

CASE SCHOOL OF ENGINEERING UNDERGRADUATE DEGREE REQUIREMENTS

Bachelor of Science in Engineering Degree

Candidates for the Bachelor of Science in Engineering (BSE) degree, in addition to meeting the **general requirements for bachelor's degrees**, including the SAGES and physical education requirements, must also complete the following requirements:

1. A minimum of 128-133 credit-hours as specified by the requirements for each BSE major.
2. The General Education Requirements of the Case School of Engineering listed below.
3. The requirements for the specific engineering major listed below as presented in this Bulletin in the section devoted to each department or program.

Note that most students pursuing a degree from the Case School of Engineering will complete ENGR 398 and ENGL 398 to fulfill the SAGES Departmental Seminar requirement and will complete an engineering senior project in their major to fulfill the SAGES Senior Capstone requirement.

Major Fields Available for the Bachelor of Science in Engineering degree:

- Aerospace Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Physics
- Materials Science and Engineering
- Mechanical Engineering
- Polymer Science and Engineering
- Systems and Control Engineering
- General Engineering

General Education Requirements of the Case School of Engineering

These requirements provide a foundation in mathematics and sciences for programs in engineering leading to the Bachelor of Science degree.

The CSE general education requirements are also designed to develop communication skills and to provide breadth beyond mathematics, the sciences, and engineering in each student's education.

Course credit earned by Advanced Placement, International Baccalaureate, proficiency examinations, and transfer may be used to satisfy Case School of Engineering general education requirements.

Mathematics, Sciences, and Engineering Requirements (44 credit-hours)

Mathematics		14
MATH 121	Calculus for Science and Engineering I	
MATH 122	Calculus for Science and Engineering II	
or MATH 124	Calculus II	
MATH 223	Calculus for Science and Engineering III	
or MATH 227	Calculus III	
MATH 224	Elementary Differential Equations	
or MATH 228	Differential Equations	
Chemistry *		4
CHEM 111	Principles of Chemistry for Engineers	
Physics		8
PHYS 121	General Physics I - Mechanics	
or PHYS 123	Physics and Frontiers I - Mechanics	
PHYS 122	General Physics II - Electricity and Magnetism	
or PHYS 124	Physics and Frontiers II - Electricity and Magnetism	
Engineering		18
ENGR 131	Elementary Computer Programming **	
or EECS 132	Introduction to Programming in Java	
ENGR 145	Chemistry of Materials	
ENGR 200	Statics and Strength of Materials	
ENGR 210	Introduction to Circuits and Instrumentation	
ENGR 225	Thermodynamics, Fluid Dynamics, Heat and Mass Transfer ***	
Total Units		44

* The chemistry-materials course sequence CHEM 105-CHEM 106-ENGR 145 may be substituted for the sequence CHEM 111-ENGR 145.

** Computer engineering and the computer-oriented concentrations in biomedical engineering specifically require EECS 132.

*** Students pursuing a polymer science and engineering major or the biomaterials concentration in the biomedical engineering major may substitute EMAC 351 and EMAC 352 for ENGR 225. Students pursuing majors in aerospace or mechanical engineering may substitute EMAE 251, EMAE 252, and EMAE 353 for ENGR 225.

Natural Sciences, Mathematics, or Statistics Requirement (3 credit-hours)

Course designated by major department.

Breadth Requirement (15 credit-hours)

ENGL 398	Professional Communication for Engineers	2
ENGR 398	Professional Communication for Engineers	1

Twelve credit-hours comprised of 3- or 4-credit-hour courses outside of the areas of engineering, natural science, and mathematics offered by the College of Arts and Sciences; the Weatherhead School of Management; the Frances Payne Bolton School of Nursing; the Jack, Joseph, and Morton Mandel School of Applied Social Sciences; the School of Medicine Department of Bioethics; the Cleveland Institute of Music; or the Cleveland Institute of Art. Other courses approved by the School of Engineering's Undergraduate Studies Committee are also acceptable. The selection of courses to satisfy this requirement should be done in consultation with the student's academic advisor(s).

Total Units 15

Bachelor of Science in Computer Science Degree

Candidates for the Bachelor of Science in Computer Science degree, in addition to meeting the **general requirements for bachelor's degrees** (<http://bulletin.case.edu/undergraduatestudies/degreeprograms>), including the SAGES and physical education requirements, must also complete the following requirements:

1. A minimum of 127 credit-hours.
2. The General Education Requirements of the Case School of Engineering as modified for the Bachelor of Science in Computer Science degree and listed below.
3. The requirements for the computer science Bachelor of Science major as presented in this Bulletin.

Note that most students pursuing a degree from the Case School of Engineering will complete ENGR 398 and ENGL 398 to fulfill the SAGES Departmental Seminar requirement and will complete an engineering senior project in their major to fulfill the SAGES Senior Capstone requirement.

General Education Requirements of the Case School of Engineering, modified for the Bachelor of Science in Computer Science degree

These requirements provide a foundation in mathematics and sciences for the Bachelor of Science program in computer science. The CSE general education requirements are also designed to develop communication skills and to provide breadth beyond mathematics, the sciences, and engineering in each student's education.

