and medicine. This course will include the tissue processing, immunocytochemistry, theoretical aspects and instrumentation, tissue preparation, sectioning and staining of grids, specialized techniques such as electron microscopy in situ hybridization by using colloidal gold decoration, application of EM for diagnostic purposes, pre- and post-embedding EM immunocytochemistry, image analysis and EM qualitative and quantitative autoradiography. Cross-listed as ANAT 421.

PATH 430. Oxidative Stress and Disease Pathogenesis (1)

Oxidative stress and free radicals are implicated in a number of disease processes including aging, arthritis, emphysema, Alzheimer’s disease and cancer. Lecture course with discussion of recent studies concerning the formation and destructive mechanisms of free radicals in the context of various disease processes. Students read assigned papers and discuss these in class. Prereq: Consent of instructor.

PATH 432. Biomedical and Molecular Aspects of Vision (3)

Increasingly, progress in the study of visual science is requiring multidisciplinary approaches that draw from the areas of biochemistry, genetics, molecular biology, neuroscience and pathology. We have recognized this fact and have adapted this course to fit the needs of tomorrow’s scientists. This course encompasses the basic science aspects of the eye. Subjects include retinal anatomy and function; biochemical, molecular aspects of retinal disease and cataract; cellular and molecular neuroscience aspects pertinent to the visual system. Cross-listed at NEUR 432 and PHRM 432.

PATH 444. Neurodegenerative Diseases: Pathological, Cellular, & Molecular Perspectives (3)

This course, taught by several faculty members, encompasses the full range of factors that contribute to the development of neurodegeneration. Subjects include pathological aspects, neurodegeneration, genetic aspects, protein conformation and cell biology in conditions such as Alzheimer’s disease, Parkinson’s disease, amyotrophic lateral sclerosis and prion diseases. Students read assigned primary literature and present and discuss these in class. Prereq: Consent of instructors.

PATH 446. Host-Virus Interactions (3)

(See MVIR 446.) Cross-listed as MVIR 446.

PATH 465. Advanced Immunobiology (3)

Advanced immunology topics course covering the most important and recent advancements in specific areas of immunobiology. Course organization includes lectures by the faculty to give an overview of each topic emphasizing the recent advancements in that area, followed by student presentations of important papers and discussion on related topics. Course also includes participation in an immunology journal club (literature review/discussion sessions). Prereq: PATH 416.

PATH 477. Cellular and Molecular Basis of Immune Dysfunction (3)

Lectures and student presentations focusing on immunologic mechanisms of tissue injury; disorders of the immune response and diseases of immunocompetent cells. Hypersensitivity, allergy, immune complex disease, immune deficiency, lymphoma and multiple myeloma discussed from chemical, cellular and physiological perspectives. Prereq: PATH 416 or consent of instructor.

PATH 480. Immunology, Evolution, and Logic (3)

Review and discussion of current research papers and selected sections of scientific books to explore connections between immunological recognition, evolution and logic. Emphasis placed on student analysis of scientific concepts, interpretation of data and synthesis of ideas. Prereq: PATH 416 or PATH 510 or consent of instructor.

PATH 481. Immunology of Infectious Diseases (3)

Lectures and discussion on the immune response to infectious organisms, including bacteria, viruses and parasites. Emphasis on human responses but includes discussions of animal models. Other topics include vaccines and infections in immuno-compromised hosts. Prereq: PATH 416 or consent of instructor. Cross-listed as MVIR 481.

PATH 487. Cell Biology of the Nucleus (3)

Discussion of current cell biology research on the structure and functions of the nuclear envelope, the matrix and chromatin. Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456 or consent of instructor. Cross-listed as CLBY 487.

PATH 488. Yeast Genetics and Cell Biology (3)

(See MBIO 488.) Prereq: CBIO 453 and CBIO 454 and CBIO 453 and CBIO 456. Cross-listed as MBIO 488.

PATH 510. Basic Pathologic Mechanisms (4)

An interdisciplinatory introduction to the fundamental principles of molecular and cellular biology as they relate to the pathologic basis of disease. Lectures, laboratories, conferences. Prereq: Consent of instructor.

PATH 511. Experimental Pathology Seminar I (1)

Weekly discussions of current topics and research by students, staff and distinguished visitors.

PATH 512. Experimental Pathology Seminar II (1)

Weekly discussions of current topics and research by students, staff and distinguished visitors.

PATH 525. Transport and Targeting of Macromolecules in Health and Disease (3)

Each class includes introductory lecture, followed by student participation in interactive discussion of 3 to 5 research publications. At the end of the course, the students are expected to submit a paper or a short research proposal on any of the topics discussed during
the course. Prereq: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Cross-listed as CLBY 525.

**PATH 527. Mechanisms of Cell Growth Control (3)**
In-depth study of examples of cellular growth control involving hormonal, metabolic, transcriptional and post-translational mechanisms in higher eukaryotes using current scientific reviews and research articles. During each class period, students summarize research articles orally and lead discussions of the scientific points raised in the papers, with facilitation by the instructor. Emphasis placed not only on the scientific content of the papers, but also on developing skills of interpretation of published work and oral presentation. Attendance at research seminars relevant to the topic also required. Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456 and consent of instructor.

**PATH 555. Emerging Concepts in Cell Regulation (3)**
This course will cover the general principles of cell regulation with an emphasis on the emerging novel mechanisms of signal transduction. The traditional areas of receptor tyrosine kinases, G-protein coupled receptors will be examined but the focus will be on the roles novel mechanisms such as regulated proteolysis, ubiquitin proteasomal degradation, protein acetylation etc. in signal transduction and gene expression. This will be a literature-based course which will depend on critical evaluation of research papers, reviews and accompanied with in-depth discussion. Prereq: CBIO 453. Cross-listed as BIOC 555 and CLBY 555.

**PATH 601. Special Problems (1-18)**
Research on the nature and causation of disease and on host factors which tend to protect against disease. Special courses and tutorials in subspecialty areas of general and/or systemic anatomic and/or clinical pathology. Prereq: Consent of Chair of Graduate Committee.

**PATH 651. Thesis M.S. (1-18)**
**PATH 701. Dissertation Ph.D. (1-18)**
**PATH 703. Dissertation Fellowship (1-8)**

**Department of Pharmacology**
Room W-312, School of Medicine
Phone (216) 368-4617
http://pharmacology.case.edu/

**GRADUATE PROGRAMS**
The Department of Pharmacology offers training leading to the Ph.D. or M.D./Ph.D. degree for highly qualified post-undergraduate candidates committed to academic research careers in the biomedical sciences. Adequate preparation in the biological sciences, mathematics, organic chemistry, and physics or physical chemistry is a prerequisite for admission.

Multidisciplinary training, carried out by faculty in pharmacology and other basic science departments, emphasizes molecular, cellular and clinical aspects of the pharmacologic sciences. Areas of faculty expertise include drug/xenobiotic metabolism; receptor-ligand interactions, and biochemical reaction mechanisms; cell biology of signaling pathways; structure-function of membrane components; endocrine and metabolic regulation; hormonal regulation of gene expression; neuroscience/neuropsychopharmacology-oncology; drug resistance; and bacterial pathogenesis.

Students seeking the Ph.D. degree are admitted directly into the Department of Pharmacology through the Molecular Therapeutics Training Program or through the Biomedical Sciences Training Program (BSTP please see separate entry in this publication), each of which provides an introduction to many related training areas within the biomedical field during the first year. Thus, students follow an integrated first-year sequence of course work that involves a core curriculum in cell and molecular biology. In addition, the first year includes three research rotations that allow the students to sample areas of research and become familiar with faculty members and their laboratories. Selection of a specific training program and thesis advisor is made before the end of the first year.

Students pursue advanced-level courses—including a core of courses on molecular pharmacology, fundamental principles of therapeutic agents, and properties of classes of drugs—that emphasize principles of molecular structure, drug receptor interactions, mechanisms of drug action, and the absorption, distribution, metabolism and excretion of drugs, as well as adverse drug interactions illustrating these principles.

Admission to Ph.D. candidacy is based on successful course work, oral presentations, laboratory performance, and the completion of a two-part qualifying exam. The Ph.D. degree is awarded to students who complete a research project leading to an original and meritorious scientific contribution that is accepted for publication by a leading journal in the chosen field.

Students who desire the combined M.D./Ph.D. degrees are admitted to the Medical Scientist Training Program (MSTP, please see separate listing in this publication). These students participate in the two-year integrated preclinical curriculum of the School of Medicine (University Program), which features clinical correlation of basic biologic concepts. Combined degree students who select the Ph.D. in pharmacology undertake a series of advanced courses, research rotations, preliminary examinations, and dissertation research similar to that described above for conventional Ph.D. candidates.

**FACILITIES**
The Department of Pharmacology occupies about 25,000 net square feet in the School of Medicine Harland Goff Wood Building and its Research Tower. Facilities include extensive chromatographic and tissue culture facilities, a transgenic mouse laboratory, imaging and confocal microscopy equipment, and ready access to specialized research techniques, including various aspects of recombinant DNA and hybridoma technology, in situ hybridization histochemistry, and mass spectrometry.

**PHARMACOLOGY (PHRM)**

**Undergraduate Course**

**PHRM 301. Undergraduate Research (1-18)**
**PHRM 340. Science and Society Through Literature (3)**
This course will examine the interaction of scientific investigation and discovery with the society it occurred in. What is the effect of science on society and, importantly, what is the effect of society on science? An introduction will consider the heliocentric controversy with focus on Galileo. Two broad areas, tuberculosis and the Frankenstein myth, will then be discussed covering the period 1800-present. With tuberculosis, fiction, art and music will be examined to understand the changing views of society towards the disease, how society’s perception of tuberculosis victims changed, and how this influenced their treatments and research. With Frankenstein, the original novel in its historical context will be examined. Using fiction and film, the transformation of the original story into myth with different connotations and implications will be discussed. Most classes will be extensive discussions coupled with student presentations of assigned materials.
Graduate Courses

PHRM 400. Research Experience in Pharmacology (0)
Research rotation in Pharmacology.

PHRM 413. Molecular and Genomic Pharmacology (3)
The primary goal of this seminar style course is the development of a critical approach to the evaluation and design of research in the broad context of the interaction of receptors with endogenous ligands and with drugs and the determination of the polygenetic basis of disease states and interindividual variation in responsiveness to drugs. Lectures and/or journal article presentation will illustrate the application of fundamental principles of chemistry, biochemistry, thermodynamics, genomics, and pharmacology to experimental problem solving. Students and faculty participate as discussion leaders. Prereq: Consent of instructor.

PHRM 421. Fundamentals of Therapeutic Agents (3)
A rational approach to the use of drugs based upon a knowledge of receptor theory and a consideration of the pharmacokinetic factors that limit the duration of drug action. Prereq: Consent of instructor.

PHRM 423. Drug Action and Biodisposition (3)
Mechanisms of therapeutic action and adverse side effects for major drug classes leading to a rational approach to drug choice using a problem-solving approach based on selected disease states. Prereq: Consent of staff.

PHRM 430. Advanced Methods in Structural Biology I (3)
(See BIOC 430.) Cross-listed as BIOC 430.

PHRM 432. Biochemical and Molecular Aspects of Vision (3)
Increasingly, progress in the study of visual science is requiring multidisciplinary approaches that draw from the areas of biochemistry, genetics, molecular biology, neuroscience and pathology. We have recognized this fact and have adapted this course to fit the needs of tomorrow's scientists. This course encompasses the basic science aspects of the eye. Subjects include retinal anatomy and function; biochemical, molecular aspects of retinal disease and cataract; cellular and molecular neuroscience aspects pertinent to the visual system. Cross-listed as NEUR 432 and PATH 432.

PHRM 434. Mechanisms of Drug Resistance (3)
Resistance to drugs is an important health concern in the new millennium. Over the past century, modern medicine has developed and prescribed drugs for various ailments and diseases with known therapeutic benefit. Since the discovery of antibiotics by Dr. Fleming, we have struggled with a new complication in infectious diseases, development of drug resistance. This course will focus on and compare the drug resistant mechanisms selected by viruses, bacteria, parasites, fungi, and tumor cells. Topics to be covered include antiretroviral resistance (e.g., AZT and protease inhibitors), antibiotic resistance (e.g., B-lactams), resistance to chemotherapy agents, and resistance to antimicrobial drugs (e.g., chloroquine). Cross-listed as MBIO 434 and MVIR 434.

PHRM 435. Integrative Systems Physiology and Therapeutics (5)
This is a lecture-based and interactive learning course that will provide in-depth overviews of the major physiological systems in humans and the important drug classes that are used to treat pathophysiological states within each system. The major topics of discussion include the circulatory, renal, nervous, muscle, gastrointestinal, and endocrine systems as well as a basic chemotherapy section. Typical drugs that target components of each system will be presented by faculty and students. Learning activities will emphasize the molecular mechanisms of action of each drug. Each major topic area will conclude with a problem-based learning session that will consist of interactive, small group learning experiences on drug discovery, action, or related topics. Prereq: Consent of instructor.

PHRM 440. Science and Society Through Literature (3)
This course will examine the interaction of scientific investigation and discovery with the society it occurred in. What is the effect of science on society and, importantly, what is the effect of society on science? An introduction will consider the heliocentric controversy with focus on Galileo. Two broad areas, tuberculosis and the Frankenstein myth, will then be discussed covering the period 1800-present. With tuberculosis, fiction, art and music will be examined to understand the changing views of society towards the disease, how society's perception of tuberculous victims changed, and how this influenced their treatments and research. With Frankenstein, the original novel in its historical context will be examined. Using fiction and film, the transformation of the original story into myth with different connotations and implications will be discussed. Most classes will be extensive discussions coupled with student presentations of assigned materials. Cross-listed as BETH 440.

PHRM 506. Central Nervous System Pharmacology (3)
Principles of neurotransmission in the central nervous system: the pharmacology of drug-induced alterations in these central systems and neurochemical basis of behavior and selected neurological and psychiatric diseases. Lecture seminar.

PHRM 511. Pharmacology Seminar Series (0-1)
Current topics of interest in the pharmacologist sciences.

PHRM 514. Pharmacokinetics (2)
Seminar on drug absorption, distribution, metabolism and excretion and the mechanisms of adverse drug interaction. Prereq: PHRM 413.

PHRM 515. Endocrine Pharmacology (3)
Seminar lecture course on regulation at the molecular level of selected interrelated endocrine systems. Prereq: Consent of instructor. Cross-listed as BIOC 515.

PHRM 520. Introduction to Cancer Biology and Chemotherapy (3)
Cancer influences the lives of one in three people in the United States. Cancer is multistaged and is a series of disease within every organ of the body. Recent rapid advances in the fundamental causes, treatment, and prevention of cancer make research in this area important and interesting, not just to students interested in cancer, but to those interested in other fields, such as DNA Repair, Cell Cycle Regulation, Hormonal Regulation, Gene Regulation, Angiogenesis, and basic Molecular and Cellular Biology. This team-taught lecture/seminar course is an introduction to the genetics, prevention, and treatment of cancers. The course represents a survey covering: DNA damage and repair; cancer genetics; chemical carcinogenesis and prevention; signal transduction; cell cycle checkpoint regulation; hormonal regulation; chemotherapy and apoptosis. This course will also include an examination of the pathology of cancer and cancer epidemiology and biostatistics, in addition to the cellular and molecular biology of cancer. Prereq: Consent of instructor.

PHRM 523. Advanced NMR Spectroscopy in Structural Biology (3)
(See PHOL 523.) Cross-listed as PHOL 523.

PHRM 525. Topics in Cell and Molecular Pharmacology (3)
Individual library research project under the guidance of a pharmacology sponsor. Projects will reflect the research interest of the faculty sponsor, including molecular endocrinology, neuropharmacology, receptor activation and signal transduction, molecular mechanisms of enzyme action and metabolic regulation. Prereq: Consent of instructor.

PHRM 543. Developmental Pharmacology (3)
Principles of ontogeny related to drug sensitivity. Lecture, literature.

PHRM 601. Independent Study and Research (1-18)

PHRM 651. Thesis M.S. (1-18)

PHRM 701. Dissertation Ph.D. (1-18)

PHRM 703. Dissertation Fellowship (1-8)

Department of Physical Medicine and Rehabilitation

Phone (216) 778-3205
Gary S. Clark, M.D., C.P.E.
Professor, Chair, and Residency Program Director

Physical medicine and rehabilitation (P M & R) is a medical specialty devoted to restoring people's maximal functional ability following a wide variety of disabling medical conditions, from traumatic brain injury and spinal cord injury to acute and chronic back or knee pain. In 1995, the Center for Physical Medicine and Rehabilitation was created to coordinate and expand the research and training activities of the medical school that are devoted to the rehabilitation of people with disabling conditions and injuries. In 2002, a full academic department was established in recognition of the significant growth in the scope of education and research in the field.

The goals of the department:

1) To foster high-quality, innovative research that concerns impairments, disabilities, and handicaps resulting from illness, injury, and developmental processes and that focuses on health-related improve-
ment (physical, cognitive, behavioral and social) in human functioning and quality of life.

2) To promote and conduct effective teaching and training of principles and methods for rehabilitation of people with disabling chronic conditions and injuries at the undergraduate, graduate and postgraduate levels of medical education.

3) To enhance the quality and access to physical medicine and rehabilitation clinical services at university-affiliated medical centers.

4) To foster collaborative rehabilitation training and research among clinicians and basic scientists from a wide range of disciplines within the university.

The department’s faculty includes physicians and psychologists with varied backgrounds who have a broad array of clinical and research interests. Current areas of research focus include 1) enhancing motor recovery and functional ability following paralysis from spinal cord injury, brain injury and stroke; 2) improving methods for managing bladder and bowel dysfunction following spinal cord injury; and 3) outcomes research related to health and human functioning, from specific functional abilities that can be enhanced by individual therapy methods to the cost-benefit of integrated trauma and rehabilitation care systems. Many opportunities are available for physicians, graduate students and allied health trainees to gain knowledge and skills related to clinical rehabilitation and/or related research areas.

**Department of Physiology and Biophysics**

Room E-541, School of Medicine
Phone (216) 368-5529
http://physiology.case.edu/

**GRADUATE PROGRAMS**

The Department of Physiology and Biophysics at Case is a multidisciplinary department ranked among the top departments in the country. The department includes 60 active faculty members, more than 100 post-doctoral associates, and 60 full-time Ph.D., M.D./Ph.D., and master of science degree students. The training programs are designed to provide a mentored training environment that maximizes faculty-student interaction.

As outlined below, the department offers Ph.D., M.D./Ph.D. and master of science degrees. These programs are tailored to prepare students for successful careers in biomedical, pharmaceutical and industrial research. The master’s programs are designed for students wishing to learn technology that will provide them with employment opportunities in the biotechnology and physical therapy areas. The major goal of these programs is to provide students with a broad knowledge of cell and molecular biology, organ systems, and biophysics and an in-depth expertise in a selected research area.

The department offers four graduate-level programs, each of which uses state-of-the-art molecular, cellular, and biophysical method and concepts and state-of-the-art instrumentation. The goal is to provide an outstanding training opportunity. The major goals of the Ph.D. programs are to provide students with a broad knowledge base in organ systems and integrated physiology and in-depth expertise and outstanding research potential in the fields of cellular and molecular physiology and molecular/cellular biophysics. These goals are accomplished using a series of foundation and advanced topic courses, skill development courses, laboratory rotations, and thesis research.

**ADMISSION REQUIREMENTS FOR THE PH.D. PROGRAMS**

Applications to the program are available from and should be submitted to the Department of Physiology and Biophysics. Typically, entering students will have a B.A., B.S. or M.Sc. degree in physical or life sciences. Requirements for admission:

- An appropriate undergraduate or master’s degree.
- Undergraduate/graduate transcripts.
- GRE scores (plus TOEFL for international students).
- Three letters of recommendation.

Status of admission to the program is determined by a committee of faculty members based on application information and (often) candidate interviews. Normally, students enter the program in the fall semester.

Students apply for financial assistance when they apply to the program. A majority of admitted students receive cost-of-living stipend support, health insurance, and full tuition remission during the duration of their studies in the program.

**PH.D. AND M.S. PROGRAMS**

New students are advised and mentored by the Physiology Graduate Education Committee until they pass their Ph.D. qualifying exam (usually at the end of their second fall semester). After passing the qualifying exam, the student initiates thesis research under the direction of a specific mentor. Progress is then monitored by a graduate thesis committee.

The program of study consists of a core of courses that are completed during the first year. In addition, the students participate in three laboratory rotations by the end of their first full year of study. These rotations enable the student to sample the diverse research areas represented in the program and assist the student in making a well-informed choice of a thesis laboratory. Students also are required to attend the seminar series of either or both of the sponsoring departments throughout the duration of their studies, to gain wide exposure to cutting-edge research.

Elective courses provide an opportunity for advanced study relevant to the student’s particular research interest.

Near the beginning of their second year of study, students in good standing (>3.1 GPA and a maximum of 1 “C”) choose their research preceptor and take their Ph.D. qualifying exam, a written/oral exam. The written segment involves preparing a qualifying exam research proposal, the topic for which is chosen from
several provided by the faculty. The oral exam tests the student on general course knowledge, understanding of laboratory rotation research, and a defense of the qualifying exam research grant.

Following satisfactory completion of the qualifying exam, the student and research advisor submit a list of four to six faculty to serve on the student’s thesis committee. This list is submitted to the director of graduate education for approval/revision in consultation with the Committee on Graduate Education. The research progress of the student is then overseen by this committee through a series of periodic progress report meetings.

Specific requirements for graduation include satisfactory general knowledge in cell and molecular biology, and molecular/cellular biophysics, specific expertise in the student’s chosen area of research, completion of the thesis dissertation, and completion and acceptance of two first authored manuscript in an excellent to outstanding peer-reviewed scientific journal.

Ph.D. in Systems Integrative Physiology

The discipline of systems and integrative physiology embraces the concepts of cell and molecular physiology, biochemistry, and allied sciences, and seeks to understand the function of the organism at the organ system level. Systems research integrates information from genetic, biochemical, physiological and pathological science to understand organ function.

The systems integrated physiology program focuses on various aspects of cardiopulmonary and cardiovascular organ physiology. The major goal of this program is to provide intensive training in interdisciplinary science with an emphasis on integration of function of the cardiorespiratory systems at the organ system and whole organism levels. Specific areas of research excellence include cardiac metabolism, pulmonary physiology, neurotransmitters and receptors in cardiorespiratory regulation, and computational biology.

Ph.D. in Cell Physiology

The ultimate goal of cell and molecular biology, and biophysics is to understand the fundamental organizational and physiological functions of the cell using state-of-the-art methodology and conceptual approaches. Internationally recognized investigators in the Department of Physiology and Biophysics are studying gene regulation, membrane protein function, channels, mechanisms of intracellular transport, signal transduction pathways, membrane transport mechanisms, the electrophysiological properties of cells, cell pathophysiology, protein structure, and cancer/gene therapy. The cell and molecular physiology graduate training program is designed to provide students with training in state-of-the-art cellular and molecular technologies including gene cloning, transgenic methodology, and advanced microscopy. A parallel track, molecular/cellular biophysics, emphasizes quantitative methods and equips students to study cell and protein structure and function using state-of-the-art instrumentation and computing. Structural biology is an important strength, as departmental investigators are currently probing protein structure to produce high-resolution 3-D structural images of proteins. These studies are providing new approaches towards explaining, exploiting, and controlling the components of biological systems.

Ph.D. in Biophysics and Bioengineering

The biophysics and bioengineering program is designed to use advanced computers, instrumentation, biochemistry, and molecular technology to study biological processes. A major program theme is the quantitative approach. The department has a nationally recognized program in the electrophysiological sciences. This program includes investigation of the structural basis of ion channel function and understanding the mechanisms that cause cardiac arrhythmia. Mathematical models and computer simulations are used to describe and predict the electrical behavior of everything from single ion channels to whole organs. The biophysics and bioengineering Ph.D. program is co-sponsored by the Departments of Physiology and Biophysics, and Biomedical Engineering. The goal of the program is to provide students both with a comprehensive knowledge base in cellular and molecular biology and with the quantitative biophysical and engineering skills required to carry out studies that exploit and advance biophysical technologies. The program has particular strengths in cellular/electrophysiology and biophysics, biological imagining, biosensors, tissue engineering, modeling, biomaterials, and structural biology.

Ph.D. for M.D.s

This program is specifically designed for individuals who already have an M.D. degree but are interested in obtaining a research Ph.D. This program can be linked to research-oriented residency programs, such as the Clinical Investigator Pathway, approved by the American Board of Internal Medicine, and other similar programs.

M.D./Ph.D.

This program consists of the core medical training in the Case School of Medicine with advanced graduate research training in any of the disciplines outlined above, leading to a combined M.D./Ph.D. degree.

Master of Science in Physiology/Biotechnology

The masters of science in physiology degree program is a two-year program that provides an excellent foundation for future careers in biomedicine, academic or pharmaceutical research, and biotechnology. The program also is intended to serve as a stepping-stone for individuals seeking preparation for entry into Ph.D. or M.D. programs. A wide variety of master training areas are available in cell, biochemical, molecular and organ systems research. Enrolled students also may request consideration for direct transfer to the Department of Physiology and Biophysics Ph.D. training programs.

Master of Science in Exercise Physiology

The master of science in exercise physiol-
ogy degree program is a two-year program that provides a strong background in fundamental scientific concepts as well as a training emphasis in exercise physiology research. This unique combination offers flexibility for career opportunities in socially and medically important careers. The program features the department’s nationally recognized faculty and resources, providing for the integration of basic and clinical science with practical application to exercise physiology.

Program of Study for Cell and Molecular Physiology

Recent years have witnessed a major revolution in the ability of investigators to study fundamental biological problems. This revolution has been spearheaded by the dramatic advances in molecular and cellular biology. Investigators in the Department of Physiology and Biophysics utilize these state-of-the-art concepts and methods to study cell architecture, membrane transport, intracellular signaling, protein structure and function, functional genomics, cell metabolism, regulation of ionic and electrical gradients, transgenic models of disease, cell differentiation, immune function, transcriptional regulation, second messengers, membrane receptors and ion channels, signaling pathways, protein phosphorylation, enzyme regulation, transport mechanisms, gene expression, intracellular trafficking of proteins, transport across nuclear membranes, gene therapy, cancer progression, disease prevention, single-channel and whole-cell currents. This program is divided into two major focuses - cell and molecular physiology, and molecular/cellular biophysics. Ph.D. candidates in cell physiology can arrange a research focus in either of these areas. In the molecular/cellular biophysics focus, two of the courses listed below are replaced with two biophysics courses, Protein Biophysics and Membrane Biophysics.

Planned program of study for cell physiology:

First Year
Fall
Course (Credit Hours)

PHOL 432 Cell Structure and Function (3)
PHOL 460 Introductory Molecular Biology (3)
PHOL 480 Physiology of Organ Systems (3)
PHOL 498-01 Physiology and Biophysics Seminar (1)
PHOL 505-01 Laboratory Research Rotation (3)

Spring
PHOL 456 Structure and Function of Proteins (3)
PHOL 465 Ethical Conduct in Science (1)
PHOL 466 Cell Signaling (3)
PHOL 468 Membrane Physiology (3)
PHOL 498-02 Physiology and Biophysics Departmental Seminar (1)
PHOL 505-02 Laboratory Research Rotation (3)
PHOL 505-03 Laboratory Research Rotation (3)

Program of Study for Ph.D. in Systems Integrated Physiology

The revolutionary advances in cell and molecular biology have provided spectacular insights into the understanding of structure and function of biologic systems. Integrative systems physiology is a discipline that embraces the concepts of cell/molecular physiology, biochemistry, and allied sciences and applies the principles and experimental approaches to the study of human or animal organ systems. The major goal of the graduate program in systems integrated physiology is to provide trainees with intensive training in interdisciplinary sciences with an emphasis on integration of function of the cardio-respiratory systems at the molecular, cellular, organ, and whole animal or human levels. Examples of specific areas of research include cardiac metabolism, transmitters and second messengers in control of cardio-respiratory systems, excitation-contraction coupling, sudden infant death syndrome, and computational biology. The faculty in this program use a vast repertoire of experimental approaches ranging from whole body physiology to organ and cellular and molecular physiology.

Planned Program of Study for Systems Integrated Physiology:

First Year
Fall
Course (Credit Hours)

PHOL 432 Cell Structure and Function (3)
PHOL 460 Introductory Molecular Biology (3)
PHOL 480 Physiology of Organ Systems (3)
PHOL 498-01 Physiology and Biophysics Seminar (1)
PHOL 505-01 Laboratory Research Rotation (3)

Spring
PHOL 456 Structure and Function of Proteins (3)
PHOL 465 Ethical Conduct in Science (1)
PHOL 466 Cell Signaling (3)
PHOL 468 Membrane Physiology (3)
PHOL 498-02 Physiology and Biophysics Departmental Seminar (1)
PHOL 505-02 Laboratory Research Rotation (3)
PHOL 505-03 Laboratory Research Rotation (3)

Program of Study for Ph.D. in Biophysics/Bioengineering

The biophysics and bioengineering program was formed in response to dramatic advances in computers and instrumentation, spectacular progress in biochemistry and molecular biology, and the realization that integrated systems/engineering approaches are becoming critical for the understanding of biologic processes.

These synergistic advances provide tremendous opportunities for researchers interested in biology who are equipped to take quantitative approaches. A spectacular example is found in the area of structural biology, where the number of high-resolution 3-D structures of biologic macromolecules solved and deposited into the Brookhaven Protein Databank has dramatically increased. Another example is found in electrophysiology, where now it routinely is possible to measure transmembrane currents conducted by single ion channel protein molecules. Further, the tools of molecular biology now routinely are used to facilitate the large-scale
preparation of proteins and nucleic acids, thereby providing access to a host of important molecules that previously were unavailable in significant quantities.

The various genome projects are generating a staggering quantity of sequence data that will serve as the basis for much of the biological and biomedical research of this new century. As a result of such advances and developments, new approaches to explaining, exploiting, and controlling the components of biologic systems for basic science, biotechnologic, or medical reasons are both required and feasible.

The biophysics and bioengineering program is an interdisciplinary Ph.D. program, co-sponsored by the Department of Physiology and Biophysics in the Case School of Medicine and the Department of Biomedical Engineering of the Case School of Medicine and Case School of Engineering. The goals of the program are to provide students with the necessary knowledge base in cellular and molecular biology and with the quantitative biophysics and engineering skills required to perform studies that exploit advanced techniques. These goals are accomplished through a flexible curriculum that is tailored to the specific needs of the student and by providing a wide range of available faculty expertise and research opportunities.

The program has particular strengths in cellular/electrophysiology and biophysics, biologic imaging, biosensors, tissue engineering, modeling, biomaterials, and structural biology. Many of the participating faculty are affiliated with the Cleveland Center for Structural Biology, which includes state-of-the-art nuclear magnetic resonance and x-ray diffraction instrumentation.

Planned Program of Study for Biophysics & Bioengineering:

**First Year**

**Fall**

Course (Credit Hours)

PHOL 432 Cell Structure and Function (3)
PHOL 460 Introductory Molecular Biology (3)
EBME 409 Systems and Signals (3)

One of the following*:

PHOL 498 Physiology and Biophysics
Departmental Seminar (1)
PHOL 499 Biophysics/Bioengineering (1)
PHOL 505-1 Laboratory Research Rotation (3)

**Spring**

PHOL 456 Structure and Function of Proteins (3)
PHOL 465 Ethical Conduct in Science (1)
PHOL 468 Membrane Transport (3)
PHOL 498/99-2 Physiology and Biophysics
Departmental Seminar* (1)
PHOL 505-2 Laboratory Research Rotation (3)
PHOL 505-3 Laboratory Research Rotation (3)
Elective (3)

**Program of Study for Ph.D. Program for M.D.s**

To address the need to train M.D.-scientists, the Department of Physiology and Biophysics has instituted an accelerated Ph.D. program specifically geared to physicians interested in research. The key features of the program are its selectivity in terms of admissions qualifications—it is open only to those holding medical degrees—and its accelerated nature based on accelerated course learning and research training. The program is subdivided into advanced specialty courses (cell physiology electives) and hands-on research training and problem-solving (laboratory rotations, departmental seminars, qualifying examination, and thesis research). All students enrolled in the program must fulfill the general academic regulations for doctoral degrees as set forth by the School of Graduate Studies.

