

BIOMEDICAL ENGINEERING MINOR

College of Engineering

Program Website (<https://www.engineering.cornell.edu/bme/minor/>)

Program Description

Biomedical Engineering is the application of engineering principles and methods to a wide array of problems associated with human health. The discipline includes the design of biocompatible materials, prostheses, surgical implants, artificial organs, controlled drug-delivery systems, and wound closure devices. Diagnosing diseases and determining their biological origins depend upon increasingly sophisticated instrumentation and the use of mathematical models. This minor allows students to gain exposure to the breadth and depth of biomedical engineering offerings at Cornell, to prepare for advanced studies in biomedical engineering, and to obtain transcript recognition for their interest and capability in this rapidly growing area.

All undergraduates are eligible to participate in this minor, but they may participate in only one of the Biological Engineering (BEE) and the Biomedical Engineering (BME) minors.

Students interested in the minor should contact the BME undergraduate coordinator.

Academic Standards

At least C- in each course in the minor. A cumulative GPA ≥ 2.0 for all courses in the minor.

Minor Requirements

At least six courses (≥ 18 credits) from the five categories listed below; two course groups need to be in categories:

1. Introductory biology and/or
2. Advanced biology with no more than one course from category 1. Four courses must come from the following categories:
3. Molecular and cellular biological engineering,
4. Biomedical engineering analysis of physiological systems, and
5. Biomedical engineering applications with courses from at least two of these categories represented.

Up to two of the six courses are allowed to be required major degree courses or cross-listings. A course chosen from a list of major electives is acceptable. Additional courses may be approved by petition.

Introductory Biology

Code	Title	Hours
A maximum of 4 credits; 3-8 credits count as one course toward this category of the BME minor.		

A score of 5 on (CEEB) Advanced Placement Biology

ENGRI 1310	Introduction to Biomedical Engineering
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BIOMG 1350	Introductory Biology: Cell and Developmental Biology
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BIOG 1440	Introductory Biology: Comparative Physiology
or BIOG 1445	Introduction to Comparative Anatomy and Physiology, Individualized Instruction

Pre-med introductory biology requirement as outlined by the Health Careers Program Advisory Board of Cornell University

CHEME 2880	Biomolecular Engineering: Fundamentals and Applications
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BME 2010	Physiology of Human Health and Disease
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Advanced Biology

Code	Title	Hours
BIOAP 3160	Cellular Physiology	3
BIOMG 3300	Principles of Biochemistry, Individualized Instruction	4
BIOMG 3310 & BIOMG 3320	Principles of Biochemistry: Proteins and Metabolism and Principles of Biochemistry: Molecular Biology	3
BIOMG 3350	Principles of Biochemistry: Proteins, Metabolism, and Molecular Biology	4
BIONB 2220	Neurobiology and Behavior II: Introduction to Neuroscience	3-4
BIOMI 2900	General Microbiology Lectures	3-4
NS 3410	Human Anatomy and Physiology	4
BIOMG 2800	Lectures in Genetics and Genomics	3

Molecular and Cellular Biomedical Engineering

Code	Title	Hours
BEE 3600	Molecular and Cellular Bioengineering	3
BME 3010	Cellular Principles of Biomedical Engineering	3
BME 3020	Molecular Principles of Biomedical Engineering	3
BME 5830	Cell-Biomaterials Interactions	3
BME 5850	Current Practice in Tissue Engineering	3

BME Analysis of Physiological Systems

Code	Title	Hours
BME 3300	Introduction to Computational Neuroscience	3-4
BME 3410	Systems Mechanobiology	3
BIONB 4140	Principles of Pharmacology	3
BME 4910	Principles of Neurophysiology	4
BME 4010	Biomedical Engineering Analysis of Metabolic and Structural Systems	3
BME 4020	Electrical and Chemical Physiology ¹	3
BME 4640	Orthopaedic Tissue Mechanics	3

¹ Students interested in professional practice as biomedical engineers should consider an M.Eng. degree in BME. The recommended sequence for admission is as follows: two courses from Introductory Biology and Advanced Biology, BME 3010 Cellular Principles of Biomedical Engineering, BME 3020 Molecular Principles of Biomedical Engineering, BME 4010 Biomedical Engineering Analysis of Metabolic and Structural Systems, and BME 4020 Electrical and Chemical Physiology. The program requires students to have a knowledge of molecular and cellular biomedical engineering, and of biomedical engineering analysis of physiological systems.

Biomedical Engineering Applications

Code	Title	Hours
AEP 4700 or BME 5700	Biophysical Methods	3

BEE 4500	Bioinstrumentation	3-4
BEE 4530	Computer-Aided Engineering: Applications to Biological Processes	3
CHEME 5430	Bioprocess Engineering	3
BME 5810	Soft Tissue Biomechanics	3
BME 5780	Computer Analysis of Biomed Images	3
MSE 4610	Biomedical Materials and Their Applications	3
BME 5620	Biomineralization: The Formation and Properties of Inorganic Biomaterials	3
BME 6350	Introduction to Neurotechnology	3
BME 6210	Engineering Principles for Drug Delivery	3
BME 3210	Multiscale Biomaterial Analysis	3
BME 3310	Medical and Preclinical Imaging	3

Graduation Requirements for Engineering Minor Degree Programs

Requirements

Students may pursue minors in any department in any college that offers them, subject to limitations placed by the department offering the minor or by the students' major. Completed minors will appear on the student's transcript. Not all departments offer minors. Additional information on specific minors can be found above, in the *Engineering Undergraduate Handbook*, in the undergraduate major office of the department or school offering the minor, and in Engineering Advising.

An engineering minor recognizes formal study of a particular subject area in engineering normally outside the major. Students undertaking a minor are expected to complete the requirements during the time of their continuous undergraduate enrollment at Cornell. Completing the requirements for an engineering minor (along with a major) may require more than the traditional eight semesters at Cornell. However, courses that fulfill minor requirements may also satisfy other degree requirements (e.g., distribution courses, advisor-approved, or major-approved electives), and completion within eight semesters is possible.

An engineering minor requires:

- successful completion of all requirements for an undergraduate degree.
- enrollment in a major that approves participation in the minor.
- satisfactory completion of six courses (at least 18 credits) in a college-approved minor.

Students may apply for certification of a minor at any time after the required course work has been completed in accordance with published standards. An official notation of certification of a minor appears on the Cornell transcript following graduation.