

BIOENGINEERING, BS

for the degree of Bachelor of Science in Bioengineering

Bioengineers use engineering principles to solve problems in the life sciences, human health and medicine, and related industries. At the undergraduate level, the goal of bioengineering education is to instill a fundamental understanding of biology while developing core skills to design technologies relevant to human health and disease.

The Bioengineering department at the University of Illinois Urbana-Champaign provides a rigorous engineering education that prepares graduates to attain:

- recognition as skilled engineers in biotechnology, life sciences, medical technology, and health care industries;
- advanced degrees through graduate studies in bioengineering-related fields, or professional degrees in the health sciences, law, and business; and
- recognition for fostering an inclusive and collaborative environment while demonstrating leadership and effective teamwork within diverse professional and community organizations.

During the first and second years of the curriculum, fundamental courses in biology, chemistry, computing, mathematics, and physics introduce students to the multidisciplinary principles underlying bioengineering as a field. Throughout the curriculum, core coursework becomes progressively more integrative across the disciplines and in years three and four, students specialize in a chosen bioengineering subdiscipline. The program is distinguished by laboratory courses that provide diverse experiences and hands-on skills as well as a capstone design course in which students practice the rigorous application of engineering fundamentals to biological problems identified by faculty, clinicians, and industrial partners.

for the degree of Bachelor of Science in Bioengineering

Graduation Requirements

Minimum hours required for graduation: 128 hours.
Minimum Overall GPA: 2.0

University Requirements

Minimum of 40 hours of upper-division coursework, generally at the 300- or 400-level. These hours can be drawn from all elements of the degree. Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (<https://studentcode.illinois.edu/article3/part8/3-801/>) (§ 3-801) and in the Academic Catalog (<http://catalog.illinois.edu/general-information/degree-general-education-requirements/>).

General Education Requirements

Follows the campus General Education (Gen Ed) requirements (<https://courses.illinois.edu/gened/DEFAULT/DEFAULT/>). Some Gen Ed requirements may be met by courses required and/or electives in the program.

Code	Title	Hours
	Composition I	4-6
	Advanced Composition	3
	fulfilled by BIOE 400	
	Humanities & the Arts (6 hours)	6
	Natural Sciences & Technology (6 hours)	6
	fulfilled by CHEM 102, CHEM 104, MCB 150, PHYS 211, PHYS 212	
	Social & Behavioral Sciences (6 hours)	6
	Cultural Studies: Non-Western Cultures (1 course)	3
	Cultural Studies: US Minority Cultures (1 course)	3
	Cultural Studies: Western/Comparative Cultures (1 course)	3
	Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)	6-10
	fulfilled by MATH 220 or MATH 221; and MATH 231, MATH 241, MATH 285, PHYS 211, PHYS 212; and CS 101 or CS 124	
	Language Requirement (Completion of the third semester or equivalent of a language other than English is required)	0-15

Major Requirements

Orientation and Professional Development

Code	Title	Hours
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
BIOE 100	Bioengineering Seminar	1
BIOE 120	Introduction to Bioengineering	1
Total Hours		3

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
Total Hours		30

Bioengineering Technical Core

Code	Title	Hours
BIOE 201	Conservation Principles Bioeng	3
BIOE 202	Cell & Tissue Engineering Lab	2
BIOE 205	Signals & Systems in Bioengr	3
BIOE 206	Cellular Bioengineering	3
BIOE 210	Linear Algebra for Biomedical Data Science	3

BIOE 302	Modeling Human Physiology	3
BIOE 303	Quantitative Physiology Lab	2
BIOE 310	Computational Tools for Biological Data	3
BIOE 360	Transport & Flow in Bioengrg	3
BIOE 400	Bioengineering Senior Design	4
BIOE 414	Biomedical Instrumentation	3
BIOE 415	Biomedical Instrumentation Lab	2
BIOE 420	Intro Bio Control Systems	3
BIOE 476	Tissue Engineering	3
CHEM 232	Elementary Organic Chemistry I	4
CS 101	Intro Computing: Engrg & Sci	3
or CS 124	Introduction to Computer Science I	
MCB 150	Molecular & Cellular Basis of Life	4

Total Hours 51

Technical Electives

Code	Title	Hours
Students are required to complete 15 hours of credit from the course options listed below.		15
ABE 446	Biological Nanoengineering	3
BIOE 306	Biofabrication Lab	3
BIOE 424	Preclinical Molecular Imaging	3
BIOE 430	Intro Synthetic Biology	3
BIOE 432	Systems Biology: Uncovering Design Principles of Biological Networks	3
BIOE 434	Immunoengineering	3
BIOE 450	Introduction to Quantitative Pharmacology	3
BIOE 460	Gene Editing Lab	3
BIOE 461	Cellular Biomechanics	4
BIOE 479	Cancer Nanotechnology	3
BIOE 483	Biomedical Computed Imaging Systems	3
BIOE 484	Statistical Analysis of Biomedical Images	3
BIOE 485	Computational Mathematics for Machine Learning and Imaging	4
BIOE 486	Applied Deep Learning for Biomedical Imaging	3
BIOE 487	Stem Cell Bioengineering	3
BIOE 498	Special Topics (Technologies for Cancer Diagnosis and Therapy)	3
BIOE 498	Special Topics (Regulatory Safety Issues in Bioengineering)	3
BIOE 498	Special Topics (Surgical Techniques)	3
CHBE 471	Biochemical Engineering	3
CHBE 472	Techniques in Biomolecular Eng	3
CS 128	Introduction to Computer Science II	3
CS 225	Data Structures	4
CS 411	Database Systems	3
CS 412	Introduction to Data Mining	3
CS 440	Artificial Intelligence	3
CS 446	Machine Learning	3 or 4
CS 465	User Interface Design	4
CS 466	Introduction to Bioinformatics	3
CS 498	Special Topics (Intro to Deep Learning)	3