Application is open to any individual holding a medical degree or expecting to receive one before entry into the program. Selection for admission is based on the applicant’s potential for independent and innovative research as evidenced by an outstanding academic record in basic science disciplines, previous research experience, and three letters of recommendation. The full-time plan of study consists of a minimum of 22 semester hours of course work and 18 semester hours of thesis research. The program can be linked to research-oriented residency programs such as the Clinical Investigator Pathway, approved by the American Board of Internal Medicine, and similar programs in pediatrics and surgery.

**Program of Study for Master of Science in Exercise Physiology**

The Department of Physiology and Biophysics master’s program in exercise physiology offers not only a strong didactic component but also, unique within the existing programs at the exercise master of science level, strong research training. This is a Plan A, thesis required, program. The program includes research faculty and faculty who are involved in applied exercise physiology. The program also includes solid basic science, clinical science and practical application.

The primary goal of the program is to serve as a terminal degree for graduates who will pursue careers in exercise physiology in a variety of settings, including counselors in health clubs, personal trainers, clinical technicians in performance function laboratories, and other careers. A second goal is to supplement the education of medical students and resident physicians who wish to acquire additional knowledge and training in the field of exercise physiology as an adjunct to their clinical careers. A unique feature of the program is the emphasis on research. All students are expected to complete two laboratory rotations, ultimately selecting a project that leads to a successful thesis. All students will select an advisor no later than the end of the first term of studies. For evaluation of the thesis, each student will select with his/her advisor two additional faculty members to serve as committee members. The thesis work must result in at least one major paper with the student as first author.

Students will take 19 hours of didactic course work, six hours of laboratory rotations, and nine hours of thesis, thus meeting the requirements of the School of Graduate Studies. An earned quality point average of B+ (3.1) or better is required to remain in good standing.
The master in physiology program also is geared to serve as terminal training for careers in medically related professional positions, for careers in science teaching, and for career research positions in pharmaceutical and biotechnology organizations. The program is intended to serve as a stepping-stone for individuals seeking preparation for later entry into biomedical Ph.D. or M.D. programs.

A unique feature of this program is an emphasis on mentored independent research training, which includes both laboratory experience and formal course work in modern laboratory methodology and instrumentation. During the first year of the program, students enroll in a set of small-group classes that build a foundation of understanding that spans modern molecular biology, cell biology, protein biochemistry, and organs/whole systems physiology. Hands-on research experience is intermeshed with didactic course work to ensure that students have a working laboratory understanding of the methods and concepts. During the first year of the program, students are introduced to laboratory research methods by performing closely mentored projects. These projects provide students with in-depth exposure to an array of laboratory methods. This experience introduces students to laboratory skills and helps students choose laboratories for their focused research projects performed in the second year.

In the standard program, the second year is devoted primarily to the development and completion of a research project. Students take an advanced course in laboratory instrumentation and biotechniques; participate in advanced-level seminars, journal clubs, and lab meetings; and perform an independent, mentored research project. Upon completion of their projects, students submit written theses. The second-year research project is an important component of the program, typically leading to a publication in a peer-reviewed scientific journal.

Plan B - In some cases, a master of science degree may be obtained without completing a thesis but with a comprehensive examination and/or a major project to be administered by the academic unit.

The master in physiology program also can be pursued through an extended plan, in which the course load is tailored to allow current university employees working in laboratory technical positions to fulfill the course work and thesis registration requirements over a span of three to four years. These students perform their thesis research projects in the context of the laboratories in which they are employed.

A minimum of 18 credits of course work is required, with nine credits of dissertation research. A minimum cumulative grade point average of 3.1 is required, with a maximum of one “C” grade. A limited number of competitive fellowships may be available to qualified applicants in the standard plan of this master of science degree program.

For admission, all students must meet admission requirements of the Case School of Graduate Studies and must have taken the general section of the Graduate Record Exam, one year of biology, chemistry, organic chemistry and physics. Biochemistry and statistics are recommended. Enrollment as a full-time medical student in the Case School of Medicine or the previous attainment of a medical degree can replace the aforementioned requirements.

**Standard Plan Program of Study for Masters in Physiology:**

**YEAR 1**

**Fall:**

Course (Credit hours)

- PHOL 480 Organ System Physiology (3)
- PHOL 505 - 1 & -2 Laboratory Rotations (3 [x 2])
- Elective courses (5)
- PHOL 651 M.S. Thesis (minimum 9)

**YEAR 2**

**Spring:**

Course (Credit hours)

- PHOL 465 Ethical Conduct in Science (3)
- PHOL 456 Structure and Function of Proteins (3)
- PHOL 466 Cell Signaling (3)
- PHOL 498-2 Physiology Seminar (1)
- PHOL 505 Laboratory Research (3)
PHYSIOLOGY (PHOL)

Undergraduate Courses

PHOL 351. Independent Study (1-6)
This course is a guided program of study in physiology textbooks, reviews, and original articles. Guided laboratory projects to reproduce and extend classical physiological experiments are offered to the undergraduate science major. This course is being offered in conjunction with the Graduate level course PHOL 451. Students are required to consult with the faculty member whose work they have interest in and plan their individual experience.

PHOL 398. Physiology and Biophysics Departmental Seminar (1)
Weekly one-hour reviews from invited speakers describing their research. Students will present literature reviews or summaries of their research.

Graduate Courses

PHOL 432. Cell Structure and Function (3)
This course provides knowledge regarding cell structure and function, chiefly in mammalian cells but also in relevant model systems. The basic structure of the cell is discussed, as are various systems that regulate this structure. Topics to be covered include DNA transcription, translation and protein synthesis, intracellular transport, cell interaction with the external environment, cell cycle regulation, cell death and differentiation, signal transduction, and cell specialization and organization into tissues. The course emphasizes lectures and problem-based discussions with an emphasis on faculty-directed student self-learning. The major goals of this course are to provide students with a working knowledge of the cell to facilitate understanding of the scientific literature, and to familiarize students with current techniques in cell biology. Prereq: Permission of instructor required.

PHOL 440. Integrative and Cellular Physiology of Exercise (3)
This course provides a thorough presentation of the physiological responses to exercise. Emphasis is placed on understanding both the acute and chronic adaptation of the musculoskeletal, endocrine, pulmonary, and cardiovascular systems to physical exercise from the cellular to the multi-organ level. Students will read and interpret the research literature in the field of exercise physiology. Clinical uses of exercise in the prevention, diagnosis, and treatment of disease will also be discussed.

PHOL 444. Assessment of Human Performance Fitness (3)
This course provides a detailed description of a broad range of methods for the assessment of human performance in normal and diseased populations. The student will learn how to perform tests and measure physiological variables, and process, analyze, and interpret the information collected during the test. Topics include assessment of aerobic and anaerobic power, pulmonary gas exchange, functional capacity in a clinical setting, measurement of human strength and body composition, and histological, biochemical, and functional examination of muscle. Some of the most recent techniques for studying muscle oxygenation and metabolism, as well as techniques of the assessment of physical activity or fitness in the field will also be covered.

PHOL 446. Assessment of Human Performance Fitness-Practice (2)
This course provides practical experience that will expand on the basic principles and techniques for the assessment of human performance learned in PHOL 444. The focus will be on exercise testing devices/techniques, measurement of physiological variables, and exercise prescription/program design for the healthy person following the American College of Sports Medicine's Guidelines. Topics include health screening in the non-medical setting, measurement of aerobic and anaerobic performance, techniques for assessing body composition, exercise selection and exercise programming. Must be taken concurrently with PHOL 444. Coreq: PHOL 444.

PHOL 448. Exercise Training and Prescription (3)
This course covers muscle plasticity as the adaptive capacity of skeletal muscle to increased and decreased use and the physiological basis of training/rehabilitation. The course focuses on the physiological principles underlying cardiovascular and sports training to improve performance. These principles will be applied to both sedentary individuals and athletes who are training to improve sport performance. The exercise prescription component of the course will follow the guidelines of the American College of Sports Medicine, including determining goals and objectives, exercise selection, methods of evaluation and recording progress. Prereq: Consent of department.

PHOL 450. Special Topics in Sports Medicine (2)
This course covers three areas of interest to sport medicine professionals: (1) exercise testing and prescription in special population, such as children, adolescents, elderly, and athletes, and persons with chronic diseases (cardiovascular, pulmonary, immunological, metabolic, musculoskeletal, neuromuscular); (2) prevention and management of sport injuries; and (3) basic sport psychology. The course is based on lectures given by invited speakers specializing in the area, discussion of journal articles, and laboratory experiences.

PHOL 451. Independent Study (1-18)
Guided program of study using physiology textbooks, research reviews, and original research articles. An independent laboratory research project may also be included.

PHOL 456. Proteins and Nucleic Acids (3)
The goal of this course is to provide a basic working knowledge of protein structure/function and molecular biology. The course begins with a discussion of protein structure and enzyme catalysis followed by protein purification and characterization. The course then addresses concepts related to the application of modern molecular biology techniques. Students are taught how to clone genes and use these clones in animal and cell-based studies. The overall goal is to provide students with an understanding of proteins and genetic approaches that can be used in experimental work and to facilitate comprehension of the scientific literature. Prereq: Permission of instructor required. Cross-listed as BIOL 457.

PHOL 465. Ethical Conduct in Science (1)
This lecture/discussion course discusses the ideals motivating scientific research, the problems resulting from the breakdown of these ideals, and how those entering scientific research can prepare themselves to deal with these issues. Issues and practices regarding the use of animals, chemicals, and isotopes will also be discussed.

PHOL 466. Cell Signaling (3)
This is an advanced lecture/journal/discussion format course that covers cell signaling mechanisms. Included are discussions of neurotransmitter-gated ion channels, growth factor receptor kinases, cytokine receptors, G protein-coupled receptors, steroid receptors, heterotrimetric G proteins, ras family GTases, second messenger cascades, protein kinase cascades, second messenger regulation of transcription factors, microtubule-based motility, actin/myosin-based motility, signals for regulation of cell cycle, signals for regulation of apoptosis. Cross-listed as CLBY 466.

PHOL 468A. Membrane Physiology I (3)
This lecture/discussion/journal course focuses on physiological membranes. Topics discussed include thermodynamics and kinetics of membrane transport, oxidative phosphorylation and bioenergetics, electrophysiology of excitable membranes, and whole and single channel electrophysiology, homeostasis and pH regulation, volume and calcium regulation. Cross-listed as CLBY 468A.

PHOL 468B. Membrane Physiology II (4)
This lecture/discussion/journal course focuses on biological membranes. Topics discussed include thermodynamics and kinetics of membrane transport, oxidative phosphorylation and bioenergetics, electrophysiology of excitable membranes, and whole and single channel electrophysiology, homeostasis and pH regulation, volume and calcium regulation. This course is identical to PHOL468A except that it includes an extra hour of computer modeling. Prereq: Knowledge of thermodynamics and chemical kinetics.

PHOL 475. Protein Biophysics (3)
This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with
examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, and student presentations. A special emphasis will be placed on discussion of original publications. Prereq: Permission of instructor required.

PHOL 476. Cellular Biophysics (4)
This course focuses on a quantitative understanding of cellular processes. It is designed for students who feel comfortable with and are interested in analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular biophysics will be covered in depth. Topics include theory of electrical and optical signal processing used in cell physiology, thermodynamics and kinetics of enzyme and transport reactions, single ion channel kinetics and excitability, mechanotransduction, and transport across polarized cell layers. The format consists of lectures, problem sets, computer simulations, and discussion of original publications. The relevant biological background of topics will be provided appropriate for non-biology science majors. Prereq: Permission of instructor required.

PHOL 480. Physiology of Organ Systems (5)
This course presents an advanced introduction to the fundamental physiological principles governing the major organ systems in mammals. The function of the nervous, endocrine, digestive, muscle, circulatory, respiratory, and urinary systems are discussed. At the conclusion of the semester, integrative aspects of the major organ systems will be illustrated through consideration of exercise and high altitude physiology. Cross-listed as BIOL 480.

PHOL 498. Physiology and Biophysics Departmental Seminar (1)
Weekly one-hour reviews by invited speakers of their research. Students present literature reviews or summaries of their research.

PHOL 499. Biophysics/Biomedical Engineering Seminar (1)
Weekly one-hour reviews by faculty or invited speakers of their research. Students present literature reviews or summaries of their research.

PHOL 505. Laboratory Research Rotation (3)
One-semester experience in a selected faculty research laboratory designed to introduce the student to all aspects of modern laboratory research including the design, execution and analysis of original experimental work.

PHOL 514. Cardiovascular Physiology (3)
The goal of this course is to provide the student with a solid foundation in cardiovascular physiology and pathophysiology. The course will begin by providing a solid foundation in the structure, phenotype and function of cardiac and vascular muscle. In addition, electrophysiology and metabolism will be addressed. Both basic physiology and more advanced topics, such as pathophysiology, will be covered using a journal club format. (Twice weekly; 1.5hrs/class.) Student participation is required.

PHOL 517. Optical Microscopy and Imaging for Biologists (2)
(See ANAT 517.) Cross-listed as ANAT 517.

PHOL 519. Cardio-Respiratory Physiology (3)
This course is designed to integrate systemic, cellular and molecular aspects of cardio-respiratory systems in physiological and pathophysiological states. The course requires prior knowledge of basic physiology of the cardiovascular systems. Extensive student participation is required. Instructors provide a brief overview of the topic followed by presentation and critical appraisal of recent scientific literature by students. Prereq: Permission of instructor.

PHOL 522. Special Topics in Cardiac Electrophysiology (3)
Introduction to current topics in cellular cardiac electrophysiology and cardiac ion channel structure, function, and regulation. The format includes informal lectures as well as student presentations and class discussion of current literature.

PHOL 523. Advanced NMR Spectroscopy in Structural Biology (3)
An advanced course on NMR spectroscopy designed for advanced students interested in structural biology. Prereq: PHOL 430 or BIOL 312/412 or consent of instructor. Cross-listed as CBIO 523, CHEM 523, and PHRM 523.

PHOL 530. Technology in Physiological Sciences (3)
This lecture/discussion/journal course focuses on techniques in the physiological sciences. Topics include spectroscopy, microscopy, and electrophysiology. The theory and practice are covered with an emphasis on examples taken from the scientific literature. Prereq: CBIO 453 and CBIO 454.

PHOL 531. Transcription Factor Regulation of Gene Expression (2)
A reading and presentation course designed to expand knowledge of the mechanisms that regulate transcription factor activity and the mechanisms whereby transcription factors regulate gene expression. The major transcription factor classes are covered (i.e., API, Spl, NFkappB, POU domain, etc). Students are required to summarize a group of manuscripts that focus on a particular transcription factor-associated signaling process and coherently present this information in class.

PHOL 532. Microscopy - Principles and Application (1)
This course provides the student with both didactic lectures and hands-on experience in the design, construction, and application of numerous types of optical microscopy. Starting with basic optical theory, the course advances through transmitted, fluorescence, confocal, and finally, multiphoton microscopy, and provides the foundation for advanced optical microscopy applications and training. Subjects addressed will include: sample selection and preparation; microscope specifications, selection, and set-up; design and layout of microscopy spaces; function and use; imaging and photomicrography; techniques and limitations; documentation and analysis; and introduction to specialized applications. Prereq: Consent of instructor.

PHOL 601. Research (1-18)
Cellular physiology laboratory research activities that are based on faculty and student interests.

PHOL 651. Thesis M.S. (1-18)
PHOL 701. Dissertation Ph.D. (1-18)
PHOL 703. Dissertation Fellowship (1-8)
Individualized clinical and research experiences

MSTP Clinical Tutorial (timing optional)
Frances Payne Bolton
School of Nursing

HISTORY

The Frances Payne Bolton School of Nursing has a proud heritage beginning with the Lakeside Hospital Training School for Nurses established in 1898. With a generous endowment from Frances Payne Bolton, who was the first woman congressman from Ohio, the school of nursing was established in 1923 as a school within Western Reserve University. In 1969, Western Reserve University and Case Institute of Technology merged forming the current university, Case Western Reserve University. Consistently, the Bolton school is ranked among the top ten schools in U.S. News and World Report and in funding from the National Institutes of Health. Graduate level specialty majors also are in the top five.

The Bolton school is noted for its innovation, leadership, and excellence in education, research, and practice. To support this mission, the school has eleven endowed chairs, the largest number in the world for a school of nursing. The Bolton school is a World Health Organization Collaborating Center in Home Care. The Sarah Cole Hirsh Center for Best Nursing Practices Based on Evidence was established in 1998 and is the only national center of its kind.

STRATEGIC VISION

Mission

Within the mission of Case Western Reserve University, the Frances Payne Bolton School of Nursing builds on a tradition of innovation and a commitment to the highest standards of excellence to provide the very best nursing education, research, clinical scholarship, and professional service locally, nationally, and internationally.

Priorities

The Frances Payne Bolton School of Nursing is committed to global leadership in nursing. The discovery, transmission, and use of knowledge are at the core of our work. Knowledge of health and illness in individuals, families, groups, and communities, both locally and internationally, provides the context for our work. The ultimate test of the validity of our vision is the results, over time, of the contributions of our faculty and graduates.

Purpose

The Frances Payne Bolton School of Nursing is an integral component of Case Western Reserve University. The school assumes responsibility for the preparation of individuals committed to excellence and leadership in professional nursing. The faculty of the school accepts the responsibility for teaching and scholarly inquiry as integral parts of the educational process.

The purpose of the school is to provide an environment that permits individuals to develop their personal and professional capabilities, including the sense of responsibility for continued learning: to learn as efficiently and effectively as possible; to find enjoyment, excitement, and challenge in the pursuit of knowledge and its application; and to develop behaviors that enable them to function in a changing, complex society.

Philosophy

To accomplish the stated mission, the School of Nursing has set forth the following philosophy:

Nursing is an academic discipline and profession. Nursing as an academic discipline is a distinctive branch of human knowledge fundamental to nursing practice, nursing education, and nursing administration, and to the continuous development of the profession. The distinctive perspective of nursing includes a focus on the metaparadigm concepts of persons, environment, and nursing. The specific conceptual focus within the Bolton School is the health-seeking mechanisms and behaviors of human beings. Some of those mechanisms and behaviors are innate; others are learned or developed and may be subject to the influence of nurses’ knowledgeable ministrations. The body of nursing knowledge is continuously advanced, structured, and restructured as a consequence of a range of methods including scientific inquiry, philosophic inquiry, historical inquiry, and clinical evaluation.

Scientific inquiry within nursing is designed to discover, advance, and clarify knowledge about determinants and correlates of optimal biological, psychological, and social functioning; physical, emotional and spiritual comfort; and individual and group attainment of health goals in multiple environments and under a variety of circumstances (including illness and injury) attendant to birth, living, development, decline, and death.

Philosophic inquiry is undertaken to clarify the values that underlie consumers’ and nurses’ responsibilities for human health promotion, the ethics of nursing practice, and the nature of the body of knowledge known as nursing.

Historical inquiry is undertaken to document significant influences (by events and individuals) on the development of nursing over time as a body of knowledge and as a profession.

Clinical evaluation is designed to test and verify the relative efficacy of strategies used in nursing administration, consultation, education, and practice, and the means employed to advance nursing knowledge.
Professional nurses have mastery over a body of scientific and humanistic knowledge that is fundamental to their particular kinds of practice; they selectively use this knowledge in the execution of their professional responsibilities and in the attainment of professional goals. Those involved in differentiated nursing practices employ nursing technologies (skills and approaches that represent the application of scientific knowledge), using artistry in the execution of their professional responsibilities. Their several, particular practices are guided by a code of professional ethics and also by knowledge about the individuals and groups whom they serve.

The nurse’s professional goal is to appraise accurately and to enhance effectively the health status, health assets, and health potentials of individuals, groups, families, and communities and to promote the initiative and independence of those they serve in the attainment of reasonable health goals, mutually agreed upon by consumers and by nurses as their health care providers.

Nursing practice includes assisting persons in the maintenance of health, detecting deviations from health, assisting persons in the restoration of health, and supporting persons during life. These responsibilities are accomplished through a systematic and deliberative process. Nursing practice includes independent and interdependent functions and nurses are an integral part of the health care system.

Other beliefs essential to nursing that are shared by the faculty are stated below.

**INDIVIDUALS AND GROUPS**
- Individuals have commonalities, but each person is unique and has worth.
- Individuals are in constant interaction with the environment.
- Individuals have a capacity to grow and develop.
- Human behavior is purposeful and involves choices that are directed toward meeting the individual’s needs.
- Individuals and groups have rights and responsibilities in relation to the promotion of optimal health.
- Individuals have the responsibility for making decisions about their health and have the potential to act on these decisions.
- Most individuals possess the capability for making appropriate decisions, although there are times when these abilities are diminished or absent.

**LEARNING**
- Individuals are capable of changing their behavior through the process of learning.
- The need and ability to learn continues throughout life.
- Learning is affected by interaction between the individual and the environment.
- Learning is enhanced when consideration is given to individual differences in cognitive styles.
- The responsibility for learning resides in the individual learner.
- The learning process is an individual endeavor; stimulation of the process is a joint responsibility of teacher and learner working toward common goals.

**HEALTH**
- Health is a dynamic, ever-changing state.
- Health is influenced by an individual’s heredity, environment, and lifestyle.
- Individuals may manifest simultaneously states of health and illness.
- Individuals differ in the ways they value and define health.
- Individuals have the potential to grow as a result of an experience with illness.

**HEALTH CARE**
- Health care encompasses all activities necessary to promote optimal physiologic, psychological, and social functioning.
- Health care is rendered by the individual alone or in collaboration with health care providers, including nurses, and extends throughout the life span of the individual.
- Health care is complex and depends on the skills, resources, and cooperative efforts of consumers and health care providers.
- A recognized need exists in society to organize effectively the delivery of health care services.
- A variety of providers, each offering a unique and specific service, may be present in an organized health care system.
- The primary contribution of nursing to the health care system is to assist individuals and groups to attain, maintain, and regain optimal health.
- Health care professionals (including nurses) and consumers collaborate to define health; to identify factors inimical to health; to limit, reduce, or eliminate threats to health; to determine human and material resources necessary to provide health care services; and to evaluate and improve health services.
- Collaboration among health professionals and consumers can lead to the achievement of health care delivery systems that provide care that is available, accessible, feasible, acceptable, of optimal quality, sustained, and cost effective.

**CONCEPTUAL FRAMEWORK**

The conceptual framework of the Bolton School of Nursing is consistent with the definition of nursing adopted by the faculty.

“The science and art of enhancing, through the professional encounter, the health-seeking behaviors of individuals as they strive to attain, maintain or regain an optimal level of health within an environment of care.”
Relevant concepts include:

Optimal Level of Health: Highest achievable level of function and security. This includes physiological function and environmental (physical security, psychosocial function, and security), and personal growth.

Health-Seeking Behaviors: The range of mental and physical activities consciously performed to maintain, attain, or regain optimal level of health.

Environment of Care: The “place” and phenomenal field where a nurse encounters clients who need assistance in maintaining, attaining, or regaining competence in striving for health and performs acts for clients to facilitate health-seeking behaviors.

PROFESSIONAL ENCOUNTER

A person’s competence in matters related to health is dynamic and is influenced by genetic endowment and life experiences. At times a person requires assistance in improving competence. At these times, the nurse may enter into a relationship with the person (client) to facilitate the client’s health-seeking behaviors as he/she strives toward an achievable level of health. The client and nurse may view this relationship differently.

The professional encounter requires a reciprocal relationship in which the nurse, as a professional expert with the client’s assent, influences the behavior of the client. The client in turn evokes responses from the nurse.

The professional encounter is the initiation of a relationship between a nurse and a person requiring nursing care. The relationship is reciprocal in nature and may be initiated by either the client or nurse. Through the relationship mutual goal setting regarding health attainment is sought. When a nurse and client interact within the professional relationship, each performs functions deriving from their positions within a particular social context. The context (human-physical environment) in which the encounter occurs will have varying influence on both the client and nurse based on the cognitive, perceptual and emotional capacities of both. Although the environment in it physical representation is essentially the same for both, the perceptions of the client and nurse are different. The attributes that they bring to the relationship are shaped by intervening variables.

NURSING STRATEGIES

Nursing strategies can be categorized according to the function they serve in facilitating clients’ health-seeking behaviors. A tentative classification scheme according to the function strategies is set forth below. Within each category there are multiple behaviors from which the nurse can select depending on the nature of the clients’ assets and deficits. Also, each category is open to the discovery of more activities than are presently known. Each category focuses on facilitating health-seeking behaviors.

Compensating: Performing selected activities or measures (including monitoring) for clients when they are unable to do these activities.

Teaching: Performing actions intended to induce learning.

Counseling: Assisting clients to examine alternative course of action.

Supporting: Promoting clients’ ability to cope, adapt, and change.

Stimulating: Promoting clients’ desire to perform health-seeking behaviors.

Advocating: Intervening on behalf of the client to overcome obstacles that are interfering with health-seeking behaviors.

Comforting: Providing an environment that promotes ease and well being.

The choice of nursing strategies for enhancing client’s health-seeking behaviors is based on assessment of these behaviors and the intervening variables to determine the assets and deficits and potential for engaging in behaviors that are directed toward attaining, maintaining, or regaining an optimal level of health.

SARAH COLE HIRSH INSTITUTE FOR BEST NURSING PRACTICES BASED ON EVIDENCE

Established in 1998, the Sarah Cole Hirsh Institute for Best Nursing Practices Based on Evidence is building a repository of best nursing practices based on research findings.

Historically, nursing and medical practices have been based in part on expert opinion and tradition, creating variations in practice and often subjectivity in judgment. Through the integration of research and practice, the Hirsh Institute stimulates the use of best nursing practices based on evidence as a basis for delivering superior health care, shaping the next phase of nursing research, and providing standards for nursing education and practice.

The goals of the Hirsh Institute are to enhance nursing practice and health care delivery by:

- Building a repository of best nursing practices based on research findings.
- Disseminating current scientific evidence on best nursing practices to practicing nurses, educators, administrators, health care facilities, insurers, and policy makers.
- Guiding nursing research by identifying areas where scientific evidence is lacking.
- Conducting a certificate program in implementing best nursing practices based on evidence.
- Focusing attention on nursing excellence through its State of the Evidence Reviews with recommendations for practice.

INTERNATIONAL HEALTH PROGRAMS

The Bolton School houses a World Health Organization Collaborating Center for Nursing, one of only nine in the United States. The focus of the Collaborating Center is home care nursing education and research. In addition, there are a variety of international health opportunities for students of all levels.
including study abroad programs and short-term programs for international health experience.

LEARNING RESOURCE CENTER (LRC)

The newly renovated LRC includes a Cyber Café, Center for Bioinformatics and Health Promotion, Multimedia Simulation Center, and significant upgrades to the Clinical Teaching Center. An element of the Simulation Center is Cath-Sim, a computer unit and software program that stimulates the experience of inserting an intravenous catheter and drawing blood from various types of patients. The center includes two Cath-Sim units. The Cyber Café includes computers that students can use to access e-mail and the Internet, a network printer and Ethernet ports and wireless access points that students can use for their own laptops. Also included are a refrigerator, microwave and furnishings, including cable television. The Center for Bioinformatics and Health Promotion is a multi-enhanced classroom that has workstations for up to 24 students and an instructor, an application and CD/DVD server, an electronic whiteboard, document camera, and digital projector. The Clinical Teaching Center includes a variety of beds, a two-bed intensive care unit, a nursery, and a variety of mannequins and electronic devices to allow for experimental learning and teaching assessment.

ACCREDITATION

Bachelor of Science in Nursing and Master of Science in Nursing programs are accredited by the National League for Nursing Accreditation Council. National League for Nursing Accreditation Council
61 Broadway-33rd Floor
New York, NY 10006
212-363-5555 Ext. 153
www.accrediting-comm-nlnac.org

The Council on Accreditation of Nurse Anesthesia Programs accredits the nurse anesthesia program.
American Association of Nurse Anesthetists
222 South Prospect Avenue
Park Ridge, Illinois 60068-4001
(847) 692-7050
info@aana.com

The nurse midwifery program is accredited by the American College of Nurse Midwives.
American College of Nurse Midwives
818 Connecticut Ave. NW, Suite 900
Washington D.C. 20006
202-728-9860
info@acnm.org

The School of Nursing is approved by the State of Ohio Board of Nursing and is a member of the Council of Baccalaureate and Higher Degree Programs of the National League of Nursing.
Ohio Board of Nursing
17 High Street
Suite 400
Columbus, OH 43215-3413
614-466-3947
www.state.oh.us/nur

The North Central Association of Colleges and Schools, Commission on Institutions of Higher Education accredits the university.
North Central Association of Colleges and Schools
Commission on Institutions of Higher Education
30 N. LaSalle Street, Suite 2400
Chicago, IL 60602-2504
(800) 621-7440
info@nca-cihe.org

INSTRUCTIONAL FACILITIES

With a highly qualified faculty engaged in teaching, research, and community service, the Bolton school offers high quality academic programs. Instruction includes lectures, seminars, individual conferences and small groups discussions, and clinical experiences under the guidance of a preceptor. Modern research and educational facilities include computer and skills laboratories.

CLINICAL FACILITIES

Instructional facilities are abundant and varied. The University Hospitals of Cleveland is a 947-bed academic medi- cal center and is a aggregate of specialized hospitals that includes Alfred and Normal Lerner Tower, Samuel Mather Pavilion, and Lakeside Hospital for adult medical/surgical care; Rainbow Babies and Children's Hospital; University MacDonald Women's Hospital; University Ireland Cancer Center; and skilled nursing and rehabilitation services. University Hospitals is part of the University Hospitals Health System with services provided at 100 locations in 40 northern communities. The Cleveland Clinic Health System has 2,957 beds and is comprised of the Cleveland Clinic Foundation and Fairview Hospital, Health Hill Hospital for Children, Lakewood Hospital, Lutheran Hospital, Marymount Hospital, Euclid Hospital, Hillcrest Hospital, Huron Hospital, and South Pointe Hospital. MetroHealth Medical Center is a regional referral center with 690-beds for medical/surgical care to adults and children. It is a trauma I center with a burn center and 143-bed rehabilitation facility specializing in spinal cord injuries, only one of 19 in the nation. MetroHealth also has the Clement Center for Family Care, a neighborhood outpatient center, and a 291-bed. Skilled Nursing Care Center. These hospitals are major clinical resources.

Additional opportunities are available in a variety of health, social, and educational agencies. These include, for example, American Red Cross, Benjamin Rose Institute, Hospice of the Western Reserve, Cleveland Psychiatric Institute, Kenneth W. Clement Center for Family Health Care, Judson Park Retirement Community, Hospice of the Western Reserve, Visiting Nurses Association, Cleveland Public Health Department, the Ohio Permanente Medical Group, and many others.

ORGANIZATIONS

Student Organizations
All enrolled students are members of their respective Undergraduate or Graduate
Student Organizations that promote collegiality among students and provide social, cultural activities and educational. They are also members of the National Student Nurses’ Association, and after paying dues, members of the Bolton School’s chapter of this organization. Ph.D. students elect one member and one alternate to the Graduate Student Senate of the School of Graduate Studies. All minority undergraduate nursing students are automatically members of the Minority Student Nurses Association, which fosters collegiality among minority students. The Nurses’ Christian Fellowship is an affiliate of the Inter-Varsity Christian Fellowship. Selected by the student organizations, students also are members of some standing committees of the Bolton School. There are a variety of international student associations on campus as well.

