GENETICS (GENE)

GENE 367. Commercialization and Intellectual Property Management. 3 Units.
This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. During this course, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two laws students, two MBA students and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. Please visit the following website for more information: fusioninnovate.com. Offered as EBME 467, ECSE 467, GENE 367, GENE 467, LAWS 5341, MGMT 467, and RGME 467.

GENE 451. A Data-Driven Introduction to Genomics and Human Health. 3 Units.
This course introduces the foundational concepts of genomics and genetic epidemiology through four key principles: 1) Teaching students how to query relational databases using Structure Query Language (SQL); 2) Exposing students to the most current data used in genomics and bioinformatics research, providing a quantitative understanding of biological concepts; 3) Integrating newly learned concepts with prior ones to discover new relationships among biological concepts; and 4) providing historical context to how and why data were generated and stored in the way they were, and how this gave rise to modern concepts in genomics. Offered as PQHS 451, GENE 451, and MPHP 451.

GENE 467. Commercialization and Intellectual Property Management. 3 Units.
This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. During this course, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two laws students, two MBA students and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. Please visit the following website for more information: fusioninnovate.com. Offered as EBME 467, ECSE 467, GENE 367, GENE 467, LAWS 5341, MGMT 467, and RGME 467.

GENE 488. Yeast Genetics and Cell Biology. 3 Units.
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. Offered as CLBY 488, GENE 488, MBIO 488, and PATH 488.

GENE 500. Fundamentals and Current Topics in Genetics and Genomics Research. 6 Units.
This course is aimed towards first year Ph.D. students in the Department of Genetics, but the course is open to anyone wishing to study genetic approaches to biological research. A solid background in basic biochemistry, molecular biology and general genetics is essential. At the end of this course students should be able to (1) read and critically evaluate studies in the primary literature and communicate the significance and impact of that study and (2) identify the important open questions and be able to design a research strategy to begin to address those questions. Recommended preparation: BIOL 362.

GENE 503. Readings and Discussions in Genetics. 0 - 3 Units.
(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 Units.
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. Recommended preparation: GENE 500 or permission of instructor.

GENE 505. Genetics Journal Club. 1 Unit.
Genetics Journal Club is a graduate level course designed to facilitate discussion of topics in Genetics. Students choose "hot" papers in Genetics and present them to their peers. Group presentations are designed to encourage audience participation. The intent of this class is to expose students to cutting edge topics in Genetics and to instill teaching and leadership skills.

GENE 511. Grant Writing and Reviewing Skills Workshop. 3 Units.
This is an introductory graduate course in grant writing and reviewing skills. During this course each student will write a research grant on a topic of his or her choice. Proposals may form the basis for the written component of the preliminary examination in the Genetics Department. Students will also participate in editing and reviewing the proposals of their classmates. Prereq: GENE 500 and GENE 504 or consent of instructor.

GENE 520. Computational Human Genomics and Epigenomics. 4 Units.
The purpose of this course is to acquaint students with current high-throughput techniques and computational pipelines to assay the human genome, epigenome, and transcriptome on a large scale. The course will be a combination of lecture, discussion, and hands-on sessions. Topics will include next-generation sequencing pipelines (DNA variant calling, RNA sequencing, ATAC-seq, single-cell sequencing, spatial transcriptomics, etc.), as well as "best practices" for programming, software development, and distribution.

GENE 524. Advanced Medical Genetics: Molecular & Cytogenetics. 2 - 3 Units.
This course provides an in-depth forum for discussion of fundamental principles regarding clinical cytogenetics and molecular genetics and their relevance to medical genetics, genomics and genetic counseling. Following a historical overview, topics include a discussion of numerical and structural aberrations, sex chromosome abnormalities, issues regarding population cytogenetics, clinical relevance of such findings as marker chromosomes, mosaicism, contiguous gene deletions and uniparental disomy. The course will cover principles of molecular genetics including structure, function and regulations of genes (DNA, RNA, proteins), genetic variation, inheritance patterns and both cytogenetic and molecular laboratory techniques (fluorescence in situ hybridization, micro-array, SNP analyses, sequencing) in the clinical laboratory. Students who register for 3.00 credit hours are required to do an additional paper.