ECE 210	Analog Signal Processing	4
ECE 310	Digital Signal Processing	3
ECE 311	Digital Signal Processing Lab	1
ECE 329	Fields and Waves I	3
ECE 365	Data Science and Engineering	3
ECE 380	Biomedical Imaging	3
ECE 416	Biosensors	3
ECE 417	Multimedia Signal Processing	4
ECE 418	Image & Video Processing	4
ECE 437	Sensors and Instrumentation	3
ECE 365	Data Science and Engineering	3
ECE 460	Optical Imaging	4
ECE 467	Biophotonics	3
ECE 472	Biomedical Ultrasound Imaging	3
ECE 473	Fund of Engrg Acoustics	3
ECE 480	Magnetic Resonance Imaging	3
ECE 481	Nanotechnology	4
ECE 490	Introduction to Optimization	3
ECE 498	Special Topics in ECE (Deep Learning in Hardware)	3
IE 310	Deterministic Models in Optimization	3
IE 330	Industrial Quality Control	3
IE 370	Stochastic Processes and Applications	3
ME 330	Engineering Materials	4
ME 481	Whole-Body Musculoskel Biomech	3
ME 482	Musculoskel Tissue Mechanics	3
ME 483	Mechanobiology	4
ME 487	MEMS-NEMS Theory & Fabrication	4
MSE 403	Synthesis of Materials	3
MSE 404	Laboratory Studies in Materials Science and Engineering	1.5
MSE 450	Polymer Science & Engineering	3
MSE 457	Polymer Chemistry	3 or 4
MSE 470	Design and Use of Biomaterials	3
MSE 473	Biomolecular Materials Science	3
MSE 474	Biomaterials and Nanomedicine	3
MSE 480	Surfaces and Colloids	3
NPRE 461	Probabilistic Risk Assessment	3 or 4
SE 402	Comp-Aided Product Realization	3
SE 423	Mechatronics	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 445	Continuum Mechanics	4
TMGT 461	Tech, Eng, & Mgt Final Project	4

Free Electives

Code	Title	Hours
Additional coursework, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. (https://go.grainger.illinois.edu/FreeElectives/)		9
Total Hours of Curriculum to Graduate		128

for the degree of Bachelor of Science in Bioengineering

Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence. The curriculum sequence can also be viewed via dynamic and static curricular maps (<https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/bioengineering-map/>), which include prerequisite sequencing.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. See the corresponding section on the Degree and General Education Requirements (<http://catalog.illinois.edu/general-information/degree-general-education-requirements/>).

Free Electives: Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives (<https://go.grainger.illinois.edu/FreeElectives/>), so that there are at least 128 credit hours earned toward the degree.

First Year

First Semester	Hours	Second Semester	Hours
BIOE 100	1	BIOE 120	1
CHEM 102	3	CHEM 104	3
CHEM 103	1	CHEM 105	1
MATH 221 (MATH 220 may be substituted)	4	MATH 231	3
ENG 100	1	PHYS 211	4
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	MCB 150 (or Composition I course)	4
Composition I course or MCB 150	4		
17		16	

Second Year

First Semester	Hours	Second Semester	Hours
BIOE 201	3	BIOE 202	2

BIOE 206	3	BIOE 205	3
MATH 241	4	BIOE 210	3
PHYS 212	4	MATH 285	3
CS 101 (CS 124 may be substituted)	3	CHEM 232	4
17		15	

Third Year

First Semester	Hours	Second Semester	Hours
BIOE 302	3	BIOE 310	3
BIOE 303	2	BIOE 360	3
BIOE 476	3	BIOE 414	3
Technical Elective	3	BIOE 415	2
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	Technical Elective	3
		Language Other Than English (3rd level) course	4
14		18	

Fourth Year

First Semester	Hours	Second Semester	Hours
BIOE 400 (or Free Elective)	4	BIOE 400 (or Free Elective)	4
Technical Elective	3	BIOE 420	3
Technical Elective	3	Technical Elective	3
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3	Free Elective	3
Free Elective	2	General Education course (choose a Humanities or Social/Behavioral Science)	3
15		16	

Total Hours 128

for the degree of Bachelor of Science in Bioengineering

This program is accredited by the Engineering Accreditation Commission of ABET (<https://www.abet.org>), under the General Criteria and the Bioengineering, Biomedical, and similarly named Engineering Programs Criteria.

Bioengineering graduates will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

for the degree of Bachelor of Science in Bioengineering

B.S. in Bioengineering (<https://bioengineering.illinois.edu/academics/undergraduate/bioengineering/>)

Bioengineering Faculty (<https://bioengineering.illinois.edu/people/faculty/>)

The Grainger College of Engineering Admissions (<https://grainger.illinois.edu/admissions/>)

The Grainger College of Engineering (<https://grainger.illinois.edu/>)