Sigma Theta Tau

Sigma Theta Tau is a national professional honor society, and Alpha Mu is the chapter at the Bolton School. Members are selected from students enrolled in one of the school’s nursing programs or nurses in the community with a B.S.N., M.S.N., Ph.D. or N.D. degree. Candidates are chosen based on superior scholastic achievement, potential for leadership, and desirable personal qualities.

Alumni Association

Upon graduation, all nursing students are inducted into the Alumni Association. This begins a life-long membership and relationship with the School of Nursing. An elected board of directors and officers administer the association. Alumni are generous in their support of the school and provide funds for students and the Bolton school through the Annual Fund and other gifts and bequests. Activities of the alumni are reported in the FPB Nursing magazine published by the nursing school.

ADMINISTRATION

May L. Wykle, Ph.D., R.N., FAAN, FGSA (Case Western Reserve University)
Dean of Nursing
Director, Center on Aging and Health
Georgia Narsavage, Ph.D., (University of Pennsylvania)
Associate Dean of Academic Programs
Director, M.S.N. and N.D. Programs
Carol Savrin, M.S.N. (West Virginia University)
Assistant to the Director for the M.S.N. Program
Deborah Lindell, M.S.N. (University of Pennsylvania)
Assistant to the Director for the N.D. Program
Shirley Moore, Ph.D. (Case Western Reserve University)
Associate Dean for Research
Gail McCain, Ph.D., R.N., (Case Western Reserve University)
Associate Dean for Community Affairs
Marilyn B. Lotas, Ph.D., RN (University of Michigan)
Associate Dean for Student Services
Director, B.S.N. Program
Marcella T. Hovancek, M.S.N. (Case Western Reserve University)
Assistant to the Director for the B.S.N. Program
Jaclene A. Zauszniewski, Ph.D. (Case Western Reserve University)
Director, Ph.D. Program
Elizabeth Madigan, Ph.D. (Case Western Reserve University)
Director, Center for Research and Scholarship
Nora Hennessy, B.A. (Walsh University)
Executive Director of Development and Alumni Relations
Susan Frey, M.Acc. (Cleveland State University)
Director of Finance and Administration
Debbie Joseph, M.B.A. (Miami University)
Director of Marketing

PROFESSORS

Gene C. Anderson, Ph.D., FAAN
(Wisconsin, Madison)
Edward J. and Louise Mellen Professor of Nursing

Joyce J. Fitzpatrick, Ph.D., MBA, FAAN
(New York University)
Elizabeth Brooks Ford Professor of Nursing
Faye A. Gary, Ed., R.N., FAAN

Susan M. Ludington, Ph.D., C.N.M, FAAN
(Texas Woman’s University)

Carol W. & Margaret Davis Walter Professor of Pediatric Nursing

Beverly L. Roberts, Ph.D., FAAN, FGSA
(Case Western Reserve University)
Professor of Nursing

May L. Wykle, Ph.D., FAAN, FGSA (Case Western Reserve University)
Florence Cellar Professor of Nursing

ASSOCIATE PROFESSORS

Claire M. Andrews, Ph.D., FAAN (Wayne State University)
Associate Professor of Nursing
John Clochesy, Ph.D., FAAN (Case Western Reserve University)
Independence Foundation Professor of Nursing Education

Marion P. Good, Ph.D., R.N. (Case Western Reserve University)
Associate Professor of Nursing

Barbara J. Daly, Ph.D., FAAN (Bowling Green University)
Associate Professor of Nursing

Sara L. Douglas, Ph.D., R.N. (Illinois State University)
Associate Professor of Nursing

Earle M. Heinzer, Ph.D., R.N. (Case Western Reserve University)
Associate Professor of Nursing

Marilyn J. Lotas, Ph.D., R.N., (University of Michigan)
Associate Professor of Nursing

Elizabeth A. Madigan, Ph.D., R.N., (Case Western Reserve University)
Associate Professor of Nursing

Elizabeth A. Madigan, Ph.D., R.N., (Case Western Reserve University)
Associate Professor of Nursing

Judith A. Maloni, Ph.D., FAAN (University of Pittsburgh)
Associate Professor of Nursing

Gail C. McCain, Ph.D., R.N., (Case Western Reserve University)
Associate Professor of Nursing

Shirley M. Moore, Ph.D. (Case Western Reserve University)
Associate Professor of Nursing
ASSISTANT PROFESSORS

Kimberly Adams-Tufts, N.D., FAAN (Case Western Reserve University)
Assistant Professor of Nursing

Gloria F. Antall, N.D., R.N., (Case Western Reserve University)
Assistant Professor of Nursing

Mary K. Anthony, Ph.D. (Case Western Reserve University)
Assistant Professor of Nursing

Elizabeth G. Damato, Ph.D., R.N. (Boston College)
Assistant Professor of Nursing

Donna A. Dowling, Ph.D. (University of Illinois)
Assistant Professor of Nursing

Mary T. Quinn Griffin, Ph.D. R.N., (Case Western Reserve University)
Assistant Professor of Nursing

Patricia A. Higgins, Ph.D. (Case Western Reserve University)
Assistant Professor of Nursing

Christine Hudak, Ph.D. (Cleveland State University)
Assistant Professor of Nursing

Marion M. Kraness, D.N.Sc. (Rush University)
Assistant Professor of Nursing

Patricia E. McDonald, Ph.D. (Case Western Reserve University)
Assistant Professor of Nursing

Barbara Morrison, Ph.D., R.N.C., F.N.P., C.N.M., (University of Illinois)
Assistant Professor of Nursing

Theresa S. Standing, Ph.D. (Case Western Reserve University)
Assistant Professor of Nursing

M. Jane Suresky, N.D., R.N., C.S. (Case Western Reserve University)
Assistant Professor of Nursing

Constance G. Visovsky, Ph.D., R.N. (Case Western Reserve University)
Assistant Professor of Nursing

National Cancer Institute Post-Doctoral Fellow

Christine Winkelmann, Ph.D. (Case Western Reserve University)
Assistant Professor of Nursing

Amy Y. Zhang, Ph.D. (Pennsylvania State University)
Assistant Professor of Nursing

INSTRUCTORS

Jeannine Bernstein, M.N. (University of California, Los Angeles)
Instructor of Nursing

Paul R. Blakeley, M.S.N. (Case Western Reserve University)
Instructor of Nurse Anesthesia;
Director Cleveland Clinic Foundation Nurse Anesthesia Program

Rhonda Draper, N.D. (Case Western Reserve University)
Instructor of Nursing

Evelyn G. Duffy, M.S. (University of Wisconsin, Madison)
Instructor of Nursing

Kimberly A. Edwards, M.S.N. (Case Western Reserve University)
Instructor of Nursing

Carol Savrin, M.S.N. (West Virginia University)
Instructor of Nursing

Tamara Schurigyn, M.S.N. (Case Western Reserve University)
Instructor of Nurse Anesthesia

Margaret Smith, M.S.N. ,C.R.N.A., (Case Western Reserve University)
Part-Time Instructor of Nurse Anesthesia

Valerie Toly, M.S.N. (Case Western Reserve University)
Instructor of Nursing

Margaret A. Wheatley, R.N., M.S.N.
Sue Zronek, R.N., M.S.N.

BACHELOR OF SCIENCE IN NURSING

The B.S.N. program emphasizes intensive and early clinical experience, a strong foundation in acute and critical care nursing, and a commitment to service to
our community. Our students begin their clinical experience in the first term of the freshman year and complete their program with a 300 hour clinical preceptorship in the senior year. Students graduate with 1620 hours of clinical experience, far exceeding that of other schools of nursing.

The student learning environment includes traditional classrooms and the new Learning Resource Center (LRC). The LRC consists of four activity centers: the Clinical Teaching Center, the Center for Bio-informatics and Health Promotion, the Multimedia Simulation Center, and the Cyber Café. Clinical experiences occur in Cleveland’s nationally and internationally renown health care facilities including University Hospitals of Cleveland, the Cleveland Clinic, and the MetroHealth System.

The opportunities available to students are limitless. Students are encouraged to participate in interdisciplinary research projects with senior faculty. They have the opportunity to explore health issues in the global arena and to participate in international activities through the Bolton School's World Health Organization (WHO) Collaborating Center.

Graduates have a foundation in the discipline of nursing, demonstrate leadership in clinical practice, use clinical inquiry to advance practice, become involved in research, and assume responsibility for their own professional development.

Characteristics of the Graduate

- Teaches and counsels individuals, families, and other groups about health, illness, and health seeking behaviors
- Critiques and applies research findings to clinical practice
- Provides direct patient care and assumes leadership role in directing nursing care to individuals, groups and families
- Participates and assumes beginning leadership roles
- Uses principles of ethics and the professional code as a framework for decision making
- Works effectively as a member of an interdisciplinary health care team
- Uses effective communication techniques with diverse clients, colleagues, and information systems
- Describes process of health care policy development

ADMISSION REQUIREMENTS

Freshman
Application for undergraduate admission to the University
Recommendation from secondary school report/counselor
Secondary school transcript
Writing sample
SAT/ACT scores

Transfer
Application for undergraduate admission to the University
Secondary school transcript
Teacher recommendation
Statement of good standing
College transcripts
Personal statement
SAT/ACT scores

DEGREE REQUIREMENTS

Candidates for the Bachelor of Science in Nursing degree must complete the following:
Minimum of 124 hours as specified by the requirements with a 2.0 GPA
A minimum of C for all courses taken in nursing and science.
A minimum of 50 credit hours in 300 and 400 level courses
A modified core curriculum described in the Case Western Reserve University General Bulletin

PROGRESSION IN THE B.S.N. PROGRAM

Progression in the Bachelor of Science in Nursing program is contingent upon satisfactory academic achievement in all required courses. To maintain satisfactory academic standing, students must attain a GPA of 2.0 or above by the end of their junior year and must obtain a C or above in all nursing and science courses. Although the University accepts a D as a passing grade, the grading policy of the Bolton School is A, B, C, F. Students who receive two unsatisfactory grades (D or F) in nursing and/or natural and behavioral science courses will be subject to separation from the School of Nursing. See the Undergraduate Student Handbook for a description of the criteria for academic standing.

Students who receive a grade of Incomplete (I), given at the discretion of the instructor for the course, must complete course requirements by the eleventh week of the following semester. It is the student’s responsibility to notify the instructor of the circumstances preventing completion of all assigned work. In the absence of notification or adequate justification, the instructor may give the student a final grade that assumes a failing grade for the missing work. If a student fails to submit the work required for removing the Incomplete by the date established or by the eleventh week of the following semester, the instructor will give the failing grade (F). The grade will convert from I to F when the deadline for making up incomplete grades from a previous semester has passed.

Students who receive an F for a nursing course must register for that course the next semester that it is offered. If the overall GPA falls below the required cumulative GPA, the student is placed on academic probation. If the GPA does not improve the next semester, the Academic Standing Committee of the University Undergraduate Faculty will review the student’s record to determine whether extenuating circumstances warrant an additional semester of probation or separation from the university.

CURRICULUM

This four-year generic program for high school graduates leads to a B.S.N. degree. Upon successful completion of the program, graduates will be eligible
to sit for the examination for licensure as a registered nurse (RN). The School of Nursing has the right to determine a student’s readiness to sit for the NCLEX-RN examination and the right to restrict testing until the student demonstrates a readiness to pass this examination. This examination is given by State Boards of Nursing, and satisfactory completion of this examination enables the graduate to practice as a RN in the state for which the examination was written.

The B.S.N. program includes nursing, science and liberal arts courses. A minimum 124 credit hours, with at least 50 credits from upper division courses, are required for awarding of the B.S.N. degree. Students must meet the University requirements for graduation. The ratio of clinical hours to credit hours is 4 to 1, and for laboratory hours, it is 2 to 1. The program plan for entry-level students to the B.S.N. program is located on the next page.

Degree Requirements

Candidates for the Bachelor of Nursing Science degree must complete all required courses with a cumulative grade point average of 2.0 or above and passing grades of C or better in all nursing and science courses.

Program Plan for Generic Baccalaureate Students

Freshman Year – Fall Semester ... Hours
ENG 150 Expository Writing ...............3
BIOL 114 Principles of Biology ..............3
BIOL 119 Molecular View of Biology I ........3
BIOL 346 Human Anatomy .................3
PHED Physical Education ..................0
NURS 110 Foundations of the Discipline ..................1
NURS 111 Foundations of the Practice ..................3
Total .............................................16

Sophomore Year - Fall Semester
General Education Requirement ........6
NURS 211 Pharmacology ...................2
NURS 250 Aging in Health and Illness .................3

NURS 230 Nursing Care of the Adult & Older Adult I ...........5
Total .............................................16

Junior Year - Fall Semester
General Education Requirement ........3
NURS 343 Issue and Ethics in Health Care ..............2
NURS 346 Informatics IV ...................2
NURS 344 Trends and Issues in Professional Nursing ........2
NURS xxx Health in the Global Community ..............5.5
Total .............................................14.5

Senior Year - Fall Semester
General Education Requirement ........3
BIOL 121 Chemical Biology .................3
BIOL 148 Physiology .......................3
NURS 201 Nutrition .........................3
NURS 122 Nursing Assessment .............3
NURS 120 Nursing Informatics: Introduction ..................2
PHED Physical Education ..................0
Total .............................................17

Freshman Year - Spring Semester Hours
General Education Requirement ........3
NURS 342 Medical Microbiology ..........4
NURS 240 Nursing Care of the Adult & Older Adult II ........5
NURS 317 Psych/Mental Health ............4.5
Total .............................................16.5

Sophomore Year - Spring Semester
General Education Requirement ........3
NURS 320 Nursing Research ...............3
NURS 345 Informatics III: NIS ............2
NURS 353 Critical Care ....................4.5
NURS 351 Acute Care II ..................4.5
Total .............................................17

Junior Year - Spring Semester
General Education Requirement ........3
NURS 341 Concepts of Management .......3
NURS 352 Acute Care III OR ..........9
NURS 354 Critical Care: Adults OR ....9
NURS 356 Critical Care: Children OR ..9
NURS 350 Concepts and Management in Geriatric Nursing ........9
Total .............................................12

RN/B.S.N. ENTRY OPTION

Registered nurse graduates of an associate or diploma program in nursing can obtain their B.S.N. by fulfilling the core requirements of the University and the upper division nursing courses developed specifically for this program.

Admission Requirements

Completion of an accredited associate degree or diploma program in nursing with a minimum GPA of 2.5
Current RN licensure
Transcripts of all academic work

Program Requirements

Based on passing the NCLEX examination for licensure, 30 semester hours of proficiency in clinical nursing will be granted. Upon satisfactory completion of 62 credits of the University’s core requirements for a baccalaureate degree, the required 30 hours of upper division nursing courses, and the 32 hours of proficiency in clinical nursing (total of 124 credits), students will be granted a Bachelor of Science in Nursing degree. Transfer credit will be evaluated for content and equivalence to University courses by the appropriate academic department. To be considered by transfer, course syllabi may have to be provided along with the academic transcript.

Nursing Core Requirements

To satisfy University core requirements, 62 semester hours of coursework must be completed in the following areas:

- English Composition
- Natural and Mathematical Sciences
- Arts and Humanities
- Social Sciences
- Global and Cultural Diversity
- Physical Education

Upper Division Nursing Courses Hours
NURS 318 Nursing in the Community ..4
NURS 320 Nursing Research ............3
NURS 345 Nursing Informatics III ......2
NURS 346 Nursing Informatics IV ......2
NURS 391 Home Health Care Nursing · 5
NURS 392 Dynamics of Nursing · 4
NURS 393 New Applications of Nursing Practice Management · 4
NURS 443 Professionalism in Advanced Practice Nursing · 3
NURS 444 Health Care Delivery, Legal and Ethical Issues in Advanced Practice · 3

Total Semester Hours · 30

MASTER OF SCIENCE IN NURSING (M.S.N.)

The Master of Science in Nursing program prepares registered nurses for advanced practice specialization either as a nurse practitioner, clinical specialist, nurse midwife, or nurse anesthetist. In addition, an M.S.N. in nursing informatics is offered. Dual degree programs are offered in bioethics (M.S.N./M.A.), anthropology (M.S.N./M.A.), business administration (M.S.N./M.B.A.), and public health (M.S.N./M.P.H.).

Characteristics of the Graduate

Develops and teaches educational offerings and provides consultation with other professionals/populations and communities about health, illness, and health-seeking behavior

Identifies clinical research problems, initiates utilization of research, and participates in scientific inquiry

Assumes functions and role of the Advanced Practice Nurse

Assumes leadership positions in organizations at the local/state/national level

Applies ethical principals in Advanced Practice Nursing

Initiates interdisciplinary teams to enhance practice

Establishes effective communication systems among clients and colleagues

Contributes to policy development through active participation in legislative processes

Entry Options

RN with National Certification in Advanced Nursing Practice

This M.S.N. completion program is designed to assist certified advanced practice nurses to complete a Masters of Science in Nursing degree. Registered nurse applicants must have a Bachelor in Nursing Science from an accredited nursing program. Applicants must have certification from a national accrediting organization as a nurse practitioner, clinical nurse specialist, nurse midwife, nurse anesthetist or AORN first assistant. The national certification in advanced nursing practice takes the place of the clinical coursework in the specialty where the person holds certification. A Master of Science in Nursing can be obtained by completing 18 credits (6 courses) at the Bolton School of Nursing. These include the core courses in Inquiry, Professional Development and Advanced Practice.

Professional Development Core · Hours

NURS 443 Professionalism in Advanced Practice · 3
NURS 444 Health Care Delivery, Legal and Ethical Issues in Advanced Practice · 3

Scientific Inquiry Core

NURS 405 Inquiry I · 3
NURS 415 Inquiry II · 4
NURS 503 Inquiry III · 2

Advanced Practice Core

NURS 430 Pharmacology and Therapeutics · 3

RN/MSN Entry Option

Registered nurse graduates of an associate degree or diploma nursing program may enter the Masters of Nursing program after completing undergraduate pre-requisites for graduate level nursing courses.

Undergraduate Prerequisites to MSN Courses

Fall Semester Weekend Classes · Hours

NURS 392 Dynamics of Nursing · 4
NURS 393 New Applications of Nursing Practice Management · 4

Total · 8

January Intensive Classes · Hours

NURS 345 Nursing Informatics III · 2
NURS 318 Nursing in the Community · 4

Total · 6

May Intensive Classes · Hours

NURS 346 Nursing Informatics IV · 2
NURS 320 Nursing Research · 3

Total · 5

Total Semester Hours · 19

RN with a B.S. or B.A. Degree

Applicants with a B.A. or B.S. degree from an accredited college or university in a field other than nursing and who have graduated from NLNAC or AACN accredited associate degree or diploma programs may submit a portfolio detailing professional accomplishments and experiences. If the portfolio is approved, the applicant may enter the Master of Science in Nursing program directly.

RN with B.S.N. Degree

Applicants with a B.S.N. degree from an AACN or NLNAC accredited nursing program are admitted directly into the Master of Science in Nursing program.

Admission Requirements

Three professional recommendations

Eligible for RN licensure in Ohio

Satisfactory scores on the Miller Analogies Test (MAT) or the Graduate Record Examination (GRE).

Completion of an accredited first professional degree program in nursing.

Within 5 years of admission and prior to registering for NURS 415, satisfactory completion of a college or university statistics course with content comparable to Case STAT 201 or Anthropology 319 (Statistics for MSN/MA Anthropology majors)

Applicants who do not meet the above requirements may be referred to the M.S.N. Admissions Committee for special consideration, and may be required to fulfill additional prerequisites and demonstrate clinical nursing proficiency.

Program Requirements

Candidates for a Master of Science in Nursing with a B.S.N. degree or a Certificate in Professional Nursing must
The Frances Payne Bolton School of Nursing, a part of Case Western Reserve University, offers a curriculum that includes the following core requirements.

### Clinical Nursing Core.. Semester Hours

**NURS 443 Professionalism in Advanced Practice** ........................................... 3  
**NURS 444 Health Care Delivery, Legal and Ethical Issues in Advanced Practice** .......................... 3

### Scientific Inquiry Core

**NURS 405 Inquiry I** ............................................ 3  
**NURS 415 Inquiry II** ........................................... 4  
**NURS 503 Inquiry III** ........................................... 2

### Advanced Practice Core

**NURS 430 Pharmacology and Therapeutics** ........................................... 3  
**NURS 453 Advanced Physiology** ........................................... 4  
**NURS 459 Advanced Assessment** ........................................... 3

### Community Engagement Focus

Selected courses for M.S.N. students at the Frances Payne Bolton School of Nursing incorporate projects with community agencies. These projects are designed to improve health care among underserved residents of Cleveland’s inner-city neighborhoods. Developed in collaboration with the community partners, these projects are a unique component of the Bolton School's master's curriculum.

Community agencies that participate include but are not limited to the Hospice of the Western Reserve, The Health Museum of Cleveland, the American Red Cross Greater Cleveland Chapter, Health CMHA (Cuyahoga Municipal Housing Authority), American Diabetes Association-Cleveland, and school districts in the Cleveland area.

### Progression Requirements

Progression in the M.S.N. program is contingent on a cumulative GPA of 3.0 and passing grades in all courses (A, B, C, P, or S). If the cumulative GPA falls below 3.0 during any semester, the student will be placed on academic probation. To be removed from probation, the student must have a cumulative GPA of 3.0 or higher in the next academic semester. If the student fails to complete course requirements within the time frame, he/she may be separated from the School of Nursing.

The grade of incomplete (I) will be given at the discretion of the instructor for work not completed in the semester. The "Arrangement to Resolve a Grade of Incomplete" form must be completed prior to the end of the semester or the instructor may assign a grade of U or F. A grade of I must be removed by the end of the semester following the one in which the course was taken or before the student enrolls in a course for which the initial course is a prerequisite. No credit is given for an I grade. The I will remain a permanent part of the transcript if the student fails to complete course requirements within the next semester, unless alternative arrangements are approved in writing.

A student who receives a grade of F or U for a required course must register for the course the next semester it is offered to continue in the M.S.N. program. If the grade of U or F is in a course that is not required for the M.S.N. program, the student may register for the same course or a substitute course and achieve a passing grade to continue in the M.S.N. program.

If the student receives a grade of F or unsatisfactory performance (F, U & NP) in two courses, he/she will be excluded from the Bolton School.

### Degree Requirements

The Master of Science in Nursing program requires a minimum of 36 semester hours of graduate credit for the student who enters with a B.S.N. degree. Other degree requirements must be fulfilled for those entering with the portfolio or R.N./M.S.N. entry options. A maximum of 15 semester hours of credit in approved graduate courses, where the student obtained a grade of B or above, may be transferred to meet program requirements. To be awarded a M.S.N. degree, the student must have a cumulative GPA of 3.0 and received satisfactory grades in all nursing courses taken for credit as a M.S.N. student. Degree requirements must be completed within five years of initial enrollment.

### NURSE PRACTITIONER

Nurse practitioners promote optimal health, detect illness, and facilitate restoration and maintenance of health. They often function independently in a variety of settings. Two specialties are available for acute care nurse practitioners, and six specialties are available in primary care. These programs contain at least 500 hours of clinical experience. Graduates are eligible to sit for the national certification examinations for these specialties.

### Acute Care Nurse Practitioners

There are practice requirements for these specialties. One year of experience in acute care is required for the Acute Care Nurse Practitioner. A concentration in flight nursing is available within the Acute Care Nurse Practitioner major. One year of experience in neonatal intensive care is required for the Neonatal Nurse Practitioner.

### Acute Care Nurse Practitioner

**Professional Development** .................................. 6  
**NURS 443** ............................................. 3  
**NURS 444** ............................................. 3
Scientific Inquiry ......................... 9-11  
NURS 405 .................................. 3  
NURS 415 .................................. 4  
NURS 503 OR NURS 500 ........... 2-4  
Advanced Practice Core .......... 10  
NURS 430 (Spring) ................. 3  
NURS 453 (Fall) .................... 4  
NURS 459 ............................... 3  
Clinical Nursing Courses ......... 14  
Semester I (Fall) 
NURS 438 Theoretical Foundations of  
Acute Care Nursing .................. 4  
Semester II (Spring) 
NUNP 443 Acute Health Problems of  
the Adult II ............................ 6  
Semester III (Fall) 
NUNP 444 Advanced Management of  
Acutely III Adults .................... 4  
Total Semester Hours ............. 39-41  
The following courses may be taken in  
addition to complete a flight nurse  
concentration:  
NURS 406 Flight Nursing Clinical  
Seminar I ......................... 1  
NURS 404 Emergent Care of Children. 2  
NURS 407 Flight Nursing Clinical  
Seminar II ............... 1  
NURS 523 Advanced Internship  
in Flight Nursing ............... 1-5  

NEONATAL NURSE PRACTITIONER  
Professional Development .......... 6  
NURS 443............................... 3  
NURS 444 .................. 3  
Scientific Inquiry ..................... 9-11  
NURS 405 .................................. 3  
NURS 415 .................................. 4  
NURS 503 OR NURS 500 ........... 2-4  
Advanced Practice Core .......... 10  
NURS 430 (Spring) ................. 3  
NURS 453 (Fall) .................... 4  
NURS 459 ............................... 3  
Clinical Nursing Courses ......... 16  
Semester I (Fall) 
NUNP 414 Neonatal Nurse  
Practitioner I ......................... 3  
Semester II (Spring) 
NUNP 412 Neonatal Nurse  
Practitioner II ......................... 4  
Semester III (Summer) 
NUNP 413 Neonatal Nurse  
Practitioner III ...................... 3  

Semester III (Fall) 
NUNP 414 Neonatal Nurse  
Practitioner IV ....................... 5  
Total Semester Hours .......... 40-42  
*Note: Courses listed under the area of  
Professional Development, Scientific  
Inquiry, and Advanced Practice Core may  
be taken alone or with Clinical Nursing  
Courses, and may be taken during any  
semester offered. The Advanced Practice  
Core courses are co-requisites or pre-requsites for the clinical nursing courses.  
Clinical Nursing Courses must be taken  
in the semester and sequence listed above. Clinical course availability is based upon  
enrollment.  

PRIMARY CARE NURSE  
PRACTITIONERS  
Adult Nurse Practitioner  
This major is now offered in distance  
format with only eight trips to Cleveland  
if you are a full-time student.  

Semester Hours  
Professional Development .......... 6  
NURS 443............................... 3  
NURS 444 .................. 3  
Scientific Inquiry ..................... 9-11  
NURS 405 .................................. 3  
NURS 415 .................................. 4  
NURS 503 OR NURS 500 ........... 2-4  
Advanced Practice Core .......... 10  
NURS 430 (Spring) ................. 3  
NURS 453 (Fall) .................... 4  
NURS 459 ............................... 3  
Clinical Nursing Courses ......... 15  
Semester I (Fall) 
NUNP 410 Health Promotion  
Across the Lifespan ............... 2  
Semester II (Spring) 
NUNP 419 Family Health Nursing:  
Health of Adults and Older Adults 5  
Semester III (Summer) 
NUNP 429 Family Health Nursing:  
Health of the Family During Childbearing  
Years ......................... 4  
Semester IV (Fall) 
NUNP 439 Family Health Nursing:  
Health of Children and Adolescents 4  
Total Semester Hours .......... 40-42  
*Note: Courses listed under the area of  
Professional Development, Scientific  
Inquiry, and Advanced Practice Core may  
be taken alone or with Clinical Nursing  
Courses, and may be taken during any  
semester offered. The Advanced Practice  
Core courses are co-requisites or pre-requsites for the clinical nursing courses.  
Clinical Nursing Courses must be taken  
in the semester and sequence listed above. Clinical course availability is based upon  
enrollment.

NUNP 434 Advanced Management in  
Adult Primary Care ............... 5  
Total Semester Hours .......... 41-43  

Family Nurse Practitioner  
This major is now offered in distance  
format with only eight trips to Cleveland  
if you are a full-time student.  

Professional Development .......... 6  
NURS 443............................... 3  
NURS 444 .................. 3  
Scientific Inquiry ..................... 9-11  
NURS 405 .................................. 3  
NURS 415 .................................. 4  
NURS 503 OR NURS 500 ........... 2-4  
Advanced Practice Core .......... 10  
NURS 430 (Spring) ................. 3  
NURS 453 (Fall) .................... 4  
NURS 459 ............................... 3  

Clinical Nursing Courses ......... 15  
Semester I (Fall) 
NUNP 410 Health Promotion  
Across the Lifespan ............... 2  
Semester II (Spring) 
NUNP 419 Family Health Nursing:  
Health of Adults and Older Adults 5  
Semester III (Summer) 
NUNP 429 Family Health Nursing:  
Health of the Family During Childbearing  
Years ......................... 4  
Semester IV (Fall) 
NUNP 439 Family Health Nursing:  
Health of Children and Adolescents 4  
Total Semester Hours .......... 40-42  

*Note: Courses listed under the area of  
Professional Development, Scientific  
Inquiry, and Advanced Practice Core may  
be taken alone or with Clinical Nursing  
Courses, and may be taken during any  
semester offered. The Advanced Practice  
Core courses are co-requisites or pre-requsites for the clinical nursing courses.  
Clinical Nursing Courses must be taken  
in the semester and sequence listed above. Clinical course availability is based upon  
enrollment.
Gerontological Nurse Practitioner

Professional Development .................. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3

Scientific Inquiry .................. 9-11
NURS 405 ........................................ 3
NURS 415 ........................................ 4
NURS 503 OR NURS 500 ............. 2-4

Advanced Practice Core .................. 10
NURS 430 (Spring) .................. 3
NURS 453 (Fall) .................. 4
NURS 459 ........................................ 3

Clinical Nursing Courses .................. 19

Semester I (Fall)
NUNP 410 Health Promotion Across the Lifespan .................. 2
NURS 441 Mental Health for Older Adults .................. 1

Semester II (Spring)
NURS 419 Family Health Nursing: Health of Adults and Older Adults ....... 5
NURS 479 Public Policy and Aging 3

Semester III (Summer)
NURS 449 Primary Care of the Older Adult .................. 3

Semester IV (Fall)
NURS 454 Management of Complex Problems in the Older Adult .......... 4
NURS 442 Mental Health Interventions with Older Adults .................. 1

Total Semester Hours ............. 44-46

For those wishing dual certification as GNP and Gerontological CNS, add the following to the GNP major:
NURS 466 Practicum and Supervision of the Role of the Clinician .................. 3
NURS 446 Collaboration and Administration in Health Care Delivery .................. 3
NURS 448 Mental Health Practice with Older Adults .................. 1

Pediatric Nurse Practitioner

Scientific Inquiry .................. 9-11
NURS 405 ........................................ 3
NURS 415 ........................................ 4
NURS 503 OR NURS 500 ............. 2-4

Advanced Practice Core .................. 10
NURS 430 (Spring) .................. 3
NURS 453 (Fall) .................. 4
NURS 459 ........................................ 3

Clinical Nursing Courses .................. 15

Semester I (Fall)
NURS 460 Theoretical Basis of Individual Therapy .................. 2
NURS 461 Practicum and Supervision of Individual Therapy .................. 1
SSBT 548 Adult Psychopathology OR PSCL 524 Adult Psychopathology ..3

Professional Development .................. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3

Scientific Inquiry .................. 9-11
NURS 405 ........................................ 3
NURS 415 ........................................ 4
NURS 503 OR NURS 500 ............. 2-4

Advanced Practice Core .................. 10
NURS 430 (Spring) .................. 3
NURS 453 (Fall) .................. 4
NURS 459 ........................................ 3

Clinical Nursing Courses .................. 15

Semester I (Fall)
NURS 460 Theoretical Basis of Individual Therapy .................. 2
NURS 461 Practicum and Supervision of Individual Therapy .................. 1
SSBT 548 Adult Psychopathology OR PSCL 524 Adult Psychopathology ..3

Semester II (Spring)
NURS 462 Practicum and Supervision of Group and Family Therapy ....... 2
NURS 467 Theories of Family and Group Modalities .................. 2

Semester III (Fall)
NURS 463 Theoretical Basis of Practicum and Supervision in Consultation and Mental Health Education ....... 2
NURS 466 Practicum and Supervision of the Role of Clinician .............. 3

Total Semester Hours ......... 40-42

Women’s Health Nurse Practitioner

Professional Development .................. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3

Scientific Inquiry .................. 9-11
NURS 405 ........................................ 3
NURS 415 ........................................ 4
NURS 503 OR NURS 500 ............. 2-4

Advanced Practice Core .................. 10
NURS 430 (Spring) .................. 3
NURS 453 (Fall) .................. 4
NURS 459 ........................................ 3

Clinical Nursing Courses .................. 14

Semester I (Fall)
NURS 454 Well Woman Health Care ....... 3

Semester II (Spring)
NURS 455 The Childbearing Family ....... 4

Semester IV (Fall)
NUNP 410 Health Promotion Across the Lifespan .................. 2
NURS 559 Advanced Practice in Nursing Care of Women .................. 5

Total Semester Hours ......... 39-41

*Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. The Advanced Practice Core courses are co-requisites or pre-requirements for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.
NURSE ANESTHESIA

Nurse anesthesia focuses on preoperative evaluation, intraoperative management and postoperative evaluation of patient anesthesia care. Nurse anesthetists are primarily responsible for direct patient care and are prepared as expert clinicians.

