

## DEPARTMENT OF BIOLOGICAL ENGINEERING

### Undergraduate Study

#### **Bachelor of Science in Biological Engineering (Course 20)**

The Department of Biological Engineering (BE) (<http://be.mit.edu>) offers an undergraduate curriculum emphasizing quantitative, engineering-based analysis, design, and synthesis in the study of modern biology from the molecular to the systems level. Completion of the curriculum leads to the Bachelor of Science in Biological Engineering and prepares students for careers in diverse fields ranging from the pharmaceutical and biotechnology industries to materials, devices, ecology, and public health. Graduates of the program will be prepared to enter positions in basic research or project-oriented product development, as well as graduate school or further professional study.

The required core curriculum includes a strong foundation in biological and biochemical sciences, which are integrated with quantitative analysis and engineering principles throughout the entire core. Students who wish to pursue the Bachelor of Science in Biological Engineering (<http://catalog.mit.edu/degree-charts/biological-engineering-course-20>) are encouraged to complete the Biology General Institute Requirement during their first year and may delay completion of Physics II until the fall term of sophomore year if necessary. The optional subject Introduction to Biological Engineering Design, offered during the spring term of the first year, provides a framework for understanding the Biological Engineering SB program.

Students are encouraged to take the sophomore fall-term subject 20.110[*J*] Thermodynamics of Biomolecular Systems. This subject also fulfills an SB degree requirement in Biology. Students are also encouraged to take Organic Chemistry I and Differential Equations during their sophomore year in order to prepare for the introductory biological engineering laboratory subject that provides context for the lecture subjects and a strong foundation for subsequent undergraduate research in biological engineering through Undergraduate Research Opportunities Program projects or summer internships.

The advanced subjects required in the junior and senior years introduce additional engineering skills through lecture and laboratory subjects and culminate in a senior design project. These advanced subjects maintain the theme of molecular to systems-level analysis, design, and synthesis based on a strong integration with biology fundamentals. They also include a variety of restricted electives that allow students to develop expertise in one of six thematic areas: systems biology, synthetic biology, biophysics, pharmacology/toxicology, cell and tissue engineering, and microbial systems. Many of these advanced subjects are jointly taught with

other departments in the School of Engineering or School of Science and may fulfill degree requirements in other programs.

#### **Minor in Biomedical Engineering**

An interdepartmental Minor in Biomedical Engineering (<http://catalog.mit.edu/interdisciplinary/undergraduate-programs/minors/biomedical-engineering>) is available to all undergraduate students outside the BE (Course 20) major, described in detail under Interdisciplinary Programs.

#### **Minor in Toxicology and Environmental Health**

The Department of Biological Engineering offers an undergraduate Minor in Toxicology and Environmental Health. The goal of this program is to meet the growing demand for undergraduates to acquire the intellectual tools needed to understand and assess the impact of new products and processes on human health, and to provide a perspective on the risks of human exposure to synthetic and natural chemicals, physical agents, and microorganisms.

Given the importance of environmental education at MIT, the program is designed to be accessible to any MIT undergraduate. The program consists of three required didactic core subjects and one laboratory subject, as well as one restricted elective. The prerequisites for the core subjects are 5.111 / 5.112 Principles of Chemical Science or 3.091 Introduction to Solid-State Chemistry *plus* Introductory Biology (7.012 / 7.013 / 7.014 / 7.015 / 7.016).

#### **Core Subjects**

20.102	Metakaryotic Stem Cells in Carcinogenesis: Origins and Cures	12
20.104[ <i>J</i> ]	Environmental Cancer Risks, Prevention, and Therapy	12
20.106[ <i>J</i> ]	Applied Microbiology	12

#### **Laboratory Core**

Select one of the following:		12-18
5.310	Laboratory Chemistry	
20.109	Laboratory Fundamentals in Biological Engineering	
7.002 & 7.003[ <i>J</i> ]	Fundamentals of Experimental Molecular Biology and Applied Molecular Biology Laboratory	

#### **Restricted Electives**

Select one of the following:		12
1.080	Environmental Chemistry	
1.089	Earth's Microbiomes	
5.07[ <i>J</i> ]	Introduction to Biological Chemistry	
7.05	General Biochemistry	
7.06	Cell Biology	
7.28	Molecular Biology	

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20.URG	Undergraduate Research Opportunities
22.01	Introduction to Nuclear Engineering and Ionizing Radiation
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<b>Total Units</b>	<b>60-66</b>

***Inquiries***

For further information on the undergraduate programs, see the Biological Engineering website (<http://be.mit.edu>) or contact the BE Academic Office ([be-acad@mit.edu](mailto:be-acad@mit.edu)), Room 16-267, 617-452-2465.