GENE 525. Advanced Medical Genetics: Clinical Genetics. 2 - 3 Units.
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.

GENE 526. Advanced Medical Genetics: Quantitative Genetics & Genomics. 2 - 3 Units.
The purpose of this course is twofold: first, to provide a foundation in quantitative genetics and second, to focus on genomic approaches and technologies which have greatly expanded our understanding of not only rare genetic disorders but common ones as well. We will cover concepts related to risk assessment and calculation and its application to medical genetics including principles and application of Hardy Weinberg equilibrium as well as applying Bayes' Theorem as a mechanism to refine risk assessment based on data specific to a patient. We will also focus on understanding the clinical implications of the interpretation of next generation sequencing results, identify limitations of genomic technologies, and practice curation / annotation and interpretation of genomic testing results. In addition, we will discuss resources and bioinformatics tools including national databases and clinical labs to aid in the interpretation of genomic test results including variants of uncertain significance. Students who register for 3.00 credit hours are required to do an additional paper.

GENE 527. Advanced Medical Genetics: Biochemical Genetics. 2 - 3 Units.
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.

GENE 528. Principles and Practices of Genetic Counseling. 3 Units.
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.

GENE 529. Psychosocial Issues in Genetic Counseling. 3 Units.
Fundamental principles regarding the psychosocial aspects of genetic disease and birth defects, its psychological and social impact on the individual and family. Topics include the genetic counseling interview process, issues regarding pregnancy and prenatal diagnosis, chronicity, death and loss. Cultural issues and their impact on the genetic counseling session are addressed. Resources for families are also explored. Basic interviewing skills are presented. Students will have an opportunity for practice of skills through role play and actual interviewing situations.

GENE 531. Cancer Genetics. 2 - 3 Units.
This seminar will discuss basic concepts in cancer epidemiology, principles of cancer genetics, inherited cancer syndromes, cytogenetics of cancers, pedigree analysis for familial cancer risk and approaches to the differential diagnosis of inherited and familial cancers. Additionally, topics of risk assessment, genetic testing, screening, management and psychosocial issues in providing genetic counseling to patients with familial and inherited cancers will be discussed.

GENE 532. Clinical Practicum in Genetic Counseling. 1 - 6 Units.
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. Recommended preparation: Admission to Genetic Counseling Training Program.

GENE 534. Preparing for Genetic Counseling Practice. 1 Unit.
This course is designed to provide students with a practical foundation in preparing for clinical participation in various practice areas. This hands-on course will build on and mirror the didactic content learned from GENE 528: Principles of Genetic Counseling and GENE 529: Psychosocial Genetic Counseling and will serve as an applied course. Students will have the opportunity to practice empathy and listening skills, patient education, and counseling techniques through patient role plays. In addition, students will attempt practical skills such as chart review, interpretation of screening and testing reports, pedigree risk assessments, online risk models, simulated coordination of testing, application of practice guidelines in a clinical context, completion of requisition forms, and identification of genetic testing options based on insurance considerations. This practice-based exploration of clinical genetic counseling will be a safe space to practice counseling skills and will equip students to participate in patient care on clinical rotations. Coreq: GENE 528 or GENE 529.

GENE 535. Genetic Counseling Journal Club. .5 Unit.
This in-person seminar course will discuss current topics in genetic counseling by reading and reviewing recently published articles in the scholarly literature. This will allow students to practice and hone critical appraisal of the literature and apply recently published literature to genetic counseling practice. The format is a group seminar, problem-based learning in which a student will lead a semi-structured interactive presentation and facilitation of group discussion of the research article. Articles chosen for discussion will have a focus on access, service delivery, diversity, disability, social determinants of health, education, religion, culture, equity, inclusion, justice, or belonging issues relevant to the field of genetic counseling. For each session, students choose articles with instructor's guidance, prepare discussion questions, and lead the group discussion.

GENE 601. Research in Genetics. 1 - 9 Units.
(Credit as arranged.)

GENE 701. Dissertation Ph.D.. 1 - 9 Units.
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.