Clinical courses provide students with opportunity to give direct patient care, participate in staff education programs and identify clinical topics for research. Students work one-on-one with a clinical preceptor with expertise in nurse anesthesia. The student will take part in administering general and regional anesthesia in persons of all ages. The management of emergency operations, obstetrics, pediatrics, and neurosurgery are an integral part of the clinical experience. Graduates will be eligible to take the certification examination administered by the Council on Certification of Nurse Anesthetists.

All applicants must have at least one year of recent experience in one of the following acute care settings: recovery room, emergency room; or medical, surgical, neonatal, or pediatric intensive care. Applicants will be reviewed as files are completed; to be considered, all files must be completed by January 15 of the expected year of enrollment.

Semester I (Fall) ................. Hours  
NURS 443 Professionalism in Advanced Practice Nursing ..........................3  
NUAN 449 Chemical and Physical Principles of Anesthesia ..................2  
NUAN 455 Anesthesia Nursing .............1 2  
NUAN 450 Pharmacological Strategies in Anesthesia Practice ..............2  
Total ........................................... 9

Semester II (Spring)  
NURS 405 Inquiry I ..................................3  
NUAN 451 Physiological Variables and Responses I .........................2  
NUAN 452 Physiological Variable and Responses II ..........................3  
NUAN 456 Anesthesia Nursing II 1 .... 9  

Semester III (Summer)  
NUAN 457 Anesthesia Nursing III .... 1  
NUAN 453 Physiological Variables and Responses III .......................4  
NURS 444 Health Care Delivery, Legal and Ethical Issues .................3  
Total ........................................... 8

Semester IV (Fall) Hours  
NURS 415 Inquiry II .................4  
NUAN 454 Physiological Variables and Responses IV ......................3  
NUAN 551A Nurse Anesthesia: Advanced Practice I ....................9  

Semester V (Spring)  
NUAN 551B Nurse Anesthesia: Advanced Practice I .........................1  
NURS 503 Inquiry III 2 ..........3  
Semester VI (Summer)  
NUAN 551C Nurse Anesthesia: Advanced Practice II ......................1  

Semester VII (Fall)  
NUAN 552 Nurse Anesthesia: Advanced Practice II .........................1  
Total Semester Hours .................. 40

NURSE MIDWIFERY

Nurse-midwifery focuses on the clinical and scientific areas of women's health maintenance. A nurse-midwife is primarily responsible for direct care in the areas of gynecologic health, antepartum, intrapartum, postpartum, family planning, and parent education. Students work one-on-one with a clinical preceptor and select and work in birth centers, health maintenance organizations, and private practices. Graduates are eligible to sit for the certification examination for nurse midwifery from the American College of Nurse Midwives.

Semester I (Fall) ................. Hours  
NURS 405 Inquiry I .........................3  
NURS 454 Well Woman Health Care ....3  
NURS 459 Integrated Assessment - APN .................3  
NURS 453 Physiologic Foundations - APN 4 .......................13  

Semester II (Spring)  
NURS 455 The Childbearing Family ....4  
NURS 430 Pharmacology and Therapeutics .........................3  
NURS 415 Inquiry II .........................4  
Total ........................................... 11

Semester III (Fall) Hours  
NURS 457 Labor and Birth ............7  
NUNP 410 Health Promotion Across the Lifespan .........................2  
NURS 444 Health Care Delivery, Legal and Ethical Issues .............3  
Total ........................................... 12

Semester IV (Spring)  
NURS 557 Advanced Nurse-Midwifery 6  
NURS 443 Professionalism in Advanced-Practice Nursing ............3  
NURS 503 Inquiry III ...................2  
Total ........................................... 11  
Total Semester Hours .................. 47

CLINICAL NURSE SPECIALIST

Two specialties are in the clinical nurse specialist track in the masters program. Medical-surgical nursing focuses on the care of patients recovering from illness and living with chronic illness. The student selects a specialty in critical care, oncology, or other specialty adult medical-surgical areas. The student then does clinical practicum in these areas. The focus of the Community Health program is on mobilizing and empowering the community to act on its own behalf in matters affecting health and well being. Interventions are designed in collaboration with the community and interdisciplinary personnel. A concentration in infection control may be taken along with the community health courses. Graduates of these tracks are eligible to sit for certification examinations as a clinical nurse specialist.

Medical-Surgical Nursing  
Professional Development ..............6  
NURS 443 ........................................3  
NURS 444 ........................................3  

Scientific Inquiry ......................... 9-11  
NURS 405 ........................................3  
NURS 415 ........................................3  
NURS 503 OR NURS 500 ............2-4  

Advanced Practice Core ..................10  
NURS 430 (Spring) .........................3  
NURS 453 (Fall) .........................4  
NURS 459 ........................................3
### Informatics Nursing Core

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPBI 494 Infectious Disease Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>NURS 450 Infection Control II</td>
<td>3</td>
</tr>
<tr>
<td>NURS 524 Infection Control Practicum</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. The Advanced Practice Core courses are co-requisites or pre-requirements for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.*

### NURSING INFORMATICS

The M.S.N. major in Nursing Informatics emphasizes the preparation of graduates who can analyze nursing information requirements, design systems; manage information and its technological requirements; identify system implementation strategies; implement user training strategies; and evaluate system effectiveness in clinical, educational, administrative, and research venues. Students in the Nursing Informatics major will specialize in an area of interest within Nursing Informatics. These areas include but are not limited to: systems analysis and design, emerging technologies, database management, and organizational implementation of information systems. An internship of one semester will provide an opportunity for the student to obtain practical experience as a Nursing Informatics Specialist (NIS) in a variety of clinical, educational, research, and administrative settings. The program includes 500 hours that may be credited toward the required 2000 hours for certification as a Nursing Informatics Specialist through the ANCC.

### Required Nursing Courses

- **Semester I (Fall)**
  - NURS 491 Community Health Nursing Assessment 4
  - NURS 480 Public Health Epidemiology 3
  - NUNP 410 Health Promotion Across the Lifespan 2

- **Semester II (Spring)**
  - NURS 495 Community Health Nursing Program Planning 4
  - NURS 496 Community Health Nursing Leadership 4
  - NUND 483 Health Care Policy and Planning and Information Management Systems 3

### Relevant Courses

**Administration Option**

- NURS 471 Organizational Theories 3
- NURS 446 Collaboration and Administration in the Health Delivery System (Fall) 3

**OR** Select two courses in the following areas:

- Anthropology Demography
- Biostatistics Epidemiology

**Total Credits** 41-43

### Concentration in Infection Control

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPBI 490 Epidemiology: Introduction to Theory/Method</td>
<td>3</td>
</tr>
<tr>
<td>NURS 445 Infection Control I</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. The Advanced Practice Core courses are co-requisites or pre-requirements for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.*

### M.S.N./M.A. (ANTHROPOLOGY) JOINT DEGREE

The Master of Science in Nursing/Master of Arts in Anthropology joint degree provides students with the unique combination of cross-cultural expertise in medical anthropology and clinical expertise in nursing. Students must complete a minimum of 19 credits in nursing core courses; 12 to 22 credits in clinical major courses; and a minimum of 18 credits in anthropology courses, distributed as indicated below. The actual number of credits depends upon the major selected. This curriculum plan reflects clinical nursing majors other than nurse anesthesia and community health. Choice of electives should guarantee that minimum credit requirements are met. All students must pass the Masters Qualifying Examination in Anthropology.

### Required Nursing Courses

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUNI 421 Theoretical Foundations of Nursing Informatics</td>
<td>4</td>
</tr>
<tr>
<td>NURS 438 Theoretical Foundations of Organizational Theory</td>
<td>3</td>
</tr>
</tbody>
</table>

**Semester II (Spring)**

- NUNI 431 Advanced Nursing Informatics 4

**Semester III (Fall)**

- NUNI 499 Internship in Nursing Informatics 5
- NIDS 409 Introduction to Management Information Systems 3

**Total Credits** 37-39

**Note:** Courses listed under the area of Professional Development and Scientific Inquiry may be taken alone or with Informatics Nursing Core Courses, and may be taken during any semester offered. The Informatics Nursing Core courses must be taken in the semester and sequence listed above. Informatics Nursing Core courses availability is based upon enrollment.

---

604 Frances Payne Bolton School of Nursing

Case Western Reserve University General Bulletin 2004–2006
NURS 443 Professionalism in Advanced Practice Nursing..................3
NURS 444 Health Care Delivery, Legal and Ethical Issues..................3
NURS 453 Physiological Foundations ....................................4
NURS 459 Integrated Assessment ....................................3
NURS 430 Pharmacology and Therapeutics ..................................3
NURS 405 Inquiry I ........................................3
NURS 415 Inquiry II ....................................4
NURS 443 Professionalism in Advanced Practice Nursing.................3
Total ..................................................32-42

Required Anthropology Courses
ANTH 480 Anthropology of Health & Illness Part I ........................3
ANTH 481 Anthropology of Health & Illness Part II ........................3
ANTH 462 Contemporary Theory in Anthropology .........................3
Anthropology Electives (health-related) ......................................6-9
Total ..................................................15-18

Required Research Courses
NURS 415 Inquiry II ........................................4
NURS 503 Inquiry III ........................................2
Total ..................................................6

OR
ANTH 504 Advanced Methods in Medical and Gerontological Anthropology ..............................................................3
and either of the following:
ANTH 444 Urban Health/Cultural Competence Practicum ..................3
Or
ANTH 447 Qualitative Methods in Medical Anthropology ..................3
Total ..................................................6

Required Elective
Approved elective course in Anthropology OR Nursing..................3 3
Total Semester Hours .............................................55-68

M.S.N./M.A. (BIOETHICS) JOINT DEGREE

The Masters of Science in Nursing/Masters in Business Administration joint degree program is designed for nurses with managerial and organizational skills needed to manage patient care environments or health programs and to participate in the strategic leadership of health care agencies. This program integrates nursing and management courses taken concurrently. A nine-hour practicum must be taken in one semester.

Orientation and Statistics Preparation
Workshops begin week before Fall courses

Semester I (Fall) Hours
MBAC 410 Management Assessment and Development ..................1 2
MBAC 410 (Lab) Team Development Seminars ..............................1
MBAC 411 Strategic Issues and Applications I ..............................1
MBAC 412 Career Management Seminars .....................................1
MBAC 414 Statistics and Decision Modeling .....................................3
MBAC 415 Financial Reporting and Control .....................................3
MBAC 416 Managerial Finance .................................................3
NURS 405 Inquiry I ........................................3
Total ..................................................17

Semester II (Spring)
MBAC 413 Human Values in Organizations ....................................3
MBAC 413 (Lab) Negotiations and Collaboration ............................1
MBAC 421 Strategic Issues and Applications II ..............................2
MBAC 424 Marketing ..............................................3
NURS 415 Inquiry II ........................................4
NUND 483 Health Care Policy and Planning and Information Management Systems .........................................................3
Total ..................................................32-42

Semester III (Fall)
MIDS 409 Information Design and Management .............................3
OPMT 405 Operations Management .............................................3
NURS 468 Continuous Improvement in Health Care (recommended) 3
ECON 403 Economics .................................................3
NURS 503 Inquiry III ........................................2
Total ..................................................14

Semester IV (Spring) Hours
Open elective (WSOM) .............................................3
NURS 456 Issues in Health Care Management
OR HSMC 456 (Thematic elective) ...........................................3
NURS 577 Nursing Practicum .............................................9
Total ..................................................21

Semester V (Fall)
Open elective (WSOM) .............................................3
Open elective (WSOM) .............................................3
Open elective (WSOM) .............................................3
MBAC 440 Exit Skills Assessment ..............................................1
NURS 499 The Nurse Executive .............................................3
Total ..................................................15

Total Semester Hours .............................................78

Note: This program may be done part time. See advisor for details.

M.S.N./M.P.H. DEGREE

The focus of the M.S.N. clinical specialization is on the development of skills necessary for the comprehensive assessment and diagnosis of the health status of communities and populations. The use of program planning models for development of community or population need-based programs is emphasized, and thorough program evaluation techniques are stressed. The Master of Public Health Program, operated by the School of Medicine and the School of Graduate Studies, prepares students for the broad mission of public health,
defined as "enhancing health in human populations through organized community effort" utilizing education, research, and community service. The dual degree program will not only prepare nurses to sit for the American Nurses Credentialing Center (ANCC) clinical specialty exam in Community Health Nursing but also will prepare nurses to assume leadership roles in the overall planning, organizing, and delivery of care to populations and communities. Students pursuing the combined M.S.N./M.P.H. degree will take 30 credits of M.P.H. coursework and 29 M.S.N. credits.

Semester I (Fall).......................... Hours
NURS 405 Inquiry ......................... 13
NUNP 410 Health Promotion ............ 2
MPHP 490 Epidemiology ................. 3
MPHP 405 Statistical Methods .......... 3
Public Health Elective .................... 3
MPHP 504 Public Health Capstone Seminar...........................................0
Total ................................................. 16

Semester II (Spring)....................... Hours
NURS 415 Inquiry II ....................... 4
NURS 443 Professionalism in Nursing . 3
NURS 444 Legal and Ethical Issues ...... 3
MPHP 439 Health Management and Policy ............................................... 3
MPHP 411 Behavioral Medicine
MPHP 504 Public Health Capstone Seminar...........................................0
Total ................................................. 16

Semester III (Fall)........................ Hours
NURS 491 Community Health Nursing Assessment .................................... 4
NURS 503 Inquiry III ..................... 2
MPHP 429 Environmental and Occupational Health ............................ 3
MPHP 652 Capstone Experience ....... 3
Public Health Elective .................... 3
MPHP 504 Public Capstone Seminar ....0
Total ................................................. 15

Semester IV (Spring) Hours
NURS 495 Community Health Nursing Program Planning ......................... 4
NURS 496 Community Health Nursing Leadership .................................... 4
MPHP 652 Capstone Experience ........ 6
MPHP 504 Public Health Capstone Seminar...........................................0
Total ................................................. 15

Total Semester Hours.................... 59

JOINT PROGRAMS WITH FRONTIER NURSING SERVICE

M.S.N./CNEP
The Community-Based Nurse-Midwifery Education Program (CNEP) is a distance education program leading to a certificate in nurse-midwifery. Students complete course and clinical work in their communities. CNEP is housed in the Frontier School of Midwifery and Family Nursing in Hyden, Kentucky. The program is administered by a Certified Nurse-Midwife with over 40 Certified Nurse-Midwifery faculty members. Through an innovative affiliation agreement, students attending CNEP receive full course credit towards a Master's Degree in Nursing from Case Western Reserve University. Degree requirements must be completed within 5 years of completion of CNEP.

Course of Study for MSN/CNEP Curriculum
Semester (Fall) ................. Hours
NURS 405 Inquiry I .................... 3
NURS 415 Inquiry II ................... 4
NURS 503 Inquiry III ................ 9

M.S.N./CFNP
The Community-Based Family Nurse Education Program is an innovative joint degree program with the Frances Payne Bolton School of Nursing at Case Western Reserve University. The program is designed for aspiring family nurse practitioners who complete course and clinical work in their communities. The program is designed with a 24-month full-time or a 36-month part-time option. The Master's degree is awarded by Case Western Reserve University. Degree requirements must be completed within five years of completion of CFNP courses at Frontier Nursing Service. For more information, contact:

Case Western Reserve University
Frances Bolton Payne School of Nursing
Student Services
10900 Euclid Avenue
Cleveland, Ohio 44106

OR

Frontier School of Midwifery and Family Nursing
www.frontierfnp.org

Course of Study for MSN/CFNP Curriculum
Semester (Fall) ................. Hours
NURS 405 Inquiry I .................... 3
NURS 415 Inquiry II ................... 4
NURS 503 Inquiry III ................ 9

DOCTOR OF NURSING

The Doctor of Nursing Program (N.D.) is an innovative academic program designed to prepare leaders in nursing. This is a four-year program leading to both a Masters of Science in Nursing and Nursing Doctorate degrees. The Doctor of Nursing program is designed with multiple entry points to accommodate students with diverse prior educational backgrounds. The 16-month prelicensure portion is designed for baccalaureate prepared college graduates from a variety of disciplines ranging from the social and natural sciences to the humanities and arts. The post licensure portion is designed for entry of B.S.N.- and M.S.N.- prepared nurses and prepares advanced practice nurses. The Doctor of Nursing program is characterized by educational depth and emphasis on advanced practice, nursing inquiry, management, and policy required for clinical leadership in nursing. Upon successful completion of the prelicensure portion of the N.D. program, the student receives a Certificate of Professional Nursing that qualifies them to sit for the professional nursing licensing examination (NCLEX-RN). A Masters of Science in Nursing and a Nursing Doctorate are awarded after successful completion of the post licensure portion of the N.D. program.
Characteristics of the Graduate

Initiates and develops educational offerings and provides consultation with other professions/populations and communities about health, illness, and health seeking behavior

Initiates, designs, conducts, directs, and reports clinical research studies

Assumes functions and role of Advanced Practice Nurse and evaluates system-wide processes and directs changes in outcomes

Assumes leadership positions of increasing complexity at the local/state/national levels

Analyzes ethical issues in generating policy and practice recommendations

Develops systems to establish and promote interdisciplinary teams

Evaluates communication systems and generates new models to effect system change

Analyses impact of health care policy on delivery systems and implements changes

Entry Options

Prelicensure Portion of the N.D. Program

Graduates from an accredited college or university with a baccalaureate degree in a non-nursing field.

Students currently enrolled in a four-year baccalaureate program at a participating accredited liberal arts college after three years of study. The student earns a B.A. or B.S. from the liberal arts college upon successful completion of one year of the N.D. prelicensure level. (Senior Year in Professional Studies)

Post Licensure Portion of the N.D. Program

RNs with an associate or diploma degree
RNs with a B.S. or B.A. in a discipline other than nursing
RNs with a B.S.N. degree
RNs with M.S.N. degree

Progression in the N.D. Program

Academic Performance

Progression in the Doctor of Nursing degree program is contingent upon satisfactory academic achievement in all required courses. To maintain satisfactory academic standing, students enrolled for the prelicensure component of the N.D. degree must attain a grade point average of 2.5 or above. C, the lowest passing grade, is regarded as borderline performance. If a student’s semester grade point average is less than 2.5, the student will be placed on probation for the following semester and will be given guidance. If the student on probation receives a grade-point average of 2.5 or higher for that semester, the student will be removed from probation. If the student achieves a grade-point average of less than 2.5 for two semesters, the student’s record will be reviewed by the Executive Committee to determine whether extenuating circumstances warrant an additional semester of probation or whether the student should be excluded from the program.

N.D. students in the post-licensure component of the Doctor of Nursing Program must select the letter grade option (A, B, C, F, or W) when registering for all required nursing courses (except NUND 500) and achieve a minimum grade-point average of 3.0 for the semester. In the event that a student’s cumulative grade-point average falls below a 3.0 during any semester of matriculation, the student will be placed on academic probation. In order to remove the academic probation the student must, in the next semester for which he or she is registered, achieve grades at a level sufficient to increase the overall GPA to a 3.0. If a student on academic probation fails to be removed from that status within one academic semester following the one with academic difficulty, the student will be excluded from the program.

Students who enter the Doctor of Nursing Program at the prelicensure level must achieve a cumulative grade-point average of 2.75 or above in all courses taken for credit as a N.D. student at the Frances Payne Bolton School of Nursing to be awarded the N.D. degree. Students who enter the Doctor of Nursing Program at the post-licensure level must achieve a cumulative grade point average of 3.0 or above in all courses taken for credit as a N.D. student at the Frances Payne Bolton School of Nursing to be awarded the N.D. degree.

When a student receives a grade of F for a required course, the student must register for that course the next semester in which the course is available. Doctor of Nursing degree students who receive two failing grades indicating unsatisfactory performance (F, NP, or U) in required courses will be excluded from the School of Nursing.

The grade of incomplete (I) will be given at the discretion of the instructor for work not completed in the semester. A grade of I must be removed by the end of the semester following the one in which the course was taken or before the student enrolls in a course for which the initial course is a prerequisite. No credit is given for an I grade. The I will remain a permanent part of the transcript if the student fails to complete course requirements within the next semester.

N.D. students must complete degree requirements within seven years from the prelicensure level, five years from Level III, and four years from Level IV.

Thesis Defense

The thesis is an independent research study designed by the student in collaboration with a three-member thesis committee approved by the Associate Dean of Academic Programs and Associate Dean of Research of the School of Nursing. The thesis must be a significant contribution to existing nursing knowledge and suitable for publication in a peer reviewed journal or a book. Students must prepare their own thesis, and joint theses are not permissible. The procedures and written thesis must conform to the regulations of the Bolton School of Nursing. The student must pass a formal proposal approval process before applying for IRB approval and implementation of the thesis.
Students must successfully defend their thesis in an oral examination with their thesis committee members who are also responsible for certifying that it meets acceptable scholarly standards. The thesis defense is open to University faculty and students, but the chair determines whether the defense is open to others outside of the University.

The thesis committee determines the adequacy of the oral examination and written thesis. A student will pass if two or more of the committee members agree that the student successfully responded to questions during the examination and the written thesis met scholarly standards.

Degree Requirements

Candidates for the Doctor of Nursing degree must complete all required courses, including the courses required in their master level clinical major. Post-licensure students will be awarded a Master of Science in Nursing if they meet the degree requirements for this degree. However, if the student completes NURS 520 and NURS 521, they do not need to complete NURS 503 to be awarded M.S.N.

Non-nurses enrolled in the N.D. program must complete the program within seven years of initial enrollment. B.S.N. graduates must complete the post-licensure portion of the program in five years. M.S.N. graduates must complete the program within four years. If not completed, the student's record will be re-evaluated in terms of the curriculum in effect at the time of review. The student may be required to take additional course work to graduate.

Students entering the N.D. program in the prelicensure portion must achieve a cumulative GPA of 2.75 in all courses taken for credit as a N.D. student at the Bolton School. Students who enter the program at the post-licensure portion of the N.D. program must achieve a GPA of 3.0 or above in all courses taken for credit as an N.D. student at the Bolton School. In addition, the student must successfully pass the thesis defense.

N.D. Prelicensure Program

The first two years of the Nursing Doctorate Program is the prelicensure portion that includes all course work required to sit for the professional nursing licensing examination (NCLEX-RN) required to practice nursing. During this portion of the program, the student receives instruction in nursing theory, clinical skills, and the nursing sciences. At the successful completion of this portion of the Nursing Doctorate program, students receive a Certificate of Professional Nursing. After passing the NCLEX, the student may practice as a registered nurse (RN) while completing the post-licensure portion of the N.D. program.

Entry Options

Graduates from an accredited college or university with a baccalaureate degree in a non-nursing field.

Students currently enrolled in a four-year baccalaureate program at a participating accredited liberal arts college after three years of study. The student earns a B.A. or B.S. from the liberal arts college upon successful completion of one year of the N.D. prelicensure level. (Senior Year in Professional Studies)

Admission Requirements:

Graduated from an accredited college or university with at least a baccalaureate degree in non-nursing field.

Undergraduate education must include a sound background in the social/behavioral and natural sciences with a minimum grade point average of 2.5 (4 point system) or higher in the sciences.

Satisfactory scores on the Graduate Record Examination (GRE).

Three recommendations about academic competence, personal adjustment, prediction of contribution to the nursing profession, and success as a doctoral student.

An interview with faculty to discuss career goals, either by telephone or in person. Personal interviews are preferred.

For more specific requirements, refer to N.D. Program brochure.

Senior Year in Professional Studies

A student in a college with a formal arrangement with the Bolton School may enroll in the Senior Year in Professional Studies. Students whose undergraduate institutions do not have an agreement with the Bolton School may arrange a Senior Year in Professional Studies on an individual basis. Information about arranging this program is available from Office of Student Services. Students earn a B.A. or B.S. from the participating college or university upon successful completion of the first year of the N.D. program.

Students at Case Western Reserve University must apply through the undergraduate dean of their respective schools at the beginning of their junior year. To be awarded a B.S. or B.A. degree at the end of the successful completion of the first year of the N.D. program, the following must be met:

Completion of the Case Western Reserve University Core Curriculum and two semesters of physical education, unless excused from the latter.

Completion of three quarters of the major and minor concentration requirements

Completed at least 90 semester hours of academic credit of which the final 60 hours being while in residence with no more than 6 semester hours earned in courses taken in another institution, either by cross-registration or by approved transfer of credit.

N.D. Prelicensure Plan of Study

Semester 1 (Fall) ............................... Hours
NUND 230 Foundations of Nursing Practice ................................................................. 2
NUND 410 Health Assessment ............. 2
NUND 342 Microbiology ..................... 3
NUND 412 Anatomy and Physiology ... 6
NUND 233 Growth and Development . 1
NUND 213 Nursing Strategies and Interventions ......................................................... 4
Total .................................................. 18
Semester II (Spring)
NUND 224 Acute Care: Adults .................. 9
NUND 220 Altered Human Functioning ......................... 3
NUND 211 Pharmacology .................................. 2
NUND 223 Health and Aging ......................... 2
NUND 234 Genetics .................................... 1
Total .................................................. 17

Successful completion of STAT 201, Basic Statistics for the Social and Life Sciences I (or a comparable course), is a prerequisite to enrolling in Level II of the program.

Semester III (Summer) ................. Hours
NUND 315 Parents & Neonates ............ 4
NURS 405 Inquiry I .......................... 3
NUND 316 Children & Adolescents .... 4
Total .............................................. 11

Semester IV (Fall) ..................... Hours
NUND 317 Psych Mental Health .......... 4
NUND 319 Public Health Nursing ........ 4
NURS 415 Inquiry II ............................ 4
NUND 322 Nursing Informatics II ....... 1
NUND 341 Concepts of Management .... 2
NUND 343 Issues and Ethics in Healthcare .................................. 2
Total .............................................. 17

Progression from one semester to the next in the Prelicensure Component of the N.D. Program is contingent upon passing grades in all courses taken in the preceding semester.

Note: Successful completion of all prelicensure courses is necessary to sit for the Professional Nursing Licensing Examination (NCLEX-RN). The School of Nursing has the right to determine a student’s readiness to sit for the NCLEX-RN examination and the right to restrict testing until the student demonstrates a readiness to pass this examination.

N.D. POST LICENSURE PROGRAM

After completing the prelicensure portion of the N.D. program, students select an advanced practice specialty. Students with a B.S.N. or a M.S.N. enter in this portion of the N.D. program. For those entering with a B.S.N., course work consists of master’s level courses in the chosen specialty, N.D. core courses, and a N.D. thesis. For those entering with a M.S.N., course work consists of N.D. core courses and N.D. thesis. After successful completion of the course requirements for masters clinical track, the student receives a Masters of Science in Nursing degree and is eligible to sit for national certification examinations in advanced nursing practice. The Acute Care Nurse Practitioner, Acute Care Pediatric Nurse Practitioner, Neonatal Nurse Practitioner, and Nurse Anesthetist specialties have requirements for clinical experience before entering these clinical tracks (See descriptions of each specialty requirements in the Master of Science of Nursing section). The N.D. core requirements prepare the student in nursing management and nursing inquiry; and an independent research study, N.D. thesis, is a component of the post-licensure portion of the program.

Entry Options
RN with a diploma or associate degree in nursing from an accredited school (See RN/M.S.N. program described under the masters program)
RN with a B.S. or B.A. degree in a discipline other than nursing (See portfolio option described under the masters program)
Nurse with a B.S.N. degree
Nurse with a M.S.N. degree

Admission Requirements

RN with Diploma and Associate Degree
See the description of the RN-M.S.N. program described under the masters of nursing program.

Satisfactory completion of undergraduate pre-requisites for the masters of nursing program.

Written statement of academic and career objectives and research interest.

The Graduate Record Examination, including verbal, quantitative, and analytical sections.

RN with B.S. or B.A. Other than Nursing
See the description of the portfolio option described under the masters of nursing program.

Written statement of academic and career objectives and research interest.

The Graduate Record Examination, including verbal, quantitative, and analytical sections.

RN with a B.S.N.

Graduated from an accredited college or university with a baccalaureate degree in nursing with an overall GPA of 2.75 (in a 4 point system) or above is required. The Graduate Record Examination, including verbal, quantitative, and analytical sections.

Transcripts from all colleges and universities where academic work was done.

Interview with faculty to discuss career plans. This can be done by phone.

Additional evidence of academic ability may be required.

Undergraduate records will be reviewed for comparability to the prelicensure portion of the N.D. program. Additional coursework may be required.

Written statement of academic and career objectives and research interest.

Students must complete the MSN level inquiry courses before beginning the upper level N.D. theory and research courses.

RN with a M.S.N.

Graduated from an accredited college or university with a masters degree in nursing with an overall GPA of 2.75 (in a 4 point system) or above is required.

The Graduate Record Examination, including verbal, quantitative, and analytical sections.

Transcripts from all colleges and universities where academic work was done

Interview with faculty to discuss career plans. This can be done by phone.
Written statement of academic and career objectives and research interest
Nationally certified or qualified to sit for a national certification exam in advanced practice nursing.

N.D. Program of Study for Students with a M.S.N.

Prerequisite for Research Strand: STAT 301 (or approved equivalent) ..... 3

Semester I (Fall) ................. Hours
NURS 504 Nursing Theory ..... 3
NURS 520 Advanced Nursing Research I ............. 3
NUND 471 Organizational Theories .... 3

Semester II (Spring)
NURS 521 Advanced Nursing Research II ............. 3
NUND 483 Health Policy Planning and Management Systems ..... 3
NUND 441 Management in Advanced Practice .......... 3

Semester III & IV
NUND 500 N.D. Thesis ...... minimum 6
Total ........................................ Minimum 24

NURSE PRACTITIONERS

Nurse practitioners promote optimal health, detect illness and facilitate restoration and maintenance of health. They often function independently in a variety of settings. Two specialties are available for acute care nurse practitioners and six specialties are available in primary care. These programs contain at least 500 hours of clinical experience. Graduates are eligible to sit for the national certification examinations for these specialties.

Acute Care Nurse Practitioner

There are practice requirements for these specialties. One year of experience in acute care is required for the Acute Care Nurse Practitioner. A concentration in flight nursing is available within the Acute Care Nurse Practitioner major. One year of experience in neonatal intensive care is required for the Neonatal Nurse Practitioner.