Course credit earned by Advanced Placement, International Baccalaureate, proficiency examinations, and transfer may be used to satisfy Case School of Engineering general education requirements.

Mathematics, Sciences, and Engineering Requirements (33 credit-hours)

Mathematics 14

MATH 121	Calculus for Science and Engineering I
MATH 122	Calculus for Science and Engineering II
or MATH 124	Calculus II
MATH 223	Calculus for Science and Engineering III

12	or MATH 227	Calculus III	
	MATH 201	Introduction to Linear Algebra for Applications	3
	or MATH 307	Linear Algebra	
	Chemistry *		4
	CHEM 111	Principles of Chemistry for Engineers	
	Physics		8
	PHYS 121	General Physics I - Mechanics	
	or PHYS 123	Physics and Frontiers I - Mechanics	
	PHYS 122	General Physics II - Electricity and Magnetism	
	or PHYS 124	Physics and Frontiers II - Electricity and Magnetism	
	Engineering		7
	EECS 132	Introduction to Programming in Java	
	ENGR 145	Chemistry of Materials	
	Total Units		36

* The chemistry-materials course sequence CHEM 105-CHEM 106-ENGR 145 may be substituted for the sequence CHEM 111-ENGR 145.

Natural Sciences, Mathematics, or Statistics Requirement (3 credit-hours)

Course designated by major department.

Humanities and Social Sciences (15 credit-hours)

ENGL 398	Professional Communication for Engineers	2
ENGR 398	Professional Communication for Engineers	1

Twelve credit-hours comprised of 3- or 4-credit-hour courses outside of the areas of engineering, natural science, and mathematics offered by the College of Arts and Sciences; the Weatherhead School of Management; the Frances Payne Bolton School of Nursing; the Jack, Joseph, and Morton Mandel School of Applied Social Sciences; the School of Medicine Department of Bioethics; the Cleveland Institute of Music; or the Cleveland Institute of Art. Other courses approved by the School of Engineering's Undergraduate Studies Committee are also acceptable. The selection of courses to satisfy this requirement should be done in consultation with the student's academic advisor(s).

Total Units 15

Bachelor of Science in Data Science and Analytics Degree

Candidates for the Bachelor of Science in Data Science and Analytics degree, in addition to meeting the **general requirements for bachelor's degrees** (<http://bulletin.case.edu/undergraduatestudies/degreeprograms>), including the SAGES and physical education requirements, must also complete the following requirements:

1. A minimum of 125 credit-hours.
2. The General Education Requirements of the Case School of Engineering as modified for the Bachelor of Science in Data Science and Analytics degree and listed below.
3. The requirements for the major in data science and analytics as presented in this Bulletin.

Note that most students pursuing a degree from the Case School of Engineering will complete ENGR 398 and ENGL 398 to fulfill the SAGES Departmental Seminar requirement and will complete an engineering senior project in their major to fulfill the SAGES Senior Capstone requirement.

General Education Requirements of the Case School of Engineering, modified for the Bachelor of Science in Data Science and Analytics degree

These requirements provide a foundation in mathematics and sciences for the Bachelor of Science program in data science and analytics.

The CSE general education requirements are also designed to develop communication skills and to provide breadth beyond mathematics, the sciences, and engineering in each student's education.

Course credit earned by Advanced Placement, International Baccalaureate, proficiency examinations, and transfer may be used to satisfy Case School of Engineering general education requirements.

Mathematics, Sciences, and Engineering Requirements (29 credit-hours)

Mathematics	14
MATH 121	Calculus for Science and Engineering I
MATH 122	Calculus for Science and Engineering II
or MATH 124	Calculus II
MATH 223	Calculus for Science and Engineering III
or MATH 227	Calculus III
MATH 224	Elementary Differential Equations
or MATH 228	Differential Equations
Chemistry *	4
CHEM 111	Principles of Chemistry for Engineers
Physics	8
PHYS 121	General Physics I - Mechanics
or PHYS 123	Physics and Frontiers I - Mechanics
PHYS 122	General Physics II - Electricity and Magnetism
or PHYS 124	Physics and Frontiers II - Electricity and Magnetism
Engineering	3
EECS 132	Introduction to Programming in Java
Total Units	29

* The chemistry course sequence CHEM 105-CHEM 106 may be substituted for the CHEM 111 course.

Natural Sciences, Mathematics, or Statistics Requirement (3 credit-hours)

Course designated by major department.

Humanities and Social Sciences (15 credit-hours)

ENGL 398	Professional Communication for Engineers	2
ENGR 398	Professional Communication for Engineers	1
Twelve credit-hours comprised of 3- or 4-credit-hour courses outside of the areas of engineering, natural science, and mathematics offered by the College of Arts and Sciences; the Weatherhead School of Management; the Frances Payne Bolton School of Nursing; the Jack, Joseph, and Morton Mandel School of Applied Social Sciences; the School of Medicine Department of Bioethics; the Cleveland Institute of Music; or the Cleveland Institute of Art. Other courses approved by the School of Engineering's Undergraduate Studies Committee are also acceptable. The selection of courses to satisfy this requirement should be done in consultation with the student's academic advisor(s).		12
Total Units		15