Acute Care Nurse Practitioner

Professional Development ............. 6
NURS 443 ..................................... 3
NURS 444 ..................................... 3

Scientific Inquiry ..................... 15-19
NURS 405* ................................... 3
NURS 415* ................................... 4
NURS 520 ...................................... 3
NURS 521 ...................................... 3
NURS 504 ...................................... 3
STAT 301 ...................................... 3

ND Thesis (NURS 500) .... Minimum 6
ND Management ..................... 9
NUND 483 ..................................... 3
NUND 441 ..................................... 3
NURS 471 ..................................... 3

Advanced Practice Core .......... 10
NURS 430 (Spring) ....................... 3
NURS 453 (Fall) ......................... 4
NURS 459 ..................................... 3

Clinical Nursing Courses .......... 14
Semester I (Fall)
NURS 438 Theoretical Foundations of Acute Care Nursing .......... 4

Semester II (Spring)
NUNP 443 Acute Health Problems of the Adult II ............. 6

Semester III (Fall)
NUNP 444 Advanced Management of Acutely Ill Adults .......... 4

Total Semester Hours .... Minimum 60

The following courses may be taken in addition to complete a flight nurse concentration:
NURS 406 Flight Nursing Clinical Seminar I .................. 1
NURS 404 Emergent Care of Children. 2
NURS 407 Flight Nursing Clinical Seminar II .................. 1
NURS 523 Advanced Internship in Flight Nursing ............. 1-5

*Prelicensure students take these during the prelicensure portion of the N.D. program.

Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

Neonatal Nurse Practitioner

Professional Development ............. 6
NURS 443 ..................................... 3
NURS 444 ..................................... 3

Scientific Inquiry ..................... 15-19
NURS 405* ................................... 3
NURS 415* ................................... 4
NURS 520 ...................................... 3
NURS 521 ...................................... 3
NURS 504 ...................................... 3
STAT 301 ...................................... 3

ND Thesis (NURS 500) .... Minimum 6
ND Management ..................... 9
NUND 483 ..................................... 3
NUND 441 ..................................... 3
NURS 471 ..................................... 3

Advanced Practice Core .......... 10
NURS 430 (Spring) ....................... 3
NURS 453 (Fall) ......................... 4
NUNP 416 ..................................... 3

Clinical Nursing Courses .......... 15
Semester I (Fall)
NUNP 414 Neonatal Nurse Practitioner I .................. 3

Semester II (Spring)
NUNP 412 Neonatal Nurse Practitioner II .................. 4

Semester III (Summer)
NUNP 413 Neonatal Nurse Practitioner III .................. 3

Semester III (Fall)
NUNP 414 Neonatal Nurse Practitioner IV .................. 5

Total Semester Hours .... Minimum 65

Primary Care Nurse Practitioners

Adult Nurse Practitioner

Professional Development ............. 6
NURS 443 ..................................... 3
NURS 444 ..................................... 3

Scientific Inquiry ..................... 15-19
NURS 405* ................................... 3
NURS 415* ................................... 4
NURS 520 ............................................ 3
NURS 521 ............................................ 3
NURS 504 ............................................ 3
STAT 301 ............................................ 3
ND Thesis (NURS 500) .... Minimum 6
ND Management ......................... 9
NUND 483 ........................................ 3
NUND 441 ........................................ 3
NURS 471 ........................................ 3
Advanced Practice Core ............ 10
NURS 430 (Spring) ....................... 3
NURS 453 (Fall) ......................... 4
NURS 459 ........................................ 3
Clinical Nursing Courses .......... 15
Semester I (Fall)
NUNP 410 Health Promotion Across the Lifespan ...................... 2
Semester II (Spring)
NUNP 432 Common and Acute Health Problems in the Adult I ....... 5
Semester III (Summer)
NUNP 433 Common and Acute Health Problems in the Adult II .......... 4
Semester IV (Fall)
NUNP 443 Advanced Management in Adult Primary Care .......... 5
Total Semester Hours .... Minimum 62
*Prelicensure students take these during the prelicensure portion of the N.D. program.

Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

Family Nurse Practitioner
Professional Development ............. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3
Scientific Inquiry ..................... 15-19
NURS 405* ...................................... 3
NURS 415* ...................................... 4
NURS 520 ........................................ 3
NURS 521 ........................................ 3
NURS 504 ........................................ 3
STAT 301 ........................................ 3
ND Thesis (NURS 500) .... Minimum 6
ND Management ......................... 6
NUND 441 ........................................ 3
NURS 471 ........................................ 3
Advanced Practice Core ............ 10
NURS 430 (Spring) ....................... 3
NURS 453 (Fall) ......................... 4
NURS 459 ........................................ 3
Clinical Nursing Courses .......... 19
Semester I (Fall)
NUNP 410 Health Promotion Across the Lifespan ...................... 2
NURS 441 Mental Health for Older Adults ................................. 1
Semester II (Spring)
NUNP 419 Family Health Nursing Health of Adults and Older Adults .... 5
Semester III (Summer)
NUNP 429 Family Health Nursing: Health of the Family During Childbearing Years .................. 4
Semester IV (Fall)
NUNP 439 Family Health Nursing: Health of Children and Adolescents .... 4
Total Semester Hours .... Minimum 61
*Prelicensure students take these during the prelicensure portion of the N.D. program.

Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

Gerontological Nurse Practitioner
Professional Development ............. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3
Scientific Inquiry ..................... 15-19
NURS 405* ...................................... 3
NURS 415* ...................................... 4
NURS 520 ........................................ 3
NURS 521 ........................................ 3
NURS 504 ........................................ 3
STAT 301 ........................................ 3
ND Thesis (NURS 500) .... Minimum 6
ND Management ......................... 6
NUND 441 ........................................ 3
NURS 471 ........................................ 3
Advanced Practice Core ............ 10
NURS 430 (Spring) ....................... 3
NURS 453 (Fall) ......................... 4
NURS 459 ........................................ 3
Clinical Nursing Courses .......... 19
Semester I (Fall)
NUNP 410 Health Promotion Across the Lifespan ...................... 2
NURS 441 Mental Health for Older Adults ................................. 1
Semester II (Spring)
NUNP 419 Family Health Nursing: Health of Adults and Older Adults .... 5
NURS 479 Public Policy and Aging ................. 3
Semester III (Summer)
NUNP 449 Primary Care of the Older Adult ..................... 3
Semester IV (Fall)
NUNP 454 Management of Complex Problems in the Older Adult .......... 4
NURS 442 Mental Health Interventions with Older Adults .......... 1
Total Semester Hours .... Minimum 62
For dual certification as GNP and Gerontological CNS, add the following to the GNP major:
NURS 466 Practicum and Supervision of the Role of the Clinician ........ 3
NURS 446 Collaboration and Administration in Health Care Delivery ........ 3
NURS 448 Mental Health Practicum with Older Adults .......... 1

Pediatric Nurse Practitioner
Professional Development ............. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3
Scientific Inquiry ..................... 15-19
NURS 405* ...................................... 3
NURS 415* ...................................... 4
NURS 520 ........................................ 3
NURS 521 ........................................ 3
NURS 504 ........................................ 3
STAT 301 ........................................ 3
ND Thesis (NURS 500) .... Minimum 6
ND Management ......................... 6
NUND 441 ........................................ 3
NURS 471 ........................................ 3
Advanced Practice Core ............ 10
NURS 430 (Spring) ....................... 3
NURS 453 (Fall) ......................... 4
NURS 459 ........................................ 3
Clinical Nursing Courses .......... 19
Semester I (Fall)
NUNP 410 Health Promotion Across the Lifespan ...................... 2
NURS 441 Mental Health for Older Adults ................................. 1
Semester II (Spring)
NUNP 419 Family Health Nursing: Health of Adults and Older Adults .... 5
NURS 479 Public Policy and Aging ................. 3
Semester III (Summer)
NUNP 449 Primary Care of the Older Adult ..................... 3
Semester IV (Fall)
NUNP 454 Management of Complex Problems in the Older Adult .......... 4
NURS 442 Mental Health Interventions with Older Adults .......... 1

Pediatric Nurse Practitioner
Professional Development ............. 6
NURS 443 ........................................ 3
NURS 444 ........................................ 3
Scientific Inquiry ..................... 15-19
NURS 405* ...................................... 3
NURS 415* ...................................... 4
NURS 520 ........................................ 3
NURS 521 ........................................ 3
NURS 504 ........................................ 3
STAT 301 ........................................ 3
ND Thesis (NURS 500) .... Minimum 6  
ND Management .................................. 9  
NUND 483 ........................................ 3  
NUND 441 ........................................ 3  
NURS 471 ........................................ 3  

Clinical Nursing Courses ............ 15  
Semester I (Fall)  
NUNP 410 Health Promotion Across the Lifespan ........................................ 2  
NUNP 401 Health Promotion of Children ........................................ 2  

Semester III (Spring)  
NUNP 402 Common and Acute Health Problems of Children ..................... 6  

Semester IV (Fall)  
NUNP 403 Advanced Management in Pediatric Primary Care ..................... 5  

Total Semester Hours................. Minimum 65  
*Prelicensure students take these during the prelicensure portion of the N.D. program.

Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

Psychiatric Mental Health Nurse Practitioner  
Professional Development .......... 6  
NURS 443 ........................................ 3  
NURS 444 ........................................ 3  

Scientific Inquiry ......................... 15-19  
NURS 405* .................................... 3  
NURS 415* .................................... 4  
NURS 520 ........................................ 3  
NURS 521 ........................................ 3  
NURS 504 ........................................ 3  
STAT 301 ........................................ 3  

ND Thesis (NURS 500) .... Minimum 6  
ND Management .................................. 9  
NUNP 483 ........................................ 3  
NUNP 441 ........................................ 3  
NURS 471 ........................................ 3  

Advanced Practice Core ............. 10  
NURS 430 (Spring) ......................... 3  
NURS 453 (Fall) ......................... 4  
NURS 459 ........................................ 3  

Clinical Nursing Courses ............ 15  
Semester I (Fall)  
NURS 460 Theoretical Basis of Individual Therapy ........................................ 2  
NURS 461 Practicum and Supervision of Individual Therapy ..................... 1  
SSBT 548 Adult Psychopathology OR PSCL 524 Advanced Psychopathology ... 3  

Semester II (Spring)  
NURS 462 Practicum and Supervision of Group and Family Therapy .............. 2  
NURS 467 Theories of Family and Group ...................................................... 3  

Total Semester Hours................. 61  
Women’s Health Nurse Practitioner  
Professional Development .......... 6  
NURS 443 ........................................ 3  
NURS 444 ........................................ 3  

Scientific Inquiry ......................... 15-19  
NURS 405* .................................... 3  
NURS 415* .................................... 4  
NURS 520 ........................................ 3  
NURS 521 ........................................ 3  
NURS 504 ........................................ 3  
STAT 301 ........................................ 3  

ND Thesis (NURS 500) .... Minimum 6  
ND Management .................................. 9  
NUNP 483 ........................................ 3  
NUNP 441 ........................................ 3  
NURS 471 ........................................ 3  

Advanced Practice Core ............. 10  
NURS 430 (Spring) ......................... 3  
NURS 453 (Fall) ......................... 4  
NURS 459 ........................................ 3  

Clinical Nursing Courses ............ 14  
Semester I (Fall)  
NURS 454 Well Woman Health Care ...... 3  

Semester II (Spring)  
NURS 455 The Childbearing Family .... 4  

Semester IV (Fall)  
NUNP 410 Health Promotion Across the Lifespan ........................................ 2  
NURS 559 Advanced Practice in Nursing Care of Women ..................... 5  

Total Semester Hours................. Minimum 60  

NURSE MIDWIFERY  

Nurse-midwifery focuses on the clinical and scientific areas of women’s health maintenance. A nurse-midwife is primarily responsible for direct care in the areas of gynecologic health, antepartum, intrapartum, postpartum, family planning, and parent education. Students work one-on-one with a clinical preceptor and select and work in birth centers, health maintenance organizations, and private practices. Graduates are eligible to sit for the certification examination for nurse midwifery from the American College of Nurse Midwives.

Professional Development .......... 6  
NURS 443 ........................................ 3  
NURS 444 ........................................ 3  

Scientific Inquiry ......................... 15-19  
NURS 405* .................................... 3  
NURS 415* .................................... 4  
NURS 520 ........................................ 3  
NURS 521 ........................................ 3  
NURS 504 ........................................ 3  
STAT 301 ........................................ 3  

ND Thesis (NURS 500) .... Minimum 6  
ND Management .................................. 9  
NUNP 483 ........................................ 3  
NUNP 441 ........................................ 3  
NURS 471 ........................................ 3  

Advanced Practice Core ............. 10  
NURS 430 (Spring) ......................... 3  
NURS 453 (Fall) ......................... 4  
NURS 459 ........................................ 3  

Clinical Nursing Courses ............ 14  
Semester I (Fall)  
NURS 454 Well Woman Health Care ...... 3  

Semester II (Spring)  
NURS 455 The Childbearing Family .... 4  

Semester IV (Fall)  
NUNP 410 Health Promotion Across the Lifespan ........................................ 2  
NURS 559 Advanced Practice in Nursing Care of Women ..................... 5  

Total Semester Hours................. Minimum 60  

NURSE MIDWIFERY  

Nurse-midwifery focuses on the clinical and scientific areas of women’s health maintenance. A nurse-midwife is primarily responsible for direct care in the areas of gynecologic health, antepartum, intrapartum, postpartum, family planning, and parent education. Students work one-on-one with a clinical preceptor and select and work in birth centers, health maintenance organizations, and private practices. Graduates are eligible to sit for the certification examination for nurse midwifery from the American College of Nurse Midwives.
NURS 504 ........................................... 3
STAT 301 ............................................. 3

**ND Thesis (NURS 500) .... Minimum 6**

**ND Management ......................... 9**
NUND 483 ........................................ 3
NUND 441 ........................................ 3
NURS 471 ........................................ 3

**Advanced Practice Core ................. 10**
NURS 430 (Spring) .......................... 3
NURS 453 (Fall) ................................. 4
NURS 459 ........................................ 3

**Clinical Nursing Courses ............... 20**
Semester I (Fall)
NURS 454 Well Woman Health Care .... 3

Semester II (Spring)
NURS 455 The Childbearing Family ....... 4

Semester III (Fall)
NURS 457 Labor and Birth ................. 7
NUND 410 Health Promotion Across the Lifespan ................. 2

Semester IV (Spring)
NURS 557 Advanced Nurse-Midwifery ... 6

**Total Semester Hours ..................... 68**

*Prelicensure students take these during the prelicensure portion of the N.D. program.

Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

**CLINICAL NURSE SPECIALIST**

Two specialties are in the clinical nurse specialist track in the masters program. Medical-surgical nursing focuses on the care of patients recovering from illness and living with chronic illness. The student selects a specialty in critical care, oncology, or other specialty adult medical-surgical areas. The student then does clinical practicum in these areas. The focus of the Community Health program is on mobilizing and empowering the community to act on its own behalf in matters affecting health and well being. Interventions are designed in collaboration with the community and interdisciplinary personnel. A concentration in infection control may be taken along with the community health courses. Graduates of these tracks are eligible to sit for certification examinations as a clinical nurse specialist.

**Medical-Surgical Nursing**

**Professional Development .............. 6**
NURS 443 ........................................ 3
NURS 444 ........................................ 3

**Scientific Inquiry ....................... 15-19**
NURS 405* ....................................... 3
NURS 415* ....................................... 4
NURS 520 ........................................ 3
NURS 521 ........................................ 3
NURS 504 ........................................ 3
STAT 301 ........................................ 3

**ND Thesis (NURS 500) .... Minimum 6**

**ND Management ......................... 9**
NUND 483 ........................................ 3
NUND 441 ........................................ 3
NURS 471 ........................................ 3

**Advanced Practice Core ................. 10**
NURS 430 (Spring) .......................... 3
NURS 453 (Fall) ................................. 4
NURS 459 ........................................ 3

**Clinical Nursing Courses ............... 12**

**Semester I (Fall)**
NURS 438 Theoretical Foundations of Acute Care Nursing ................. 4

**Semester II (Spring)**
NURS 424 Theoretical Basis for Medical-Surgical Nursing ................. 5

**Semester III (Fall)**
NURS 446 Collaboration and Administration in the Health Care Delivery System ................. 3

**Total Semester Hours .......... Minimum 58**

*Prelicensure students take these during the prelicensure portion of the N.D. program.

Note: Courses listed under the area of Professional Development, Scientific Inquiry, and Advanced Practice Core may be taken alone or with Clinical Nursing Courses, and may be taken during any semester offered. Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

**Community Health Nursing**

**Professional Development .............. 6**
NURS 443 ........................................ 3
NURS 444 ........................................ 3

**Scientific Inquiry ....................... 19**
NURS 405* ....................................... 3
NURS 415* ....................................... 4
NURS 520 ........................................ 3
NURS 521 ........................................ 3
NURS 504 ........................................ 3
STAT 301 ........................................ 3

**ND Thesis (NURS 500) .... Minimum 6**

**ND Management ......................... 3**
NUND 483** ................................... 3
NUND 441 ........................................ 3
NURS 471** ..................................... 3

**Clinical Nursing Courses ............... 20**

**Semester I (Fall) ........................ Hours**
NURS 491 Community Health Nursing Assessment ................. 4
NURS 480 Public Health Epidemiology 3
NUND 410 Health Promotion Across the Lifespan ................. 2

**Semester II (Spring)**
NURS 495 Community Health Nursing Program Planning ................. 4
NURS 496 Community Health Nursing Leadership ................. 4
NUND 483 Health Care Policy and Planning and Information Management Systems ................. 3

**Relevant Courses ................. 6**

**Administration Option**
NURS 471 Organizational Theories .... 3
NURS 446 Collaboration and Administration in the Health Delivery System ... 3

OR Select two courses in the following areas:
Anthropology Demography
Biostatistics Epidemiology

**Total Semester Hours Minimum ........ 60**

A concentration in infection control can be completed with the addition of the following classes:
The Ph.D. student concentrates on the and collaboration in scholarship. to the intellectual growth of the student, faculty. Moreover, the faculty is committed
Practicum ............................................
Research are required to prepare scholars to
The Ph.D. program is a post baccalaureate program designed to prepare scientists who initiate and conduct
DOCTOR OF PHILOSOPHY IN NURSING
The Ph.D. program is a post baccalaureate degree program designed to prepare scientists who initiate and conduct research relevant to nursing. Expertise in clinical nursing and competence in research are required to prepare scholars to disseminate knowledge into clinical practice and nursing education. To achieve excellence in the academic program, students engage in activities consistent with the areas of research excellence of the faculty. Moreover, the faculty is committed to the intellectual growth of the student, which is achieved through mentorship and collaboration in scholarship.

The Ph.D. student concentrates on the organization and development of knowledge requisite to nursing practice for service to a population. The population may include: age group (children, adults), focus of service (individual, family, or community) and position on the continuum of health (health and wellness, acute and chronic disruptions in health). Ph.D. students are culturally diverse, and many develop and apply knowledge relevant to global health needs.

Characteristics of the Graduate
Mentors others in the process of knowledge development
Synthesizes and generates knowledge for the discipline of nursing with cross-disciplinary implications
Identifies health issues amenable to research; disseminates data and evidence to improve health
Assumes leadership roles in the global community
Identifies and analyzes ethical issues and standards related to science and knowledge development
Initiates and contributes to interdisciplinary work in the scientific community
Uses multiple modalities in generating discussion and debate of issues, research findings, and theoretical knowledge
Generates knowledge relevant to health care policy; actively participates in policy formation, implementation, and evaluation

Entry Options
Registered nurses with a Bachelors of Science in Nursing degree.
Registered nurses with a Masters of Science in Nursing degree.
Registered nurses with a Nursing Doctorate degree

Admission Requirements
Applicants to the Ph.D. program in nursing apply to the School of Graduate Studies. Applications and information for admission are available from the Bolton School. Application requirements are:

A professional degree (B.S.N. or M.S.N.) from an accredited nursing program.

Three recommendations describing professional nursing competence, and success in the Ph.D. program and potential for making a significant contribution to nursing. Two of these recommendations should be from Ph.D. prepared individuals, preferably in nursing.

Satisfactory performance on the Graduate Record Examination that includes quantitative, verbal, and analytical sections.

Two- to three-page statement of academic and career objectives and how the applicant’s research interest is consistent with the research expertise of the faculty.

Written responses to questions contained in the application packet.

Interview with two faculty members. This can be done by phone.

Program Requirements

Course Requirements
The Ph.D. program is a post baccalaureate program, and course requirements provide a foundation for a dissertation. Programs are individually planned so that applicants with a M.S.N. degree with a clinical nursing major with supervised practice can build on their prior masters education. Students entering with only a B.S.N. degree will be required to take NURS 507 Clinical Knowledge and NURS 508 Context of Care. A minimum of 54 semester credits in core requirements is required, and courses are listed below. Additional course work may be required and will be determined by the faculty advisor.

PhD Research Methods ....................... 9
NURS 530 Advanced Nursing Research I ............................................. 3
NURS 531 Advanced Nursing Research II ............................................. 3
Methods elective ................................................................. 3

PhD Statistics ................................................. 6
NURS 630 Advanced Statistics for Nursing Research: Linear Models............. 3
Statistics elective ................................................................. 3

PhD Related Courses .................. 3-6
NURS 609 Health Policy ......................... 3
Substantive elective ............................................................. 0-3
PhD Nursing Science: Theory & Research........................................ 15-18
NURS 506 Nursing Epistemology ......3
NURS 511 Strategies for Theory Development........................................ 3
NURS 615 Topical Seminar in Nursing ................................................... 6-9
NURS 670 Proposal Development........3
Dissertation (NURS 701) minimum 18
Total .......................................................... 54

To register for NURS 701, the academic advisor and Associate Dean of Academic Programs must provide written permission that is submitted to the School of Graduate Studies. Students who have not been advanced to candidacy status (successful completion of course work and candidacy examination) may register for not more than 3 credit hours of NURS 701 per semester. They must maintain continuous limited registration for NURS 701 until advanced to candidate status. A maximum of 9 credit hours may be taken prior to advancement to candidacy. After advancement to candidacy, students can register for up to 9 credits of NURS 701 per semester. When students complete 18 credits of NURS 701, they may subsequently register for a minimum of 1 credit hour a semester.

Students who have been advanced to candidacy and have met all coursework requirements, including 18 credit hours of NURS 701, and are within their five-year time limit for completion of the degree, but have not completed the dissertation, can register for Dissertation Fellowship (NURS 702) upon recommendation to the School of Graduate Studies. Students may take NURS 702 for a maximum of four consecutive semesters. Students are considered to have full-time appointment (9 credit hours of NURS 702), and tuition is charged at the rate of one credit hour. If the dissertation is not completed and defended in the fourth semester of the fellowship, the Ph.D. candidate must register for a minimum of one credit hour of NURS 701 each semester.

Students may petition to transfer credit from another institution towards their degree at Case Western Reserve University by completing the Petition for Transfer Credit Form. An official transcript from the institution must accompany the form. Transfer credit of coursework must be requested in the student’s first academic year, and appropriate for the student’s Planned Program of Study. The coursework must be graduate level with a grade of B or better, and it must be in excess of previous degree requirements. No transfer credit will be awarded toward the Ph.D. degree except by approved petition and no dissertation research credit may be transferred from another university. All coursework must have been completed within five years of matriculation at Case Western Reserve University. The academic advisor and department chair are responsible for reviewing the course(s) and approving the transfer prior to final review and approval from the School of Graduate Studies.

Research Practicum

A research practicum is required before taking the candidacy examination (described below). The research process is complex and course work provides the student with only theoretical understanding. The integration of research concepts and their application can best be learned through practical experience. The research practicum provides the hands on experience in the daily functioning of a research study. Often presentations and publications with faculty are outcomes of this experience.

The student works with a faculty mentor on that faculty’s research for 240 hours in a 12-month period. The academic advisor, student, and faculty mentor who the student will be working with will develop objectives for the research practicum. It is recommended that the practicum begin during the first year of study. The practicum must be completed before the student will be advanced to candidate status.

Dissertation

The dissertation is an independent research study designed by the student in collaboration with a 4-member dissertation committee approved by the Associate Dean of Academic Programs and Associate Dean of Research of the School of Nursing. The dissertation must be a significant contribution to existing nursing knowledge and suitable for publication in a peer reviewed journal or a book. Students must prepare their own dissertations, and joint dissertations are not permissible. The procedures and written dissertation must conform to the regulations of the School of Graduate Studies.

Progression in the Ph.D. Program

Academic Performance and Progression

A student who receives a grade of F for a required course must register for the course the next semester it is offered. If the student receives a grade of F or unsatisfactory performance (F, U & NP) in two courses, he/she will be separated from the Bolton School.

Grade of incomplete (I) will be assigned only for extenuating circumstances and only when a student fails to complete a small segment of the course. All work for the Incomplete grade must be made up, and the change of grade recorded in the Office of the University Registrar, by the date specified by the Instructor, but no later than the 11th week of the session following the one in which the I was received. Unresolved Incomplete grades will remain permanently on the student’s academic record, if the work is not made up by the designated deadline. A student who has a permanent Incomplete for a required course must retake the course in a later term. If the student cannot complete the work for the Incomplete by the specified deadline, he or she must petition for an extension which must be endorsed by the instructor, explain the reasons why the work has not been completed, and include a new date for completion. Students are allowed only one extension of no more than one additional semester to complete the work.

A cumulative GPA of 3.0 must be maintained. If the cumulative GPA falls below 3.0, the student will be placed on academic probation. If the student does not raise the GPA to 3.0 or above in the next semester enrolled, the student will be separated from the University.
Students must maintain continuous registration throughout their degree programs unless granted a leave of absence. Students who do not register for an academic term will be automatically withdrawn from the program. They must then petition for reinstatement to continue graduate study. The Director of the Ph.D. Program and the Dean of Graduate Studies must approve the petition before students may register for further coursework. In each case of readmission with full standing, the student will receive a letter stating the terms of readmission, including future time limits for the degree program and the past course work that will be credited toward the degree. If more than 24 months have elapsed since the last registration, the Office of Graduate Studies may request more information.

Advancement to Candidate Status
To advance to candidate status, Ph.D. students must pass an oral candidacy examination and provide a written research proposal at the time of the examination. The examination and proposal are evidence of the student’s knowledge and ability to synthesize and apply research methodologies and existing knowledge. The oral examination focuses on the nursing discipline, research methods, statistics, and substantive knowledge. The candidacy committee consists of three doctorally prepared Bolton School faculty members.

The student works with the candidacy committee to develop a research proposal. During this time, the student enrolls in NURS 670, “Proposal Development.” A minimum of 3 credits of NURS 670 is required, and the student may be required to take up to 12 credits of this course, if needed, to complete the proposal. Prior to scheduling the candidacy examination, the student must have completed the research practicum and all course requirements with a cumulative GPA of 3.0.

The candidacy committee determines the adequacy of responses to the oral examination and the research proposal presented at the time of the examination. A student who fails the candidacy examination may be permitted within one year of failing the examination to retake it, provide a written response to questions from the committee, or submit a revision of the proposal. The committee may also require additional course work. A student who fails the examination a second time will be separated from the Bolton School of Nursing.

A student who is not advanced to candidacy may not undertake further study for credit towards a Ph.D. within the Bolton School. With the approval of Ph.D. Council and the School of Graduate Studies, the student may take additional coursework to complete a masters degree or enter the graduate program of another University academic department.

Proposal Defense
The purpose of the proposal defense is for students to demonstrate their synthesis and application of substantive knowledge and research methods and statistics. Students defend their dissertation proposal to their dissertation committee comprised of three doctoral-prepared nursing faculty members and another doctoral-prepared member from another department within the University. Additional voting or non-voting members may be included. The written dissertation proposal is presented to the committee three weeks prior to the proposal defense. The dissertation committee determines the adequacy of the responses to questions and the dissertation proposal. A student not passing the proposal defense may be required to repeat the defense, revise the proposal, or provide written responses to questions. The student must pass the proposal defense before implementing the dissertation.

Dissertation Defense
Students must successfully defend their dissertation in an oral examination with the dissertation committee who are also responsible for certifying that it meets acceptable scholarly standards.

The student must provide a copy of the dissertation to committee members at least 10 days before the defense. The dissertation defense must be scheduled with the School of Graduate Studies three weeks prior to the defense. The time and place of the dissertation defense must be announced within the University. The dissertation defense is open to University faculty and students, but the dissertation chair determines whether the defense is open to others outside of the University.

The dissertation committee determines the adequacy of the oral examination and written dissertation. A student will pass if no more than one voting member dissents.

Degree Requirements
A student will be awarded a Ph.D. degree upon completion of all required coursework in their curriculum as detailed in their Program of Study. All students must complete 36 semester hours of course work at the University. A cumulative GPA of 3.0 or above in all courses taken for credit (excluding grades of S) as a Ph.D. student at the University is required for awarding the Ph.D. degree.

Graduate students are considered to be in residence when they are fully engaged in academic work. Ph.D. students must be registered for a minimum of six consecutive academic terms (fall, spring, and/or summer) from matriculation to a period not exceeding five years after the first credited hour(s) of dissertation research (NURS 701). The time period in which a leave of absence is taken does not count towards the residency requirement. Within the context of continuity of registration, departments may enact other restrictions. In such instances, the departmental requirements take precedence and must formally be disclosed to the student at matriculation. Continuous registration is mandatory for all graduate students unless on an approved leave from the School of Graduate Studies.

All requirements for the Ph.D. degree must be completed within five years from the first time a student registers for dissertation credit (NURS 701), including leaves of absences. If the student fails to complete the degree requirements within this 5-year time period, including leaves, they may request a 1-year exten-
courses may NOT be taken as a non-degree student for those taking Ph.D. courses. Clinical courses at the English Language Services Center (ELS) at the university, and students must complete English courses through the 109 level or its equivalent. Students who demonstrate English language proficiency may request to be exempt from these courses.

Special Students

Special students are those who take a specified course of study designed to meet an individual’s needs. They must meet the admission requirements for the program where the majority of class work will be done. Their status and satisfactory performance will be reviewed after one year. Students completing M.S.N. courses to obtain a certificate in any advanced practice nursing major will be admitted as special students.

If a special student decides to pursue a graduate degree, the approval of the Associate Dean of Academic Programs must be obtained. Entrance into the degree program will be considered the date when the student enrolled in the first course work as a special student. These courses must have been taken within the last five years. If more than five years have elapsed since the course work as special student was done, the student must meet the current academic requirements for the major selected.

International Students

International students may enroll in the masters, nursing doctorate and PhD programs. They must meet the admission requirements for the program that they select. In addition, application should be submitted approximately one year before the desired date of enrollment. English translations of transcripts are required.

Each applicant must document the ability to speak, read, and write English as evidenced by satisfactory performance on the Test of English as a Foreign Language (TOEFL). The Educational Testing Service administers the test. Write to the following to arrange to take the test.

Educational Testing Service (ETS)
TOEFL/TSE
PO Box 6151
Princeton, NJ 08541-6151
609-951-1100
www.toefl.org

Students whose native language is English are exempt. For those whose native language is not English, a score of 550 on the paper test or 213 for the computer test is desired. Students must take English courses at the English Language Services Center (ELS) at the university, and students must complete English courses through the 109 level or its equivalent. Students who demonstrate English language proficiency may request to be exempt from these courses.

Evidence of adequate financial resources to meet the expenses of full time study and travel expenses to and from Cleveland must be presented. Financial assistance is not available from the Bolton School. The student must arrange for a sponsor who will provide full financial support. The sponsor must document their ability to financially support the student, including costs of tuition and fees, room and meals, books, incidentals, and travel expenses.

Students applying to clinical programs must be eligible for licensure as a registered nurse (RN) before any clinical courses are taken. To obtain RN licensure, the student can either 1) obtain licensure in a state other than Ohio and apply for reciprocity in Ohio, or 2) sit for the licensure examination (NCLEX-RN) in Ohio. For information on how to become licensed in any state, you must obtain information from the specific state where you wish to become licensed. For the individual addresses of each State Board of Nursing, go to the National Council of State Boards of Nursing website at www.ncsbn.org and then go to “Click here to access the Boards of Nursing contact information and Web sites.” You may also write to:

National Council of State Boards of Nursing
676 N. St. Clair Street
Suite 550
Chicago, IL 60611-2921
Telephone: (312) 787-6555.

Once admitted to the Bolton School, an application form for a student visa will be sent to the student. Upon enrollment at the university, the student must subscribe to the Student Medical Insurance Plan that is required by the University Health Service.

FINANCIAL ASSISTANCE

The following is a brief description of the financial aid opportunities available to students at the Bolton School of Nursing. Undergraduate students can find a more detailed description of undergraduate aid in the pamphlet, Financial Aid at Case, obtained from the Case Financial Aid Office.
Office. Some types of aid are not available to all students, and the awarding of some grants and scholarships may make you ineligible to receive other grants or scholarships. If you have questions or would like more information, contact either The Bolton School of Nursing or Case Western Reserve University Financial Aid Offices.

Undergraduate

Undergraduate students, those enrolled in the B.S.N. and RN-B.S.N. programs have a variety of financial assistance available, including federal and state need-based aid and merit-based grants and scholarships.

The Bolton Scholarship

All full-time students in the B.S.N. or RN-B.S.N. programs are awarded the Bolton Scholarship. The scholarship is for at least 40% tuition and may be renewed each year (maximum of 8 semesters for B.S.N. students and 4 semesters for RN-B.S.N. students) that the student remains full-time in the B.S.N. or RN-B.S.N. programs. An amount in addition to the 40% may be awarded on a financial-need basis.

Merit-Based Aid

Case offers several full and partial-tuition merit-based scholarships. These are generally renewable for all four years of study if high academic performance is maintained. To be eligible for Case scholarships, students apply by February 1st and submit SAT I or ACT scores and be admitted to the University. Contact the Case Financial Aid Office for more information.

Need-Based Aid

For all need-based aid, students are encouraged to complete the Free Application for Federal Student Aid (FAFSA) and register with the Financial Aid Profile Service (FAP) by February 15th (or as soon after as possible). From this information, and the Case Financial Aid Application, a student’s family contribution is determined. This is calculated solely on the financial circumstances of the student’s family, and does not take cost of tuition into consideration. Once the family contribution is calculated, it is subtracted from the estimated cost of attendance (tuition, room, board, fees, books, transportation, and miscellaneous expenses) to calculate the student’s financial need. The financial need is the amount that may be covered by Case’s financial aid programs. A student’s financial aid award or “package” may consist of up to three different components: grants, loans, and employment.

Graduate

Graduate programs at the Bolton School of Nursing are the M.S.N., N.D., Ph.D., RN-M.S.N., and the joint degree programs (M.S.N./M.B.A., M.S.N./M.P.H., and M.S.N./M.A.).

Full and Half-Time Students

Full-time enrollment is at least 9 credit hours Fall and Spring semesters and at least 6 credit hours, Summer semesters. Half-time enrollment is 5-8 credit hours Fall and Spring semesters and 3-5 credit hours Summer semester. To be eligible for financial aid for Summer semesters, the student must also be eligible for aid in the following Fall and/or Spring semesters.

Federal Loans

All students are encouraged to complete the Free Application for Federal Student Aid (FAFSA). Information from this form and the Case Financial Aid application will be used to determine the student’s financial need and the amount of loan for which they are eligible. The majority of students receive enough loans to cover the estimated cost of tuition and expenses.

There are two basic types of federal loans: subsidized and unsubsidized. Both types of loan repayments do not begin until a student’s enrollment falls below half time or six months after graduating, whichever comes first. Students may begin repayments earlier if they choose. Subsidized loans do not accrue interest until after you graduate or fall below half-time enrollment. Unsubsidized loans begin accruing interest immediately, although it does not need to be paid until repayments begin.

Private Loans

For those students who do not receive federal loans or wish to borrow more money than is provided by federal loans, private lenders may be an option.

Part-Time Students

Students enrolled in less than 5 credit hours Fall and Spring Semesters, and less than 3 credit hours Summer Semesters are NOT eligible for federal aid. However, some private lending agencies do give loans to part-time students. Contact the Bolton School of Nursing Financial Aid Office for more information.

Intensive Students

Students enrolled only in intensive courses are NOT eligible for federal aid because regulations require enrollment in courses that span at least a ten-week period, but students may receive loans from some private lending agencies. Contact the Bolton School of Nursing Financial Aid Office for more information.

Scholarships and Grants

Some of the following grants, scholarships, and assistantships are given directly by the Bolton School of Nursing, while others are outside sources of assistance. Students should seek other sources of assistance on their own. Direct questions regarding the following grants and scholarships to the Bolton School of Nursing Financial Aid Office.

Professional Nurse Traineeship Grant

This Department of Health and Human Services grant, awarded to the Bolton School of Nursing, is distributed to full-time M.S.N. students and post-licensure N.D. students seeking the M.S.N. To be eligible, the student must be enrolled full-time (on a continuing basis) for two or more semesters and have the Statement of Appointment of Trainee and Statement of Acceptance of Traineeship forms on file in
the Bolton School of Nursing Financial Aid Office.

National Health Service Corps Scholarship
This is an excellent opportunity for full-time students in the Family Nurse Practitioner and Nurse Midwifery programs. Awarded from the Bureau of Primary Health Care (BPHC), National Health Service Corps (NHSC) Scholarship Program, the scholarship includes full tuition and a monthly stipend. There is a one-year work commitment (minimum of two years) for each year or partial year the scholarship is awarded. To fulfill the work commitment, awardees must obtain employment in an under-served public or private facility approved by the National Health Service Corps. Employment is not necessarily with the federal government. Employment opportunities can be found across the United States in urban, suburban and rural settings. This Scholarship is very competitive and seeks applicants who are dedicated to the mission of the BPHC. Applications are available from the Bolton School of Nursing Financial Aid Office, in late February. Application deadline is in late March.

The N.D. Student Grant
Pre-licensure N.D. students may receive this Bolton School of Nursing Grant. Based on financial need, $1,000 - $3,000 is an award for each year of the pre-licensure component of the N.D. program.

Other Grants
Some advanced practice majors have additional financial assistance available. Please contact the Bolton School of Nursing Financial Aid Office.

Employment
Many employers of health care professionals offer tuition assistance of varying levels. While you should not expect that the assistance would cover your entire tuition, it is often a significant amount. Check with your employer for more information.

Student employment may be available at the Bolton School of Nursing or at other campus locations. Also, part-time employment may be available at local hospitals or other health care agencies.

Other Resources
There are many private scholarships, grants, and loans available to undergraduate and graduate students. Students should check local organizations (i.e. churches, parents’ employers, students’ employers, and service organizations). Public libraries have books on scholarships, and the Internet is another good source of information. When searching or applying for scholarships, always be alert for scams. While most scholarships are legitimate, there are some that are not.

Searching on the World Wide Web
FASTWEB (www.fastweb.com) is a free search service. After completing a profile, this service searches through its database to identify scholarships that may meet student’s eligibility.

Since the database is continually updated, check back often. Also, complete numerous profiles that cover all of the student’s qualifications and interests because different profiles may produce different results.

FINAID (www.finaid.com) is a financial aid information page. It covers a wide variety of financial aid topics, including sources of aid, private loans and links to several free scholarship search services.

Bolton School of Nursing
Website: http://fpb.Case.edu/
Charlene Quinn, Registrar/Financial Aid Director:
Direct: 216-368-2183
Toll free: 800-825-2540 ext. 2183
e-mail: cfq@po.Case.edu
Case Financial Aid Office
Website: http://finaid.Case.edu/
Submit questions via the website, and a financial aid counselor will respond by e-mail in the order that questions are received.

Phone: 216-368-4530

COURSE DESCRIPTIONS
(NUAN)

NUAN 449. Chemical and Physical Properties of Anesthesia (2)
Introduction and elaboration of basic chemical and physical principles as they relate to clinical nurse anesthesia practice. An in-depth study of organic and biochemical principles, structure/activity, relationships and their significance in pharmacology. Emphasis will be on the integration and practical application of these principles to clinical nurse anesthesia practice. Prereq: Admitted to program.

NUAN 450. Pharmacological Strategies in Anesthesia Practice (2)
Application of pharmaco-kinetic and pharmaco-dynamic principles as they relate to specific anesthetic and adjunct drugs used in anesthesia practice. Integration of this information into clinical area regarding anesthetic uses, dosages, and side effects of these classes of drugs is emphasized. Prereq: NUAN 449.

NUAN 451. Physiological Variables and Responses I: Respiratory System (2)
A detailed study of the anatomic structures and related physiochemical mechanisms governing respiratory function in health and disease. Assess the functional integrity of this system using all pertinent objective and subjective data. Consider the impact of anesthetic agents and techniques on this system and how one can plan anesthetic to facilitate health-seeking behaviors as a patient attempts to attain, maintain or regain optimal health. Implications for all types of surgery in view of effect of anesthesia on respiratory system, however, special attention on surgery involving this specific system. Prereq: NUAN 449.

NUAN 452. Physiological Variables and Responses II: Cardiovascular (3)
A detailed study of the anatomic structures and related physiochemical mechanisms governing cardiovascular function in health and disease. Assess the functional integrity of this system using all pertinent objective and subjective data. Consider the impact of anesthetic agents and techniques on this system and how one can plan anesthetic to facilitate health-seeking behaviors as patients attempt to attain, maintain, or regain optimal health. Implications for all types of surgery in view of effect of anesthesia on cardiovascular system, however, special attention on surgery involving this specific system. Coreq: NUAN 451.

NUAN 453. Physiological Variables and Responses III: Peds, OB, Endo & Geriatrics (4)
Study of health-seeking behaviors and intervening variables with special consideration of the anatomy, physiology, and pathophysiology of the pediatric and obstetric, endocrine and geriatric patient. Focus will be on the integration of this information into the nurse anesthesia care to support the health-seeking behaviors of these patients. Prereq: NUAN 451 and NUAN 452.

NUAN 454. Physiological Variables and Responses IV: Renal and Neurologic Systems (3)
Systematic investigation of the physiologic factors related to health-seeking behaviors with special emphasis on pathophysiology of the renal and neurological
systems. Focus will be on the integration of this knowledge into the planning, implementation, and evaluation of patient care and interventions. Prereq: NUAN 453.

NUAN 455. Anesthesia Nursing I (2)
An introduction to the art and science of nurse anesthesia including basic anesthetic principles and beginning clinical practicum to introduce the student to anesthetic equipment and operating room environment. This course is designed to give the student practical insight into the management of clients undergoing all forms of anesthesia. This unit includes the history of nurse anesthesia relevant to contemporary anesthetic practice, legal and ethical aspects of anesthesia delivery, and patient/client interaction strategies. The course is designed to give the nurse exposure to career expectations in nurse anesthesia; as well as prepare him/her in administration of safe, routine anesthetic with moderate amount of instructor interaction. Prereq: NUAN 455.

NUAN 457. Anesthesia Nursing III (1)
Graduated, guided instruction in clinical management of clients receiving various types of anesthesia. Focus is on the preparation and planning for anesthesia utilizing Schlotfeldt paradigm. Includes actual administration of anesthesia for clients exhibiting more complicated pathophysiology. More advanced technical instruction and experience. Correlation of didactic and clinical materials, as well as continuous evaluation of student progress are integral to this course. Prereq: NUAN 456.

NUAN 551A. Nurse Anesthesia: Advanced Practice I (2)
Individual, in-depth study of advanced clinical nurse anesthesia in such specialty areas as neurosurgical, cardiovascular, obstetric and pediatric anesthesia. The nurse learns to handle more difficult, specialized patients who are at a higher risk. Emphasis is on more complex management with advanced monitoring techniques, use of pharmacological agents and handling higher stress situations. Students develop and utilize practical clinical applications of nurse anesthesia theory. Prereq: NUAN 457.

NUAN 551B. Nurse Anesthesia: Advanced Practice I (1)
(See NUAN 551A) Prereq: NUAN 551A.

NUAN 551C. Nurse Anesthesia: Advanced Practice I (1)
(See NUAN 551A) Prereq: NUAN 551B.

NUAN 552. Nurse Anesthesia: Advanced Practice II (1)
The continuation of advanced, independent clinical nurse anesthesia administration. Emphasis is on management of higher risk patients for more difficult procedures, performing total anesthetic care with minimum of anesthesiologist supervision, and readiness for transition from student to graduate status. Prereq: NUAN 551A and NUAN 551B and NUAN 551C.

NUND

NUND 211. Pharmacology (2)
This course introduces basic principles of pharmacology and pharmacotherapeutics. A survey of characteristics and uses of major drug groups with an emphasis on nursing implications is presented. Prereq: NUND 342.

NUND 213. Nursing Strategies and Interventions for Alterations in Human Function (4)
An introduction to specific nursing strategies and interventions designed to support the maximum health potential of the adult patient. The fundamentals of nursing care are incorporated into a laboratory setting and practiced in an acute care medical-surgical facility. Particular emphasis is placed on the nursing strategies and interventions. Evaluation of the effectiveness of interventions is integrated throughout the course. Prereq: Admission to N.D. program.

NUND 220. Altered Human Functioning (3)
Introduction to basic pathophysiological outcomes of selected intervening variables that alter human physiologic and cognitive functioning. This course builds on the student’s foundation of normal anatomy and physiology. Prereq: NUND 412 and completion of first semester of N.D. program.

NUND 222. Nursing Informatics II: Biostatistics (1)
This course focuses on advanced concepts in quantitative methods for nursing, including application to nursing problems, and solution strategies using computer software.

NUND 223. Aging in Health and Illness (2)
This course will explore the concept of aging in health and illness with an emphasis on the older adult as an individual with the capacity to grow and develop. Content will include theories of aging, physiology of aging, geriatric syndromes and interventions, implication for policy and health care services. Prereq: NUND 213, NUND 233, NUND 410, and NUND 412.

NUND 225. Acute Care Nursing of the Adult (9)
The focus of this course is the integration of the nursing process in clinical practice. Human responses to significant health events and alterations are analyzed. Application of relevant physiology, psychosocial dimensions, and pharmacology are included. Particular emphasis is placed on nursing strategies, interventions, and the evaluation of their effectiveness in the care of the acutely ill adult. Prereq: NUND 213.

NUND 230. Foundations of Nursing Practice (2)
This course introduces the discipline of nursing and its attributes for clinical practice. Critical historical, sociocultural, and philosophical influences that have affected nursing as a profession will be critiqued. Nursing theories are introduced. The individual, the group, the family, and the community as clients of the nurse are introduced. Nursing strategies to promote therapeutic communication are emphasized.

NUND 233. Human Growth and Development (1)
Introduction to the theories, concepts and nursing applications relevant to the physical, psychological and social growth and development across the lifespan.

NUND 234. Introduction to Human Genetics (1)
Introduction to the theories and concepts relevant to genetics and embryological development of humans.

NUND 315. Parents and Neonates in Health and Illness (4)
This course introduces biological, psychosocial, and developmental concepts applicable to the nursing care of women, newborns, and families during the childbearing cycle. Emphasis is placed on assessment and identification of health needs as parents and neonates respond to the changes inherent in the childbearing cycle. Strategies related to nursing care of parents and neonates are discussed. The clinical experience focuses on the direct application of these concepts and strategies in the care of patients in various perinatal settings. Prereq: NUND 224.

NUND 316. Infants, Children, and Adolescents in Health and Illness (4)
The study of infants, children, and adolescents and their health-seeking behaviors from a developmental perspective. Emphasis is on healthy infants, children, and adolescents as well as infants, children, and adolescents with common, acute, and chronic illness within the context of their family environment. Nursing strategies focus on interventions to promote, restore, and maintain health and foster growth and development. These strategies are based on understanding advanced concepts of children’s and adolescents’ responses in acute health/illness states. Prereq: NUND 215.

NUND 317. Psychiatric Mental Health Nursing (4)
This course is designed to address psychiatric and mental health nursing concepts. The focus is on clients with acute and chronic psychiatric disorders and their mental health. Nursing strategies that are appropriate for assessment and intervention with individuals, families, and groups to facilitate optimal mental health will be discussed and practiced. Prereq: NUND 224.

NUND 319. Public Health Nursing (4)
This course focuses on factors influencing the health of groups, communities, and populations. The student will examine relevant concepts, theories, research, and emerging public health issues. Principles of epidemiology will be addressed. Strategies for public health nursing interventions will be designed and implemented. Prereq: Completion of two semesters of N.D. program.

NUND 341. Concepts of Management (3)
Study of basic concepts relative to leadership and working with groups of people in providing nursing care. Concepts include: decision making, power, authority, roles, teaching-learning, evaluation, leader behaviors, work groups, legal aspects, change.

NUND 342. Medical Microbiology, Immunity, and Infectious Diseases (3)
Microbial structure, growth, genetics, and metabolic control function and dysfunction of the human immune response. Manifestations of infectious disease and review of selected infectious diseases.

NUND 343. Issues and Ethics in Health Care (2)
Designed to introduce the students to the principles underlying ethical issues and methods of rational decision making. Fundamental theories will be reviewed and opportunity provided, using case analysis, to apply the theories in addressing ethical dilemmas common to modern health care.

NUND 400. Guided Study (1–6)
Selected topics in basic nursing. May include clinical experiences.

NUND 410. Health Assessment (2)
Comprehensive introduction to the assessment skills required for a successful nursing practice. Basic skills, such as vital signs, are taught along with a system by system approach to physical examination. Taking a health and psychosocial history is integrated into the course. The course is taught concurrently with anatomy and physiology, concepts of nursing practice, and strategies and interventions for alterations in functioning.

NUND 412. Anatomy, Physiology, and Metabolic Function of the Human Body (6)
This course provides a review of the normal embryologic development, anatomy and physiology of the major body systems. Basic biochemical and cellular control mechanisms will be reviewed with emphasis.
Students are expected to extend their expertise with policy analysis through development of a proposal to implement policy changes specific to needs identified within the population of women and children. Coreq: NUND 483 or permission of instructor.

NUND 500. N.D. Thesis (1–3)
Systematic investigation of a clinically based research problem selected by the student for independent study. This includes proposal refinement and acceptance, data analysis and thesis completion under thesis committee supervision. Prereq: NURS 521.

NUND 505. N.D. Project (2–4)
Systematic completion of a project based on existing educational or clinical research. The project could include: (1) program needs assessment, (2) development and testing of an assessment instrument/protocol for clients, (3) implementation and evaluation of a new program; or evaluation of a major existing program. The evaluation may include financial, clinical, or educational components as appropriate to the project. The project will be developed under the supervision of the student’s N.D. project committee. Prereq: NURS 521.

NUND 474. Theoretical Foundations of Education, Testing, and Evaluation (3)
The purpose of this course is to explore the theoretical underpinnings of education and examine innovative approaches to critical thinking. In this course, an overview of educational measurement and evaluation is provided to prepare students for an educator role. Students are provided the opportunity to analyze philosophies and principles of education, along with teaching and learning styles. Methods of evaluating teaching effectiveness, student learning, and student performance are explored, with emphasis placed on test construction and analysis.

NUND 475. Curriculum and Instruction (3)
The focus of this course is on curriculum planning and development congruent with the philosophy and objectives of a nursing education program. Curriculum development includes determination of a program and course objectives, along with selection and organization of appropriate learning experiences to meet these objectives. Techniques for instruction in classroom, laboratory, and clinical settings are explored.

NUND 481. Teaching Practicum (2)
In this preceptored teaching practicum, the student will engage in didactic, laboratory, and clinical teaching assignments in a school of nursing. The student will be expected to use current educational theory and nursing knowledge in completing the practicum experience. Prereq: NUND 474, NUND 475.

NUND 483. Health Care Planning and Policy and Information Management Systems (3)
An exploration of the nurse’s role in health care policy and planning and information systems. Overview of issues in health care policy and planning, including the socio-political and economic context of health and health-seeking behaviors. Health care policy and planning at the local, state, and federal levels will be explored. Ethical dimensions of public policy formulations and implementation will be highlighted. The application of computer technology in health care and nursing will be explored. Following an introduction to hardware and software, special consideration will be given to clinical and administrative applications of information technology. Prereq: Graduate standing in Nursing or consent of instructor.

NUND 493. Population-Based Maternal-Child Nursing:Issues,Research,Policy & Inter (3)
This course focuses on broadening the knowledge base of pediatric and family nurse practitioner students to include aggregate-based health assessment and policy issues. This course is designed to build upon the students’ previously acquired knowledge of the nurse’s role in health policy analysis and planning, and the community health. Emphasis will be placed on the assessment of women’s health and children’s health at the community level, and the development of programmatic interventions to address identified needs.

NUND 401. Health Promotion in Children and Adolescents (2)
This course introduces the concepts of pediatric primary health care from a developmental perspective. Concepts and theories from nursing and other related disciplines associated with the assessment and care of well children and their families are explored. Clinical application of theories and nursing strategies to optimize the health of children and their families are emphasized in the professional role development of students. Coreq: NUND 410.

NUND 402. Common and Acute Health Problems of Children (6)
This course introduces the common and acute health problems occurring in infancy through adolescence using a bio/psycho/social/cultural approach. Pathophysiology, assessment and diagnostic strategies specific to acute and common problems in children will be emphasized. Nursing strategies used to enhance, maintain and restore health will be discussed. Prereq: NURS 453, NURS 459, NUND 410, and NURS 430. Coreq: NURS 430.

NUND 403. Advanced Management in Pediatric Primary Care (5)
This course focuses on the primary rehabilitative health care concepts specific to the management of complex, multidimensional health problems experienced by infants, children and adolescents within the context of their family and community environments. Pathophysiology, assessment and diagnostic strategies specific to complex health problems in children are emphasized. The selection of clinical interventions, clinical decision making and evaluation of strategies used to enhance the health outcomes of children and their families will be stressed. Emphasis will be placed on the consultation and referral processes within interdisciplinary and multidisciplinary teams. Prereq: NUND 402.

NUND 405. Neonatal Nurse Practitioner I (3)
This course introduces the role of the Neonatal Nurse Practitioner and concepts relevant to the management of the well or ill neonate. Analysis of nursing strategies to optimize health-seeking behaviors in families with well or ill neonates is highlighted. Prereq or Coreq: NUND 416.

NUND 410. Health Promotion Across the Life Span (2)
This course introduces health promotion fundamental to advanced practice nursing. Epidemiological principles and international, national and local health promotion goals are examined with emphasis on cultural and environmental principles, individual assessment and evidence based practice. Diagnostic reasoning and intervention strategies to optimize health-seeking behaviors in clients and to foster therapeutic relationships are examined.

NUND 412. Neonatal Nurse Practitioner II (4)
This course focuses on the health problems of the high-risk neonate in the context of family, culture, and community. Nursing strategies that enhance, maintain, and restore health in ill neonates and their families. Principles identified for advanced diagnostic and therapeutic approaches specific to the neonate, including pharmacology, are emphasized. Prereq: NUND 405.

NUND 413. Neonatal Nurse Practitioner III (3)
Pathophysiology, assessment and diagnostic approaches specific to neonates with acute problems will be examined. Concepts related to discharge planning collaboration and long-term follow-up will be introduced. Prereq: NUND 412.

NUND 414. Neonatal Nurse Practitioner IV (4.5)
This course focuses on the acute and on-going habilitative care specific to the management of neonates with complex health problems. Pathophysiology, assessment, and diagnostic approaches specific to complex health problems of preterm infants, infants with chromosomal aberrations, and infants with multidimensional health problems will be emphasized within the context of their family and community environments. Commu-
Primary Care (5)

Health-seeking behaviors will be stressed within the approaches specific to the adolescent and adult client. This course is on the pathophysiology, assessment and diagnostic strategies used to enhance, maintain, and restore health are emphasized; health-seeking behaviors and the impact on family are stressed. Prereq: NURS 430, NURS 453, NURS 459, and NUNP 410. Coreq: NUNP 430.

NUNP 419. Family Health Nursing: Health of Adults and Older Adults (5)

This course introduces the student to the practice of primary health care of adults and older adults. The course includes the principles of growth and development, health promotion, disease prevention, and management of common acute and chronic health problems. Emphasis is placed on the biologic, psychological, social and cultural aspects of care. Pathophysiology, assessment and diagnostic techniques specific to the acute and common problems are stressed. Nursing strategies related to health problems used to enhance, maintain, and restore health are emphasized; health-seeking behaviors and the impact on family are stressed. Prereq: NUNP 440, NURS 453, NURS 459, and NUNP 410. Coreq: NUNP 440.

NUNP 429. Family Health Nursing: Health of the Family During Childbearing Years (4)

This course introduces the influence of family dynamics on the care of women and their families before pregnancy, during pregnancy and within the interconceptional period. Assessment of physical and psychosocial health and deviations is central to the course. Content also includes principles of education for childbearing, parenting and conception control. Nursing strategies to optimize health-seeking behaviors of the family during the childbearing years are emphasized. Prereq: NUNP 410 or NUNP 419.

NUNP 432. Common and Acute Health Problems of the Adult I (5)

This course introduces the common and acute health problems occurring across the adult life span. A body system approach is used with emphasis on the biologic, psychological, social and cultural aspects of care. Pathophysiology, assessment and diagnostic techniques specific to the acute and common problems of adults and adolescents will be stressed. Nursing strategies used to enhance, maintain and restore health will be emphasized. Prereq: NURS 430, NURS 453, NURS 459, and NUNP 410. Coreq: NUNP 430.

NUNP 433. Common and Acute Health Problems of the Adult II (3)

This course is a continuation of NUNP 432. Emphasis is on the pathophysiology, assessment and diagnostic approaches specific to the adolescent and adult client. Health-seeking behaviors will be stressed within the context of the family and community.

NUNP 434. Advanced Management in Adult Primary Care (5)

This course focuses on the health care concepts specific to the management of complex, multidimensional health problems experienced by adolescents and adults within the context of their family and community environments. Pathophysiology, assessment and diagnostic strategies specific to complex health problems in adults are emphasized. The selection of clinical interventions, clinical decision making, and evaluation of strategies used to enhance the health outcomes of adults will be stressed. Prereq: NUNP 433.

NUNP 439. Family Health Nursing: Health of Children and Adolescents (4)

This course introduces the influence of family dynamics and the information necessary for the practice of primary health care of children and adolescents. The course includes application of the principles of growth and development, disease prevention, and management of common acute and chronic health problems. The impact of the family on child and adolescent development and health is explored. Clinical application of nursing strategies to optimize health-seeking behaviors is emphasized. Prereq: NUNP 429.

NUNP 443. Acute Health Problems of the Adult (6)

Emphasis is on the pathophysiology, assessment, and diagnostic approaches specific to acute health problems of adults. The clinical laboratory focuses on development of advanced therapies and case management skills. Prereq: NURS 438.

NUNP 444. Advanced Management of Acutely Ill Adults (4)

This course focuses on concepts specific to complex, multidimensional health problems of hospitalized adults. Pathophysiology, assessment, and diagnostic strategies specific to complex health problems are emphasized. Clinical practice focuses on case management of acutely ill hospitalized adults with complex health problems. Prereq: NUNP 443.

NUNP 449. Primary Care of Older Adults (3)

This course will focus on the assessment of the older adults. These factors are analyzed in various environments. Epidemiological and health behavior models are used to assess health risks, assist with problem identification, primary, secondary, and tertiary prevention strategies, Cultural, ethnic, and developmental issues are addressed. Concepts, assessment strategies, interventions and evaluation approaches specific for older adults are identified. Prereq: NUNP 419.

NUNP 454. Advanced Management of Complex Problems in the Older Adult (4)

This course focuses on the management of complex multidimensional health problems experienced by older adults and their families in multiple environments of care. Pathophysiology, assessment, and diagnostic strategies specific to complex health problems in older adults are emphasized. Evidence-based management strategies used to enhance the outcomes in older adults to promote health and prevent disability will be stressed. The role of the GNP on care giving teams will be included. Prereq: NUNP 449. Coreq: NURS 442.

NURS

NURS 110. Foundations of the Discipline (1)

The course is designed to introduce the student to the practice, profession and discipline of nursing. A futuristic perspective will provide a framework for discussion of the foundation of contemporary nursing practice within a variety of health care settings. Critical historical influences that affected the development of contemporary nursing will be discussed. Selected trends and issues that will guide future nursing practice will conclude this course.

NURS 111. Foundations of Practice (3)

This course is designed as a foundation for clinical nursing practice in relation to the concepts of communication, safety and comfort. The three concepts will be applied to the application of fundamental nursing care. The basic components of the nursing process are presented as a framework for beginning clinical practice.

NURS 120. Nursing Informatics I: Introduction (2)

This course focuses on the application of mathematics for nursing, including algebra and biostatistics. Microcomputer, word processing and information concepts for nursing practice will be introduced.

NURS 122. Nursing Assessment (3)

The focus of the course is on psychosocial and physical assessment of patients in a variety of settings. Data collection essential to the nursing process will focus on the adult and geriatric populations. Prereq: C or higher in BIOL 346.

NURS 201. Applied Diet Through Health and Disease (3)

This course builds upon the student's previous knowledge base regarding human physiology and metabolism. Energy requirement changes related to lifespan changes are addressed. Dietary modulation as a therapeutic strategy to manage intervening variables is emphasized.

NURS 211. Introduction to Pharmacology (2)

Introduction to basic principles of pharmacology and pharmacotherapeutics. Review of characteristics and use of major drug groups with emphasis on nursing implications. Prereq: NURS 122, BIOL 148 or equivalent.

NURS 222. Nursing Informatics II: Biostatistics (1)

This course focuses on advanced concepts in quantitative methods for nursing, including application to nursing problems, and solution strategies using computer software. Prereq: NURS 120.

NURS 230. Nursing Care of the Adult I (5)

This course is the first in a two part series of courses focusing on the application of the nursing process in various settings to the adult experiencing common acute and chronic health alterations. Special emphasis is placed on assessment, diagnostic testing, and nursing interventions as part of the nursing process. Prereq: NURS 122, BIOL 114, BIOL 119, BIOL 148, BIOL 346. Coreq: BIOL 121.

NURS 240. Nursing Care of the Adult II (2)

This course builds upon the knowledge and skills mastered in NURS 230 and NURS 250. Course content and learning opportunities provide students with the information necessary to collaborate with other members of the health care team in providing comprehensive care to adults and older adults. Students will use the nursing process in selecting appropriate nursing interventions for the care of adults experiencing multiple acute and chronic health problems in the acute care setting. Special emphasis is placed on evaluating patient responses and revising the plan of nursing care to optimize expected outcomes. Prereq: Completion of NURS 211, NURS 230, NURS 250 and BIOL 121.

NURS 250. Aging in Health and Illness (2)

This course will explore the concept of aging as a healthy developmental process with a particular focus on the elderly as active, independent, and contributing members of the community. Content will include the physiology of aging, health problems common to the elderly, the psychological, emotional, and sociological aspects of the aging process and policy issues. Prereq: NURS 122, BIOL 114, BIOL 119, BIOL 148, and BIOL 346.
NURS 315. Parents and Neonates in Health and Illness (4)
This course focuses on the study of child bearing families and their health-seeking behaviors from a developmental perspective. Content includes nursing knowledge and skills related to assessment of health status of parents and neonates. Nursing strategies focusing on interventions to promote, restore, and maintain health are discussed. Prereq: NURS 240, NURS 317, NURS 342, and C or better in "Growth and Development."

NURS 316. Infants, Children, and Adolescents in Health and Illness (4)
The study of infants, children, and adolescents, and the health-seeking behaviors from a developmental perspective. Emphasis is on healthy infants, children, and adolescents as well as infants, children, and adolescents with common, acute, and chronic illness within the context of their family environment. Nursing strategies focus on interventions to promote, restore, and maintain health and foster growth and development. Prereq: NURS 240, NURS 342, NURS 317, "Growth and Development."

NURS 317. Psychiatric-Mental Health Nursing (4)
The course is designed to address health-seeking behavior patterns within the context of psychiatric and mental health nursing concepts. The focus is on clients with psychiatric disorders and their mental health. Nursing strategies that are appropriate for assessment and intervention with individuals, families, and groups to facilitate optimal mental health will be discussed and practiced. Prereq: NURS 230, NURS 211.

NURS 318. Nursing in the Community (4)
The study of the promotion of health and the primary, secondary, and tertiary prevention of health problems of a population. Focuses on the community as client with nursing care of individuals, families, and groups. The clinical component focuses upon developing and evaluating health promotion programs, family assessment, community assessment, and community-based home care within the context of the community. Prereq: RN license.

NURS 320. Nursing Research (3)
Introduction to scientific inquiry and research process in nursing. Discussion of issues and problems in systematically evaluating reports of empirical research on nursing phenomena. Appropriate use of the nursing research literature and research findings in clinical practice is discussed. Prereq: STAT 201 and completion of five semesters of B.S.N. program.

NURS 341. Concepts of Management (3)
This course focuses on the study of basic concepts related to leadership, management and working with groups in the provision of nursing care. Concepts include: decision making, power, authority, roles, teaching-learning, evaluation, leader behaviors, work groups, change, legal aspects and quality. Students will apply the key concepts from marketing, law, finance, quality management, and other intervening variables that affect environments of care.

NURS 342. Medical Microbiology, Immunity, and Infectious Disease (4)
Microbial structure, growth, genetics, and metabolic control. Function and dysfunction of the human immune response. Manifestations of infectious disease and review of selected infectious diseases. Prereq: Completion of three semesters of B.S.N. program.

NURS 343. Issues and Ethics in Health Care (2)
This course is designed to introduce the student to the principles underlying ethical issues and methods of rational decision making. Fundamental theories will be reviewed and opportunity provided, using case analysis, to apply the theories in addressing ethical dilemmas common to modern health care.

NURS 345. Nursing Informatics III: Clinical NIS (2)
The focus of this course is directed toward the understanding and use of information technologies and systems that support decision making in nursing practice, administration, research and education. Tools such as list servers, the World Wide Web, e-mail and databases may be used to augment the knowledge base in the course. Prereq: NURS 240 or RN license.

NURS 346. Nursing Informatics IV: Applications (2)
The focus of this course is directed toward the advanced informatics concepts and the implementation of selected applications within the health care setting. Systems analyzed and implemented may range from those used for patient care within the inpatient environment to those used in community or outpatient environments. Affected users of the systems may be clients, families, nursing or other health care professionals. Prereq: NURS 345 or seven semesters in B.S.N. program.

NURS 350. Concepts and Management in Geriatric Nursing (9)
This course will introduce concepts of rehabilitation, family nursing, geriatric nursing, and geriatric mental health and assist students in applying these concepts in a long-term care setting. Content will focus on assessment and intervention strategies for health problems common in the older adult. This will include a focus on developmental issues in the elderly, the assessment and management of depression. The course will also include content on assessment and intervention to improve the physical and functional capacities of the elderly, exercise interventions to improve cardiovascular and muscular capacity required for daily activities. Prereq: NURS 351 and NURS 353.

NURS 351. Acute Care II: Management of Care (4)
Application of management concepts in providing nursing care to individuals and groups of patients. Learning opportunities include experiences with members of the multidisciplinary health care team in planning, implementing, and evaluating patient outcomes. Prereq: NURS 315, NURS 316.

NURS 352. Acute Care III (9)
This course focuses on the knowledge and skills necessary to provide nursing care for patients with complex problems. Emphasis is on nursing strategies designed to provide comprehensive care to patients and their families affected by acute illness. Clinical practice is directed toward the care of acutely ill adults. Prereq: NURS 320, NURS 345, NURS 351, and NURS 353.

NURS 353. Principles of Critical Care I (4)
This course provides the knowledge and technical skills foundational to the care of critically ill patients. Clinical practice is directed toward the care of the critically ill patient with a focus on patient assessment, use of biomedical technology, development of psychomotor skills, and planning basic care. Prereq: NURS 315, NURS 316.

NURS 354. Nursing Care of Critically Ill Adults (9)
This course focuses on the integration of knowledge and skills to provide effective and efficient nursing care to critically ill adults. Emphasis is on nursing strategies directed toward the care of the critically ill patient with a focus on use of biomedical technology, planning and managing patient care, and beginning care of patients with complex care needs. Prereq: Grade of B or higher in NURS 353. Consent of instructor.

NURS 356. Nursing Care of Critically Ill Neonates, Infants, and Children (9)
This course focuses on the knowledge and skills necessary for beginning practice in the nursing care of critically ill neonates, infants and children. Emphasis is on nursing strategies directed toward the application of basic principles of critical care nursing with attention to special needs of critically ill neonates, infants and children and their families. Prereq: Grade of B or higher in NURS 316. Consent of instructor.

NURS 370. Information Technologies in Health (1)
The focus of this course is the application of advanced information and communication technologies in the health care of communities and populations. Building on a base of consumer informatics, the course will explore Geographic Information Systems (GIS), data mining techniques, telemedicine technology, and advanced communication technologies in the context of global health. Prereq: NURS 345. Coreq: NURS 343, NURS 371, NURS 372, NURS 373.

NURS 371. Public Health Nursing (3)
In this course, students will utilize a problem-based approach to develop knowledge and specific competencies in applying key concepts of public health, public health nursing and epidemiology. Through guided classroom and laboratory sessions, students will discover strategies to assess, plan, implement and evaluate population-focused programs for health promotion and disease prevention. Prereq: NURS 351 and NURS 353. Coreq: NURS 343, NURS 370, NURS 372, NURS 373.

NURS 372. Health in the Global Community (3)
This course focuses on an analysis of the forces shaping community and global health patterns. Drawing on multidisciplinary sources, this course explores the impact of these global processes as they manifest in the health of our own and other societies. Emphasis is placed on analysis of the broad cultural, environmental, social-economic, and political systems that contribute to health status and outcomes, health policies, and health care delivery around the world. Prereq: NURS 351 and NURS 353. Coreq: NURS 343, NURS 370, NURS 371, NURS 373.

NURS 373. Global Health Practicum (5)
The purpose of this practicum is to provide students with the opportunity to analyze the concepts of health and health care, health policy and finance, culture and ethics through a preceptorship, 10-week community-based immersion experience in local, national, or international settings. Students will apply epidemiological techniques, the skills of negotiation, partnership building, community assessment and nursing science in the identification and analysis of a health problem leading to the development of an intervention. Prereq: NURS 351, NURS 353. Coreq: NURS 343, NURS 370, NURS 371, NURS 372.

NURS 391. Home Health Care Nursing (5)
This course focuses on the knowledge and skills necessary to provide nursing care in home health settings for clients with complex problems. Emphasis is on nursing strategies designed to provide comprehensive nursing care to clients and their families. Clinical practice is directed toward the care of client/family in the home.

NURS 392. Dynamics of Nursing Practice and Management (4)
The focus of this course is management and leadership concepts and their application to nursing practice management. Topics such as strategic planning, resource
management, organizational structure, legal issues, and delegation will be explored. Prereq: RN license.

NURS 393. New Applications in Nursing Practice Management (4)
The focus of this course is the application of management and leadership concepts in a seminar format and clinical practicum for registered nurses. Students will apply concepts of strategic planning, resource management, organizational structure, and delegation in a health care setting. Prereq: RN license.

NURS 399. Independent Study (1-12)
Independent guided study for undergraduate students with special needs or interests. Prereq: Permission of the program director.

NURS 400. Guided Study in Nursing (1-18)
Independent study for students with special needs and interests.

NURS 401. Statistics for Health Sciences (3)
This course examines statistical methods of analyses of variance and multiple linear regression. Content includes ANOVA, MANOVA, ANCOVA, repeated measures of analysis of variances, correlation analysis, and multiple linear regression. Learning statistical theories is coupled with practice of data analysis using statistical software. This course is primarily for graduate students in nursing and health sciences and is not for credit towards any undergraduate or graduate degrees in statistics. Prereq: STAT 201 or equivalent.

NURS 404. Emergent Care of the Child (2)
This course incorporates biological, developmental, psychological, emotional, social, and cultural aspects of care. The emphasis is on pathophysiology, assessment, diagnostic approaches, and interventions specific to emergent care of infants, children, and adolescents. Advanced therapies are introduced. Prereq: Certification in PALS and neonatal resuscitation. Prereq or Coreq: NUNP 444.

NURS 405. Inquiry I (3)
Introduction to theoretical thinking in nursing. Study of knowledge development in nursing, conceptual structures and their uses, relationship of theory to research process as a basis for nursing practice, and the process of critical thinking in nursing.

NURS 406. Flight Nursing Seminar I (1)
This seminar course provides a forum for preparing students to care for patients requiring air transfer to specialty care facilities. Special emphasis is placed on advanced procedures, flight physiology, and environmental influences on the clinical approach in order to apply acute care competencies to flight nursing practice. Prereq or Coreq: NUNP 444.

NURS 407. Flight Nursing Seminar II (1)
This seminar continues to prepare students to care for patients requiring air transfer to specialty care facilities. Special emphasis is placed on clinical approaches to patient management across the lifespan. Prereq: ACLS, PALS, and neonatal resuscitation certification. Prereq or Coreq: NUNP 444, NURS 406, NURS 404.

NURS 408. Health Care of the Young Child with a Disability (3)
The focus is on the study of young children with disabilities and chronic conditions. Related issues of development, diagnosis, treatment, and family concerns are included. Continuum of care from hospital to home is considered. Involvement of the family as a member of the health care team is emphasized. Various technologies and feeding strategies for management of children's disabilities are highlighted. Context of care is considered from a multidisciplinary team approach.

Pereq: Grad student status and permission of the instructor.

NURS 415. Inquiry II (4)
Introduction to scientific inquiry. Study of research process, particularly design, sampling, data collection and analysis, and interpretation and reporting of findings. Experience in writing a proposal for nursing research. Prereq: NURS 405.

NURS 416. Integrated Assessment of the Neonate for Midwives (1)
This course introduces principles fundamental to the integrated assessment of the neonate. Gestational age assessment, assessment of genetic risks, and physical assessment skills are developed.

This course is designed for graduate students in the health, social, and behavioral sciences. The focus is on exploring issues of human rights and social justice within the context of the current HIV/AIDS epidemic in Uganda. Offered in collaboration with Makerere University, this course includes site visits to community organizations and academic institutions in Uganda. Prereq: Graduate status or permission of instructor. Cross-listed as MPH 418.

NURS 424. Theoretical Basis of Medical/Surgical Nursing II (5)
This course provides the opportunity to explore complex health problems of patients requiring a variety of health care services and support systems. Nursing strategies requiring independent, interdependent, and collaborative activities are evaluated for their efficacy in supporting and assisting the patient's progress toward health. Clinical experiences are individualized to promote implementation of the Clinical Nurse Specialist role and build upon the student's expertise.

NURS 430. Pharmacology and Therapeutics (3)
Examination of the major categories of pharmacologic agents and application of pharmacologic concepts in the clinical setting. Emphasis is placed on understanding the physiologic action of the drugs, expected patient responses, and major side effects. Major-specific seminars integrate knowledge of pharmacology into clinical practice. Prereq: NURS 453 recommended.

NURS 438. Theoretical Foundations of Acute Care Nursing (2-4)
This course focuses on advanced practice by examining common health and illness phenomena in the acute care setting. Concepts, theories, and phenomena will be analyzed for their relevance in planning and evaluating nursing care strategies and modalities. Individualized clinical experience in the acute care setting with a selected patient population is part of the advanced practicum. Prereq or Coreq: NURS 453 and NURS 459.

NURS 441. Mental Health of Older Adults (1)
This course focuses on discussing the consultative, investigative, and planning skills to meet the special mental health needs of the elderly. Concepts of mental health promotion, mental illness prevention, knowledge development, implementation, and evaluation of psychotherapeutic nursing strategies are examined. The examination of diverse mental health disorders in the aged mental health service delivery are included.

NURS 442. Mental Health Interventions with Older Adults (1)
This course focuses on the theoretical basis of psycho-social assessment and intervention with older adults and their families, with an emphasis on individual, group, and family interventions. Concepts from individual, family, and group modalities and the process of consultation and education are examined. Students will also learn the components of individual and family assessment in “well elders” and the identification of mental disorders, including problems with memory and cognition. This knowledge base serves as the foundation for developing and applying interventions in practice to meet the mental health needs of older adults. Prereq: NURS 441.

NURS 443A. Collaboration, Consultation, & Credentialing in Advanced Practice Nurs (1)
The focus of this course is the process of consultation and collaboration in advanced practice nursing. The organizations that are involved in promoting and assisting advanced practice nurses (APNs) will be addressed. The similarities and differences in the roles of the APN will be explored. The process of credentialing APNs will also be examined.

NURS 443B. Role Development in Advanced Practice (1)
The focus of this course is the study of the multiple roles integrated into advanced practice nursing including the roles of management and leadership. Strategies to market the value of the advanced practice nurse (APN) role and the individual APN are addressed.

NURS 443C. Teaching and Learning in Advanced Practice (1)
The focus of this course is the examination of the process of teaching, learning, and evaluation. A variety of teaching modalities applicable across the lifespan will be explored.

NURS 444A. Ethical Issues in Advanced Practice (1)
The focus of this course is ethical decision-making for advanced practice nurses. The interaction between the health care delivery system and ethical decision making is explored.

NURS 444B. Health Care Delivery and Finance in Advanced Practice (1)
The focus of this course is the study of the financial and business factors related to the health care delivery system and advanced practice nursing. Students will discuss strategies related to reimbursement, business practices, billing, and coding.

NURS 444C. Health Policy Legislation and Legal Issues in Advanced Practice (1)
The focus of this course is the critical analysis of health policy and legal issues. Strategies for influencing the regulatory process will be explored.

NURS 445. Infection Control I (3)
Examination of the principles of pathogenicity, transmission, diagnosis, immunization, and therapy of select infectious disease agents and methods of prevention and control of these agents in the community and health care settings. Introduction to application of infection control policies and procedures in a variety of community and clinical settings.

NURS 446. Collaboration and Administration in the Health Care Delivery System (3)
Examination of the influence of the health care delivery environment on the delivery of care and the role of the Advanced Practice Nurse as collaborator within the health care structure. Clinical practice and seminars will focus on the role of the manager in planning, organizing, staffing, directing, and controlling the health care environment for the purpose of improving patient care, facilitating collaborative activities with other health care professionals, and identifying mechanisms.
to effect change within the health care system. Clinical practice 8 hours per week.

**NURS 448. Mental Health Practicum with Older Adults (1)** This course focuses on the application and development of psychosocial assessment and intervention with older adults and their families, with an emphasis on individual, group, and family interventions. Concepts from individual, family, and group modalities and the process of consultation will be applied. The components of individual and family assessment will be applied in “well elders” as well as those with identified mental disorders. Prereq: NURS 441, NURS 442.

**NURS 450. Infection Control II (3)** Examination and application of an infection control program in a community or clinical setting. Content related to bioterrorism or natural disaster situations will be included. Prereq: NURS 495 and 496 or their equivalents, EPBI 494, NU RS 445.

**NURS 453. Physiologic Foundations for Advanced Practice Nursing (4)** This course is designed to build upon the student’s preexisting knowledge of basic human anatomy, physiology, and nursing science. Selected body systems are examined in order to provide in-depth integration of normal physiologic functions with specific intervening variables and pathologic mechanisms associated with life span development and dysfunction.

**NURS 454. Well Woman Health Care (3)** Study of selected theoretical formulations and models applied by professional nurses in the promotion of growth and wellness in adolescent and adult women. Emphasis on conception, decision making, sexuality and health teaching. Acquisition of knowledge and skill related to physical and psychosocial health assessment of pregnant and nonpregnant clients. Individually planned experiences with nurse faculty who are serving as primary care givers in maternity, family planning and gynecologic care settings. Prereq or Coreq: NURS 453 and NURS 459.

**NURS 455. The Childbearing Family (4)** This course will focus on analysis and applications of the nursing strategies to enhance health-seeking behaviors of the pregnant family during the maternity cycle and on the education of parents about the childbearing year. The normal aspects of the pregnant woman and the identification of any deviations from the normal are central to the content. The course will also emphasize the enhancement of the pregnant family’s childbirth experience through utilization of the teaching-learning process. The student will learn to evaluate and apply techniques relative to childbirth education. Clinical experiences will be planned in antepartum, neonatal, childbirth education, and home settings. Prereq: NURS 454, Coreq: NURS 430.

**NURS 457. Labor and Birth (5)** The focus of this course is the application of nursing theory, practice and research by advanced practice nurses in the promotion of health and wellness of women, newborns and their families during intrapartum and the immediate postpartum period. Emphasis is placed on the health-seeking behaviors of the mother and her family using a holistic approach emphasizing cultural, ethnic and racial diversity in the provision and evaluation of care. Supervised clinical experience includes anticipating and identifying complications and participating in consultations, referrals and collaborative management. Prereq: NURS 455.

**NURS 459. Integrated Assessment for Advanced Nursing Practice (3)** This course introduces concepts fundamental to the role of the Advanced Practice Nurse. It stresses health assessment, history taking, interviewing, and physical assessment skills, and provides the basis for decision making, advanced therapeutics and case management.

**NURS 460. Theoretical Basis of Nursing Interventions with Individuals (2)** Study of the theoretical basis of individual work with persons experiencing emotional crises and disturbances. The nurse therapist enhances the health-seeking behaviors of individuals as they strive to attain, maintain or regain optimal health. Emphasis on theories, psychotherapy, and crisis intervention. Prereq: Graduate standing in Nursing.


**NURS 462. Practicum and Supervision of Group and Family Therapy (2-3)** Direct care experience, formal group and family experience focusing on process, content and leader behavior. The nurse-therapist employs nursing strategies to enhance health-seeking behaviors of family and group. Use of concepts from psychiatry and behavioral and social sciences related to the promotion of mental health and treatment of psychosocial distress in groups and families. Group and individual supervision of clinical experience. Focus of supervision is on judgment, family and group intervention skills, and application of theory from analysis and interpretation of data. Prereq: NURS 467.

**NURS 463. Theoretical Basis of Practice & Supervision in Consultation & Mental H (1-3)** Indirect care experience. Theories of consultation. Adult education. Exploration of issues related to the role of the clinician in the enhancement of health-seeking behaviors of individuals and communities as they strive to achieve optimal levels of health. Examination of the consultative, administrative and educational processes in the practice of consultation and community education. Seminar, group, and individual supervision. Prereq: NURS 460 and NURS 462, and graduate standing or consent of instructor.

**NURS 466. Practicum and Supervision in Role of Clinician (3)** The professional encounter between the psychiatric mental health clinical nurse specialist, staff and agency personnel providing mental health services, and clients receiving services in the context of an environment of care is emphasized. Intraperonnel, interpersonal and extraperonnel variables that influence the health-seeking behaviors of individuals, families and groups as they seek to attain, maintain or regain optimal levels of mental health are employed.

**NURS 467. Theory of Family and Group Modalities (2-3)** The professional encounter between nurse therapist and the group or group members and the family members occurs within the context of an environment of care. The nurse therapist enhances health-seeking behaviors of individuals, families and groups. The nurse therapist employs nursing strategies cognizant of interviewing variables, to facilitate health-seeking behaviors of family and group members. Concepts from family and group theory, family and group literature, and research in family and small group dynamics are selected to provide an eclectic approach to treatment.

**NURS 468. The Continual Improvement of Health Care: An Interdisciplinary Course (3)** The goal of this course is to equip health professions students (medicine, nursing, and health administration) with the ability and confidence to contribute to continual improvement in health care. Through seminar and field experiences students will be given the opportunity to learn the philosophy, knowledge and skills of continuous quality improvement, teamwork and interdisciplinary work. The focus is on collaborative work for the benefit of patients and communities. Prereq: Consent of instructor. Cross-listed as EPBI 468.

**NURS 471. Organizational Theories (3)** Examination of intervening variables which affect health care organizations including structure, dynamics and processes of change.

**NURS 479. Public Policy and Aging (3)** (See EPBI 408.) Cross-listed as EPBI 408.

**NURS 480. Public Health and Epidemiology (3)** Study of health care problems within the larger social/environmental context. Epidemiology as a method of reasoning leading to the making of casual inferences. Principles underlying epidemiology as a method of study and the scope, potentials and limitations of this approach. Prereq or Coreq: Statistics or consent of instructor.

**NURS 491. Community Health Nursing I (4)** This is the first course in the Community Health Nursing major. It is designed to introduce students to the specialist practice of community health nursing and emphasizes the importance of population based practice. A population or a geopolitical community focus will be identified by the student, and a comprehensive appraisal of its health status conducted. Priority health concerns and strategies to enhance health-seeking behaviors and mechanisms will be identified. Prereq: Undergraduate Community Health Nursing courses; graduate standing in nursing.

**NURS 495. Community Health Nursing II (4)** In this course students will design a feasible plan to address the identified priority concern for a selected population or geopolitical community. Program planning models will be examined, and a model useful to address the priority concern selected. Evaluation techniques will be identified and included in the program design. Interventions to enhance health-seeking behaviors based on primary, secondary and tertiary prevention strategies will be implemented in the clinical component of the course. Prereq: NURS 491.

**NURS 496. Community Health Nursing III (4)** This course completes the Community Health Nursing major. Based on work successfully completed during the previous two courses the student will conclude program implementation and conduct a summative evaluation of overall program effectiveness. As part of the leadership experience, the student, in partnership with the community or population, will explore external funding for program continuation. Issues influencing health care delivery and community health nursing practice will be examined. Prereq: NURS 491 and NURS 495.
This course is structured to allow students to develop and concepts, and identification of major themes in able about approaches to the study of disciplines and (such as nursing values, goals, and tasks), and the strategic and operational configuration of hospitals and other health care agencies.

NURS 500. Master's Thesis (1-4)
Systematic investigation of a research problem selected by the student for independent study. Prereq: NURS 415.

NURS 503. Inquiry III (2)
Development of competencies in scientific inquiry. Experience in either (a) pilot study of aspect of Inquiry II proposal; (b) in depth paper on aspect of Inquiry II proposal; or (c) involvement in faculty research project and written report of experience. Prereq: NURS 415.

NURS 504. Nursing Theory (3)
Theory development in nursing, issues in theory development, and uses of theory. Seminar discussions. Prereq: One year of graduate study in Nursing or consent of instructor.

NURS 506. Nursing Epistemology (3)
This course involves the study of knowledge shared among members of the discipline, the patterns of knowing and knowledge development, criteria for evaluating knowledge claims and philosophy of science. The course is a search and discussion experience aimed at enabling graduate students to become knowledgeable about approaches to the study of disciplines and scientific knowledge development. Forces affecting the development of knowledge, the origins of key terms and concepts, and identification of major themes in nursing will be explored.

NURS 507. Clinical Knowledge (3)
This course is structured to allow students to develop clinical knowledge about their area of interest and to begin the process of identifying clinical research questions. Supervision for this experience will be twofold. Students will be placed with an expert clinician with a minimum of a master's degree (in nursing) to identify and arrange relevant clinical experiences. The student and the clinician will work with the course faculty to create opportunities for the student to experience the clinical phenomena of interest, which may include actual "hands-on" experience. Students will also meet regularly with the other students in the course and the course faculty for group supervision that focuses on linking clinical practice issues to research questions. Course requirements would include eight hours of practicum experiences per week.

NURS 508. Context of Care (3)
This course is designed to allow students to explore the social, political, economic, and health care issues that form the context for their clinical phenomena of interest. The intent of this course is for the student to become knowledgeable about the broader forces that affect their clinical problem. Topics might include current research in their field, as well as health policy related to their phenomena, political entities that affect funding, and the regulation of practice in their area of interest. The student will need a content expert to help them plan and coordinate their practicum experiences, which should be multiple and varied, and include exposure to both local and state level entities. Prereq: NURS 507 or equivalent.

NURS 511. Strategies for Theory Development (3)
This course examines the nature of theory and strategies for theory development in nursing. Students will explore a variety of strategies and select an approach for beginning theory development that addresses nursing phenomena in their area of interest.

NURS 518. Qualitative Nursing Research (3)
This course is a study of qualitative research approaches directed toward the development of nursing knowledge. This course will include methods and issues in data collection, analysis, and critique of research findings. It will focus on the philosophical and epistemological foundations of qualitative research, present an overview of various methodological approaches, examine in depth the criteria for rigor, and analyze ethical issues in qualitative methodologies.

NURS 520. Advanced Nursing Research I (3)
The development of research questions within a nursing framework and related research designs will be studied. The foci of the course will be problem formulation, selected research designs and sampling.

NURS 521. Advanced Nursing Research II (3)
The discussion of research designs and their rationale for use will be continued. Principles of measurement, study implementation and data analysis will be discussed. The development of a research proposal will be the expected outcome of this two-semester sequence. Prereq: NURS 520, NURS 401 or STAT 401.

NURS 523. Advanced Internship in Flight Nursing (1-5)
This internship is designed to provide the Master's prepared ACNP-flight nurse concentration graduate with experience needed to qualify for the Certification Examination in Flight Nursing. This experience consists of a 600 hour precepted internship in a flight nursing setting. Prereq: Completion of M.S.N. program focus in Flight Nursing and ACNP certification, certification in ACLS, PALS, and neonatal resuscitation.

NURS 524. Advanced Practicum in Infection Control (1-5)
This practicum experience consists of up to 600 hours of a precepted experience in an infection control program setting. This practicum is designed to provide the student with experience needed to qualify for the Certification Examination in Infection Control administered by the Certification Board of Infection Control and Epidemiology to receive CIC certification. The student may choose among a public health, acute care, long-term care, or international setting. Prereq: NURS 450.

NURS 530. Advanced Nursing Research Methods I (3)
This course focuses on conceptualization of a research problem within a nursing perspective, threats to validity, sampling, measurement, and survey, quasi-experimental, and experimental designs. The emphasis is on the application of these strategies while encouraging flexibility in conceptualizing a study using different research methods. Students will develop a research study using methods consistent with theoretical and empirical knowledge and the nursing perspective. Prereq: NURS 415.

NURS 531. Advanced Nursing Research II (3)
This course is the second in a two-course sequence of research methods. It focuses on power analysis, data management, measurement strategies and epidemiologic designs and designs to assess change and multiple comparisons. Included is a discussion of ethics and concerns regarding human subjects. The emphasis is on the application of research strategies while encouraging flexibility in conceptualizing a study using different methods. The development of a research proposal is the outcome of this two-semester sequence. Prereq: NURS 530.

NURS 557. Advanced Midwifery (6)
In consultation with faculty, students select a nurse-midwifery service where they assume the responsibilities of beginning practitioner for a minimum of 10 weeks of intensive, supervised clinical practice. Synthesis of the nurse-midwifery management process while providing continuity of care integrating all core competency areas is emphasized. Students explore the professional aspects of nurse-midwifery practice. Historical development of the profession is used as a framework for understanding current issues related to nurse-midwifery education and practice in the United States. Prereq: NURS 457.

NURS 559. Advanced Practice in Nursing Care of Women (2-5)
Integration of concepts, theories, conceptual, and theoretical models, focused on supporting the health-seeking of women and their families as they contend with intervening factors. Emphasis on psychosomatic, acute and long-term illnesses and their interplay with psychosocial problems encountered by women. Clinical practice and seminars will include providing nursing care to women and their families in all stages of life cycle. Prereq: NURS 455.

NURS 577. M.S.N./M.B.A. Management Practicum (9)
The student will enter the M.S.N./M.B.A. program with a minimum of two years of recent clinical nursing experience, and may or may not have had any management experience. This practicum is designed to provide a guided experience in a management context. NURS 577 will be offered in the spring semester of the second year of the M.S.N./M.B.A. program, after the student has completed nearly all basic courses in both schools. The management practicum will provide onsite experience in management activities. Most practicum sites will be area health care agencies. In some cases, students may alternate opportunities addressing health-related policies in area businesses or corporations. Typical practicum experiences will engage students in management projects, special assignments and/or research. Students are expected to use current management and nursing knowledge and will often use the research process in completing the practicum experience. They will work closely with nurse executives and managers within their organizations.

NURS 579. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

NURS 601. Special Problems (1-12)
This course is offered, with permission, to Ph.D. students in Nursing undertaking reading in a field of special interest.

NURS 609. Health Care Policy and Planning (3)
Special emphasis will be placed on selected national and international health policy issues that form the socio-political context of nursing care and practice. Health care policy and planning will also be explored. Ethical dimensions of public policy formulations and implementation will be highlighted. The course will also include an exploration of the nurse's role in research in the formation of health care policy and planning. Students will participate in sessions designed...
to illuminate the policy components and implications of clinical research. Prereq: Ph.D. standing, written consent of instructor.

**NURS 615. Topical Seminar in Health Science Research (3)**
This Ph.D. course is designed to provide in-depth knowledge of research issues in a given content area. Opportunities are provided to apply knowledge for further development of the student's research interests and ideas. An in-depth examination of selected theoretical and methodological approaches to the development of research related to health science will be emphasized. Interrelationships among theory, research, and knowledge from nursing and related disciplines will be explored.

**NURS 630. Advanced Statistics for Nursing Research (3)**
This course is one of a two-part series focused on advanced procedures for data analysis and statistical inference in nursing and health research. The course is devoted to discussion of linear models, including simple and multiple regression, factor analysis and causal modeling. The role of assumptions and theory in guiding the analysis plan is emphasized through lecture, readings and critical evaluation of published research in the student's area of interest. Prereq: NURS 530 and NURS 531.

**NURS 671. Proposal Development (1-6)**
Provides an opportunity for guided development of a candidacy proposal through planned contact with a designated committee of faculty members. The aim is to assist the student in the development of a refined proposal with strong scientific merit. The course should be utilized only by those with a candidacy proposal statement. Minimum 3 hours required for progression in program. Prereq: Permission of Candidacy Chair.

**NURS 701. Dissertation Ph.D. (1-18)**

**NURS 703. Dissertation Fellowship (1-8)**
COURSE IDENTIFICATION CODES

The following four-letter course identification codes are used at Case Western Reserve University. They must be used when entering courses on the schedule form during registration (e.g., English 150 would be listed as ENGL 150).

ACCT, Accounting
ADHT, Adolescent Health
AMST, American Studies
ANAT, Anatomy
ANES, Anesthesiology
ANTH, Anthropology
APMU, Applied Music
ARSC, College Scholars Program
ARTH, Art History
ARTS, Art Studio and Art Education
ASIA, Asian Studies
ASTR, Astronomy
BAFI, Banking and Finance
BETH, Bioethics
BIOC, Biochemistry
BIOL, Biology
BLAW, Business Law
BSTP, Biomedical Sciences Training Program
CBIO, Cellular and Molecular Biology
CHEM, Chemistry
CHIN, Chinese
CHST, Childhood Studies
CIAR, Art Courses at CIA
CLBY, Cell Biology
CLSC, Classics
CMPL, Comparative Literature
COOP, Cooperative Education
COSI, Communication Sciences
CRSP, Clinical Research Scholars Prog
DENC, Dentistry (Clinical)
DEND, Dentistry (Didactic)
DENT, Dentistry
EBME, Biomedical Engineering
ECES, Computer Engineering and Science
ECHE, Chemical Engineering
ECIV, Civil Engineering
ECON, Economics
EDJC, Education at John Carroll
EDMP, Executive Doctor of Management
EDUC, Education
EEAP, Electrical Engineering and Applied Physics
EECS, Electrical Engineering and Computer Sci
EMAC, Macromolecular/Polymer Science
EMAE, Mechanical and Aerospace Engineering
EMSE, Materials Science and Engineering
ENGL, English
ENGR, Engineering Science
ENTP, Entrepreneurship
EPBI, Epidemiology and Biostatistics
EPOM, Practice Oriented Masters Program
ERAS, Courses from Erasmus University
ESCI, Systems, Control and Industrial Engineering
ESTD, Environmental Studies
EVHS, Environmental Health Sciences
EXAM, ExaminationsMaster’s and Ph.D.
EXCH, Int’l Exchange Program
FAMD, Family Medicine
FRCH, French
GEOL, Geological Sciences
GENE, Genetics
GERO, Gerontological Studies
GREK, Greek
GRMN, German
HDEV, Human Development
HLTH, Community Health
HSMC, Health Systems Management
HSTY, History
HUMN, Humanities
IBIS, Integrated Biological Sciences
IBMS, Integrated Biological Studies
IIME, Inst for Integr of Mgmt & Engr
INTH, International Health
INTL, International Studies
ITAL, Italian
JAPN, Japanese
JRAB, Junior Year Abroad
LAPP, Law and Public Policy
LATN, Latin
LAWS, Law
LCAN, Canadian Law Courses
LHRP, Labor & Human Resource Policy
LITR, Literature
LLM, LLM Tax Program
MAND, Mandel Center for Nonprofit Organizations
MAPH, Mathematical Physics
MATH, Mathematics
MBAC, MBA Core
MBIO, Molecular Biology and Microbiology
MEDT, Medical Technology
MGMT, Management
MIDS, Information Systems
MKMR, Marketing
MPHP, Public Health
MUSC, Music and Music Education
MVIR, Molecular Virology Training Prg
NEUR, Neurosciences
NTRN, Nutrition
NUAN, Nurse Anesthesia
NUND, Doctor of Nursing
NUNI, Nursing Informatics
NUNP, Nurse Practitioner
NURS, Nursing
OPMT, Operations Management
OPRE, Operations Research
ORBH, Organizational Behavior
PATH, Pathology
PHED, Physical Education
PHIL, Philosophy
PHOL, Physiology and Biophysics
PHRM, Pharmacology
PHYS, Physics
PLCY, Management Policy
POSC, Political Science
PRAC, Practicum
PSCL, Psychology
QUMM, Quantitative Methods in Management
RBIO, Reproductive Biology
RLGN, Religion
PROGRAM CODES

This is a list of all coding used for academic programs of study at the University. It does not imply that the program is currently available as a major. Some of these codes are for concentrations, minors and for majors no longer offered. It is necessary to maintain this list in its entirety for purposes of maintaining historical records.

ACC, Accounting
AFR, Auditing & Financial Reporting
AIN, Artificial Intelligence
AMN, Amer Stud & Museum Stud
AMS, American Studies
ANA, Anatomy
ANE, Anesthesiology
ANP, Applied Anatomy
ANT, Anthropology
APM, Applied Mathematics
APY, Applied Physics
ARC, Architecture
ARE, Art Education
ARH, Art History
ARK, Arts in Technical Age
ARM, Art History & Museum Studies
ARS, Art Studio
ASC, Asian Civilization
ASI, Asian Studies
AST, Astronomy
ATT, Comp/Info Sci (MS-Columbus)
BAF, Banking And Finance
BAS, Applied Social Science
BCH, Biochemistry
BET, Bioethics
BIM, Biometry
BIO, Biology
BIS, Biomedical Sciences
BRS, Biochemical Research
CAP, Adult Clinical Psychology
CBI, Cell Biology
CCN, Critical Care Nursing
CCP, Child Clinical Psychology
CHE, Chemistry
CHI, Chinese
CHN, Community Health Nursing
CHS, Childhood Studies
CIS, Computing and Info Science
CLS, Classics
CLT, Comparative Literature

CMP, Computer Science
CMS, Ceramic and Materials Science
CNM, Certificate in Nonprofit Mgmt
COS, Communication Sciences
CPH, Cell Physiology
CRS, Clinical Research
DAM, Dean's Approved Major
DGA, Develop Genetics And Anatomy
DNC, Contemporary Dance
DNT, Dentistry
DTG, Dental Graduate
EAP, Elec Engr & Applied Physics
EAR, Aerospace Engineering
EBA, Executive MBA
EBI, Biomedical Engineering
ECE, Chemical Engineering
ECI, Civil Engineering
ECL, Clinical Engineering
ECM, Computer Engineering
ECO, Economics
EDM, Executive Doctorate in Mgmt
EDU, Education
EFT, Fluid & Thermal Science
EGL, English
EGM, Engineering Mechanics
EGR, Engineering
EIN, Industrial Engineering
EMA, Macromolecular Science
EMC, Mechanical Engineering
EMM, Metallurgy & Materials Science
EMS, Materials Science & Engr
ENT, Entrepreneurship
ENV, Environmental Engr (Adm. Only)
EPB, Epidemiology & Biostatistics
EPH, Engineering Physics
EPI, Environmental Epidemiology
EPO, Engr Pract Oriented Mast Prog
ERT, Earth Sciences
ESC, Systems Ctrl & Industrial Engr
EST, Environmental Studies
ESF, Systems & Control Engineering
EVH, Environmental Health Sciences
EXP, Exercise Physiology
FAM, Family Medicine
FMG, Financial Management
FRA, Financial Reporting & Attestation
FRC, French
FRS, French Studies
GEM, German
GEN, Genetics
GEO, Geological Sciences
GER, Gerontological Studies
GES, German Studies
GMH, Geriatric Mental Health Nurs
GMS, General Medical Sciences
GNC, Genetics Counseling
GNV, Environmental Geology
GPN, Ger Ment Hlth/Psyc Ment Hlth
GRT, Gerontological Nursing
HDE, Human Development
HEA, Health Science
HLH, Health & Med Prof (Adm Only)
HPS, History of Policy Studies
HSE, Health Science Education
HSG, Health Systems Management
HSM, History & Museum Studies
HSP, Hist & Phil of Science/Tech
HSS, Hist of Science & Technology
HST, History
HUM, Humanities
IBM, Integrated Biomedical Sciences
IDR, Industrial Relations
IGS, Integrated Graduate Studies
IMC, International Management Center
INS, Information Systems
INT, International Management
IST, International Studies
ITD, Interior Design
JAP, Japanese
JMB, JD/MBA Joint Degree
JPS, Japanese Studies
JSA, JD/MSSA Joint Degree
LAP, Law & Public Policy
LAW, Law
LBS, Liberal Arts (Adm Only)
LHR, abor & Human Resource Policy
LIB, Information & Library Science
Lis, Library Science
LIT, Literature
LLS, LLM - US Legal Studies
LNG, Foreign Language (Adm Only)
LTX, LLM - Tax
MAC, Master in Accountancy
MAP, Mathematics and Physics
MAS, Mgmt Advise Service
MAT, Mathematics
MBA, Master in Business Admin
MBO, Molecular Biology & Microbiol
MBV, ITN MBA Student
MCO, Roots of Modern Consciousness
MDT, Medical Technology
MED, Medicine
MGT, Management
MID, Management Info Systems
MIS, Certificate in MIDS
MKR, Marketing
MMB, MSMS/MBA Joint Degree
MNA, Med Surg Nurs & Nurse Admin
MNO, Master of Nonprofit Org
MPH, Master of Public Health
MSC, Management Sciences
MSM, Masters in Management Science
MSO, Operations Research
MSR, Medical-Surgical Nursing
MSS, Supply Chain Management
MST, Medical Scientist Train Prog
MUC, Musicology
MUD, Doctor Musical Arts
MUE, Music Education
MUH, Music History
MUP, Early Music Performance
MUS, Music
MVR, Molecular Virology
NAA, Acute Care Adult Nurs Pract
NAC, Acute Care Nurse Practitioner
NAD, Nursing Administration
NAP, Acute Care Pediatric Nurs Pract
NAT, Natural Sciences
NBH, Nutritional Biochem & Metabolism
NCC, Nursing Care of Children
NCF, Nsg Care - Childbearing Family
NDV, Non Degree ITN Student
NEB, Neurosciences and Bioengineering
NEU, Neurosciences
NIM, Nursing Informatics
NMG, Nursing Management
NPA, Nurse Pract Prog - Adult
NPF, Family Nurse Practitioner
NPG, Gerontological Nurse Pract
NPN, Nurse Pract Prog - Neonatal
NPP, Nurse Pract Prog - Pediatric
NTR, Nutrition
NUA, Nurse Anesthesia
NUM, Nurse-Midwifery
NUN, Nursing Doctor
NUR, Nursing
OAD, Organizational Administration
OCT, Occupational Therapy
ONC, Oncology
OPM, Operations Management
OPR, Operations Research
OPT, Optometry
ORB, Organizational Behavior
ORD, Organ Devel & Analysis
PAD, Psyc Ment Hlth/Nurs Admin
PAR, Pre-Architecture
PAT, Pathology
PD, Predentistry (Adm Only)
PDV, Developmental Psychology
PER, Perinatal Nursing
PES, Experimental Psychology
PF, Professional Fellows Program
PHA, Pharmacy
PHB, Biophysics and Bioengineering
PHE, Physical Education
PHI, Philosophy
PHN, Public Health Nutrition
PHO, Physiology And Biophysics
PHR, Pharmacology
PHS, Physiology
PHT, Physical Therapy
PHW, Prim Hlth Nurs Care of Women
PHY, Physics
PL, Prelaw (Adm Only)
PLY, Management Policy
PMC, Post Masters Certification
PMD, Premedicine (Adm Only)
PMH, Psychiatric-Mental Health Nurs
PMR, Mental Retardation Rsrch Psyc
PNP, Prim Nurse Practitioner Prog
POL, Polymer Science & Engineering
POS, Political Science
PP, Public Policy
PSY, Psychology
PVT, Preveterinary (Adm Only)
RBI, Reproductive Biology
RLG, Religion
RNB, Reg Nurs Baccalaureate
RNM, Reg Nurs Masters
RUS, Russian
SAF, Social Work - 4yr
SAIL, Social Work - Is
SAJ, Social Work - MSSA/Jewish Comm
SAI, Social Work/Law Joint Degree
SAM, Social Work - MSSA/PhD
SAO, Social Work - Is
UNIVERSITY ABBREVIATIONS

The following abbreviations are used at Case Western Reserve University and appear in this publication.

AACSB, American Assembly of Collegiate Schools of Business
AADSAS, American Association of Dental Schools Application Service
AAMC, Association of American Medical Colleges
ACT, American College Testing Program
ALA, American Library Association
ALAS, Auxiliary Loan to Assist Students
AMCAS, American Medical Colleges Application Service
ANA, American Nurses’ Association, Inc.
ARJCC, Andrew R. Jennings Computer Center
CIA, Cleveland Institute of Art
CIM, Cleveland Institute of Music
CLEP, College Level Examination Program
CMD, Center for Management Development
CPA, Certified Public Accountant
CSS, College Scholarship Service
DAT, Dental Admissions Test
EDI, Enterprise Development, Inc.
EDP, Extended Degree Program
ETS, Educational Testing Service
EXAP, External Academic Program
FERPA, Family Educational Rights and Privacy Act
FPB, Frances Payne Bolton School of Nursing
GAPSFAS, Graduate and Professional School Financial Aid Statement
GMAT, Graduate Management Admission Test
GMC, General Military Course
GRE, Graduate Record Examination
GSL, Guaranteed Student Loan
HEAL, Health Education Assistance Loan
HPSL, Health Professions Student Loan
HSMC, Health Systems Management Center
IGS, Integrated Graduate Studies
IRS, Internal Revenue Service
ITN, Instructional Television Network
LSAS, Law School Data Assembly Service
MAT, Miller Analogies Test
MCAT, Medical College Admission Test
MEIOP, Minority Engineers Industrial Opportunity Program
MSASS, Mandel School of Applied Social Sciences
NERB, Northeast Regional Board
NLN, National League for Nursing
NSNA, National Student Nurses Association
OCLC, On-line Computer Library Center
OIG, Ohio Instructional Grant
PAT, Perceptual Ability Test
POC, Professional Officer Course
PLUS, Parent Loan for Undergraduate Students
REI, Center for Regional Economic Issues
ROTC, Reserve Officers Training Corps
RPT, Repeat of a Course Previously Taken (Undergraduate Only)
SAT, Scholastic Aptitude Test
SEOG, Supplemental Educational Opportunity Grants
SLS, Supplemental Loans for Students
SPPSHS, Special Program for Students in the Health Sciences
TOEFL, Test of English as a Foreign Language
UPB, University Program Board
USG, University Student Government
WSOM, Weatherhead School of Management

SAS, Social Work
SAT, Social Work - 3yr
SIA, Social Work - Sr Yr Ab
SMG, Social Work - MSSA/MBA
SMN, Social Wk/Mngt Nonprofit Orgn
SOC, Sociology
SPA, Spanish
SPC, Speech
SPH, Social Policy History
SPM, Sports Medicine
SSC, Social Sciences (Adm Only)
STA, Statistics
SWC, Advanced Clinical Social Work
SWF, Social Welfare
SWS, Social Welfare PhD Program
SYP, Systems Physiology
TAX, Tax
TCM, Technology Management
TEC, Technology (Medical, Lab, Dental)
THR, Theater Arts
UGS, Undergraduate Scholars Program
UNK, Non-Declared Major
URB, Urban Studies
WHP, Womens Hlth Nurse Practitioner
WMN, Women’s Studies
800, Non-Degree Student
The University is about five miles east of downtown Cleveland on Euclid Avenue (U.S. Routes 6, 20, and 322). Most road maps of Ohio have the University clearly indicated.

**BY CAR**

If you are coming from the east via Interstate 90, exit at Martin Luther King Jr. Boulevard. Proceed south for about a mile to the East 105th traffic light; cross over East 105th and bear right over the traffic circle, continuing along Martin Luther King Jr. Boulevard to Euclid Avenue. Turn left onto Euclid and watch for the Information Booth at the right.

If you are coming from the east via Interstate 80 (Ohio Turnpike), remain on the Turnpike until you reach Interchange 13. Exit there and proceed north on Interstate 480, which merges with Interstate 271. Exit I-271 at Cedar Road and follow it westbound toward Cleveland. Where Cedar starts down a steep hill and lane-switching lights are hanging overhead, look for a sign identifying Case Western Reserve University at the corner of Murray Hill Road (the first light at the bottom of the hill). Turn right onto Murray Hill, bear left at the traffic light, and turn left at the three-way stop on the other side of the bridge. You will be on Adelbert Road near the center of campus.

If you are coming from the west via the Ohio Turnpike, exit at Interchange 8A and follow Interstate 90 east. In the downtown area, exit on Chester Avenue and proceed east to Euclid Avenue. Turn left onto Euclid and look to the right for the Information Booth.

If you are coming from the south via Interstate 71 (or Interstate 77), proceed north until I-71 (or I-77) merges with Interstate 90, take I-90 east, then exit onto Chester eastbound as above.

**BY AIR**

Arrive at the Cleveland Hopkins International Airport. The fastest, most economical means of reaching the University from Hopkins is the RTA (Regional Transit Authority) Rapid Transit train eastbound to the University Circle station, which is just south of campus. A free University Circle shuttle bus connects the station with all areas of the campus.

**BY BUS**

The city’s central bus depot is located downtown on Chevrolet Avenue near East 14th Street. Taxis are available, or walk one block south on East 14th street to Euclid Avenue. There you can catch RTA Bus No. 6 eastbound to the Adelbert Road, Cornell Road, or East 115th Street stops.

**BY TRAIN**

Arrive at the AMTRAK station in downtown Cleveland. Take the RTA Waterfront rail line to Tower City and transfer to a train eastbound for University Circle. A free University Circle shuttle bus connects the station with all areas of the campus. Taxis are also available at the AMTRAK station.
## Index

### A
- Abbreviations, Guide to .................................................. 629
- About the University .......................................................... 3
- Academic Advising, Undergraduate ................................. 69
  (see also under individual schools)
- Academic Advisor, Graduate ........................................... 95
- Academic Integrity ............................................................. 42, 70
- Academic Policies, Graduate Study ................................... 100
- Academic Programs, Overview ........................................... 3
  (see also Degree Programs Offered)
- Academic Standing, Undergraduate ................................... 75
- Acceleration toward Graduate Studies ............................... 78
  toward Professional Degrees .............................................. 76
- ACCESS/Trio Programs ..................................................... 41
- Accountancy, Department of .............................................. 469
  Master of ........................................................................ 452
- Accounting, Bachelor of Science in .................................. 447
- Accounting Courses ......................................................... 469
- Acting (see Theater and Dance)
- Administration, University ............................................... 15
- Admission (see also individual schools and programs)
  Undergraduate ................................................................. 8
  Graduate Study ................................................................ 93
- Adolescent Health Courses .............................................. 570
- Advanced Placement Exams ............................................. 9
- Advisors (see Academic Advising)
- Aerospace Engineering ..................................................... 182, 183
- Alcohol, Guidelines on ..................................................... 43
- Alumni/Senior Audit .......................................................... 82, 195
- American Studies Program ............................................... 196
  Courses ........................................................................... 197
- Anatomy, Department of .................................................. 553
  Courses ........................................................................... 554
- Anesthesiology, Department of .......................................... 556
- Anthropology .................................................................... 197
  Courses ........................................................................... 202
- Application for Graduation ............................................... 72
- Applied Anatomy, M.D./M.S. in ....................................... 552
- Applied Music ................................................................. 310
  Courses ........................................................................... 314
- Applied Social Sciences, Mandel School of ........................ 385
- Archives, University .......................................................... 6
- Art Education ..................................................................... 207, 209
  Courses ........................................................................... 214
- Art Education, Joint Program in ....................................... 68
- Art History and Art, Department of ................................... 207
  Courses ........................................................................... 208
- Art History Major ............................................................. 207
  Courses ........................................................................... 212
- Art Studio Courses ............................................................ 214
- Artificial Intelligence .......................................................... 215

### Arts and Sciences, College of ............................................. 195
- Asian Studies ...................................................................... 216
- Astronomy ......................................................................... 218
- Athletics ............................................................................ 33
- Attendance ........................................................................ 72
- Audio Recording Technology ............................................ 306
- Audit ................................................................................... 72

### B
- B.S./M.S. Program ............................................................... 78
- Bachelor's Degree Requirements ....................................... 56
- Baker-Nord Center for the Humanities .............................. 195
- Banking and Finance, Department of ............................... 471
- Binary (3-2) Program in Engineering ............................... 10, 67
- Biochemistry ...................................................................... 221, 557
  Courses ............................................................................ 224, 558
- Bioethics, Department of .................................................. 559
  Courses ............................................................................ 561
- Biology ................................................................................ 224
  Courses ............................................................................ 229
- Biomedical Engineering ..................................................... 114
  Courses ............................................................................ 121
- Biomedical Sciences Training Program ............................. 562
- Bookstore, University ....................................................... 7
- Business Law Courses ........................................................ 473

### C
- Career Center ..................................................................... 37
- Case School of Engineering .............................................. 105
- Cell Biology Program ......................................................... 563
- Center for Science and Mathematics Education .............. 195
- Chemical Engineering ......................................................... 124
  Courses ............................................................................ 130
- Chemistry .......................................................................... 233
  Courses ............................................................................ 238
- Childhood Studies ............................................................. 240
- Chinese Courses ............................................................... 299
- Civil Engineering ............................................................... 132
  Courses ............................................................................ 137
- Classics ............................................................................. 242
  Courses ............................................................................ 243
- Cleveland Clinic Lerner College of Medicine .................... 542
- Cleveland Health Sciences Library ..................................... 533
- Cleveland ................................................................. 4
- Clinical Nurse Specialist Program ............................ 603, 613
- Clinical Research Scholars Program ............................... 548
- Collaborative Programs with Other Colleges ................. 67
- College Scholars Program ............................................... 196, 245
- Communication Sciences ............................................... 245
  Courses ............................................................................ 248

---

Case Western Reserve University General Bulletin 2004–2006  
Index • 635
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering Degrees Granted</td>
<td>251</td>
</tr>
<tr>
<td>Courses</td>
<td>257</td>
</tr>
<tr>
<td>Entrepreneurial Studies Courses</td>
<td>442</td>
</tr>
<tr>
<td>Educational Degree Programs</td>
<td>82</td>
</tr>
<tr>
<td>Continuing Education</td>
<td>106</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>148, 152</td>
</tr>
<tr>
<td>Computer Science</td>
<td>149, 150, 152</td>
</tr>
<tr>
<td>Contemporary Learning in Clinical Settings Program</td>
<td>541</td>
</tr>
<tr>
<td>Cooperative Education</td>
<td>66</td>
</tr>
<tr>
<td>Course Identification Codes</td>
<td>629</td>
</tr>
<tr>
<td>Course Load</td>
<td>72</td>
</tr>
<tr>
<td>Course Repetition</td>
<td>72</td>
</tr>
<tr>
<td>Credit by Examination</td>
<td>73</td>
</tr>
<tr>
<td>Cross-Registration in Northeast Ohio</td>
<td>68</td>
</tr>
<tr>
<td>Dance (see Theater and Dance)</td>
<td>368</td>
</tr>
<tr>
<td>Dance Courses</td>
<td>82</td>
</tr>
<tr>
<td>Dean's Honor Lists</td>
<td>15</td>
</tr>
<tr>
<td>Degree Programs Offered</td>
<td>47</td>
</tr>
<tr>
<td>Degree Requirements, Doctoral Degrees</td>
<td>96</td>
</tr>
<tr>
<td>Master's Degrees</td>
<td>96</td>
</tr>
<tr>
<td>Dental Medicine, School of</td>
<td>401</td>
</tr>
<tr>
<td>Courses</td>
<td>414</td>
</tr>
<tr>
<td>Dentistry (see Dental Medicine)</td>
<td>79</td>
</tr>
<tr>
<td>Dentistry, Pre-Professional Scholars Program in</td>
<td>82</td>
</tr>
<tr>
<td>Departmental Honors</td>
<td>38</td>
</tr>
<tr>
<td>Disability Services</td>
<td>86</td>
</tr>
<tr>
<td>Doctor of Nursing Program</td>
<td>606</td>
</tr>
<tr>
<td>Doctor of Philosophy Degree, Engineering</td>
<td>108</td>
</tr>
<tr>
<td>Drama (see Theater and Dance)</td>
<td>74</td>
</tr>
<tr>
<td>Drop/Add</td>
<td>44</td>
</tr>
<tr>
<td>Drug Policy</td>
<td></td>
</tr>
<tr>
<td>Dual Undergraduate Degree Programs</td>
<td>63</td>
</tr>
<tr>
<td>(see also under individual schools)</td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>252</td>
</tr>
<tr>
<td>Bachelor of Arts in</td>
<td>47</td>
</tr>
<tr>
<td>Courses</td>
<td>473</td>
</tr>
<tr>
<td>Department of</td>
<td></td>
</tr>
<tr>
<td>Educational Support Services</td>
<td>38</td>
</tr>
<tr>
<td>Electrical Engineering and Computer Science</td>
<td>140</td>
</tr>
<tr>
<td>Courses</td>
<td>153</td>
</tr>
<tr>
<td>Electrical Engineering Program</td>
<td>145, 146</td>
</tr>
<tr>
<td>Eligibility</td>
<td>76</td>
</tr>
<tr>
<td>E-mail Communications, Policy on</td>
<td>44</td>
</tr>
<tr>
<td>Employment, Student</td>
<td>31</td>
</tr>
<tr>
<td>Engineering, Case School of</td>
<td>105</td>
</tr>
<tr>
<td>Engineering, Undesignated</td>
<td>159</td>
</tr>
<tr>
<td>Engineering and Management, Master of</td>
<td>107</td>
</tr>
<tr>
<td>Engineering Core Curriculum</td>
<td>60</td>
</tr>
<tr>
<td>Engineering Degrees Granted</td>
<td>106</td>
</tr>
<tr>
<td>Engineering Physics</td>
<td>161</td>
</tr>
<tr>
<td>English Composition Requirement</td>
<td>56</td>
</tr>
<tr>
<td>English</td>
<td>255</td>
</tr>
<tr>
<td>Courses</td>
<td>257</td>
</tr>
<tr>
<td>Environmental Health Sciences, Department of</td>
<td>560</td>
</tr>
<tr>
<td>Environmental Studies Program</td>
<td>260</td>
</tr>
<tr>
<td>Epidemiology and Biostatistics, Department of</td>
<td>561</td>
</tr>
<tr>
<td>Courses</td>
<td>562</td>
</tr>
<tr>
<td>Ethnic Studies Program</td>
<td>261</td>
</tr>
<tr>
<td>Evolutionary Biology</td>
<td>263</td>
</tr>
<tr>
<td>Exchange Programs, Undergraduate</td>
<td>64</td>
</tr>
<tr>
<td>Executive Doctor of Management Courses</td>
<td>494</td>
</tr>
<tr>
<td>Exercise Physiology, M.S. in</td>
<td>552</td>
</tr>
<tr>
<td>Expenses</td>
<td>18</td>
</tr>
<tr>
<td>Facilities and Services</td>
<td>4</td>
</tr>
<tr>
<td>Family Medicine, Department of</td>
<td>569</td>
</tr>
<tr>
<td>Centers</td>
<td>570</td>
</tr>
<tr>
<td>Farm, University</td>
<td>7</td>
</tr>
<tr>
<td>Fees</td>
<td>17</td>
</tr>
<tr>
<td>Final Examinations, Undergraduates</td>
<td>73</td>
</tr>
<tr>
<td>(see also under individual schools)</td>
<td></td>
</tr>
<tr>
<td>Financial Aid, Application Procedures</td>
<td>21</td>
</tr>
<tr>
<td>Types of</td>
<td></td>
</tr>
<tr>
<td>Financial Aid Policy</td>
<td>20</td>
</tr>
<tr>
<td>Financial Assistance</td>
<td></td>
</tr>
<tr>
<td>Financial Information</td>
<td></td>
</tr>
<tr>
<td>Fisk University Exchange Program</td>
<td>68</td>
</tr>
<tr>
<td>Fluid and Thermal Engineering Sciences</td>
<td>182, 184</td>
</tr>
<tr>
<td>Foreign Language and Math Credits</td>
<td>73</td>
</tr>
<tr>
<td>Foreign Students (see Students from Other Countries)</td>
<td></td>
</tr>
<tr>
<td>Frances Payne Bolton School of Nursing</td>
<td>591</td>
</tr>
<tr>
<td>Fraternities</td>
<td>36</td>
</tr>
<tr>
<td>French and Francophone Studies</td>
<td>264</td>
</tr>
<tr>
<td>French Courses</td>
<td>299</td>
</tr>
<tr>
<td>G</td>
<td></td>
</tr>
<tr>
<td>General Medical Sciences, Division of</td>
<td>569</td>
</tr>
<tr>
<td>Genetics, Department of</td>
<td>572</td>
</tr>
<tr>
<td>Geological Sciences</td>
<td>266</td>
</tr>
<tr>
<td>Courses</td>
<td>271</td>
</tr>
<tr>
<td>German Courses</td>
<td>300</td>
</tr>
<tr>
<td>German Studies</td>
<td>272</td>
</tr>
<tr>
<td>Gerontological Studies</td>
<td>274</td>
</tr>
<tr>
<td>Gerontology Program</td>
<td>275</td>
</tr>
<tr>
<td>Good Standing</td>
<td>75</td>
</tr>
<tr>
<td>Grade-Point Averages</td>
<td>12</td>
</tr>
<tr>
<td>Grading System</td>
<td>11</td>
</tr>
<tr>
<td>Graduate</td>
<td></td>
</tr>
<tr>
<td>Graduate Studies, School of</td>
<td>93</td>
</tr>
<tr>
<td>Graduation, Application for</td>
<td>72</td>
</tr>
<tr>
<td>Grants-in-Aid</td>
<td>26</td>
</tr>
<tr>
<td>Greek Courses</td>
<td>244</td>
</tr>
<tr>
<td>Greek Life</td>
<td>33</td>
</tr>
<tr>
<td>Topic</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Student Employment</td>
<td>31</td>
</tr>
<tr>
<td>Student Medical Plan</td>
<td>40</td>
</tr>
<tr>
<td>Student Organizations and Activities, Undergraduate</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>(see also under individual schools)</td>
<td></td>
</tr>
<tr>
<td>Student Records</td>
<td>12</td>
</tr>
<tr>
<td>Student Right to Know</td>
<td>14</td>
</tr>
<tr>
<td>Students from Other Countries</td>
<td>44</td>
</tr>
<tr>
<td>Supply Chain Management</td>
<td>453</td>
</tr>
<tr>
<td>Systems and Control Engineering</td>
<td>147, 151</td>
</tr>
<tr>
<td>T</td>
<td></td>
</tr>
<tr>
<td>Tau Beta Pi</td>
<td>83</td>
</tr>
<tr>
<td>Teacher Education</td>
<td>363</td>
</tr>
<tr>
<td>(see also under individual programs and departments)</td>
<td></td>
</tr>
<tr>
<td>Teacher Licensure, Joint Program in</td>
<td>69</td>
</tr>
<tr>
<td>(see also under individual programs and departments)</td>
<td></td>
</tr>
<tr>
<td>Telephone Services</td>
<td>5</td>
</tr>
<tr>
<td>Television Services</td>
<td>5</td>
</tr>
<tr>
<td>Theater and Dance</td>
<td>364</td>
</tr>
<tr>
<td>Theater Courses</td>
<td>369</td>
</tr>
<tr>
<td>Time Limitation, Graduate Study</td>
<td>101</td>
</tr>
<tr>
<td>Transfer Applicants</td>
<td>9</td>
</tr>
<tr>
<td>Transfer Credit</td>
<td>74</td>
</tr>
<tr>
<td>Graduate Study</td>
<td>102</td>
</tr>
<tr>
<td>Transient Students</td>
<td>81</td>
</tr>
<tr>
<td>Transportation</td>
<td>7</td>
</tr>
<tr>
<td>Trustees, Board of</td>
<td>15</td>
</tr>
<tr>
<td>Tuition</td>
<td>17</td>
</tr>
<tr>
<td>Tuition Payment Policy</td>
<td>18</td>
</tr>
<tr>
<td>U, V</td>
<td></td>
</tr>
<tr>
<td>UCITE</td>
<td>4</td>
</tr>
<tr>
<td>Undergraduate Admission</td>
<td>8</td>
</tr>
<tr>
<td>Undergraduate Studies</td>
<td>55</td>
</tr>
<tr>
<td>Undesignated Engineering</td>
<td>159</td>
</tr>
<tr>
<td>University Center for Teaching and Innovation (see UCITE)</td>
<td></td>
</tr>
<tr>
<td>University Circle</td>
<td>4</td>
</tr>
<tr>
<td>University Libraries</td>
<td>6</td>
</tr>
<tr>
<td>Upward Bound</td>
<td>41</td>
</tr>
<tr>
<td>V, W, X, Y, Z</td>
<td></td>
</tr>
<tr>
<td>Veterans’ Coordinator</td>
<td>11</td>
</tr>
<tr>
<td>Visiting Students (see Transient Students)</td>
<td></td>
</tr>
<tr>
<td>Washington Center Program</td>
<td>67</td>
</tr>
<tr>
<td>Washington Study Program</td>
<td>371</td>
</tr>
<tr>
<td>Weatherhead School of Management</td>
<td>445</td>
</tr>
<tr>
<td>Withdrawal, Refunds following</td>
<td>19</td>
</tr>
<tr>
<td>Withdrawal from Courses</td>
<td>75</td>
</tr>
<tr>
<td>Withdrawal from Graduate Study</td>
<td>102</td>
</tr>
<tr>
<td>Women’s Studies Program</td>
<td>372</td>
</tr>
<tr>
<td>Work Experience for Students</td>
<td>65</td>
</tr>
<tr>
<td>World Literature Program</td>
<td>373</td>
</tr>
</tbody>
</table>