BIOLOGICAL ENGINEERING

COURSE 20

CONTACT

BE Academic Office, Undergraduate Programs, be-sb@mit.edu

DESCRIPTION

Biological engineering increases understanding of how biological systems function as both physical and chemical mechanisms; how they respond when perturbed by factors such as medical therapeutics, environmental agents, and genetic variation; and how to manipulate and construct them toward beneficial use. Biological engineering builds on molecular biology and genomic biology to identify and manipulate the mechanistic components of living systems and to accelerate the rate of analysis.

INSIDE COURSE 20

20	Biological Engineering	Undergraduates: 170

INTRODUCTORY CLASSES

SP.247 and SP.247A **Exploring Majors at the Intersection of Engineering, Life Sciences, and Medicine (SPRING and IAP)**

Interactive introduction to the several majors at MIT that offer curricula bridging engineering and life sciences, through presentations by faculty, current students, and alumni. Representatives of these departments (Courses 1, 2, 3, 5, 6, 6-7, 7, 9, 10, and 20, as well as the BME minor) cover aptitudes of typical students, culture, class offerings and roadmaps, and unique opportunities. Provides first-year students practical advice about how to select, prepare for and thrive in each major. Students taking 3-unit version of SP.247 complete reflection papers outside of class. Subject can count toward the 6-unit discovery-focused credit limit for first year students.

20.s901 **Introduction to Experimentation in Biological Engineering (Fall)**

In this course we will discuss not only the specifics concerning how research is conducted, but also the implications of research. This course is ideal for students who are seeking exposure to how research is conducted and will prepare students for future work in UROP positions and laboratory classes. Furthermore, it will provide an introduction to the field of Biological Engineering.

20.110 **Thermodynamics of Biomolecular Systems**

Equilibrium properties of macroscopic and microscopic systems. Basic thermodynamics: state of a system, state variables. Work, heat, first law of thermodynamics, thermochemistry. Second and third law of thermodynamics: entropy and its statistical basis, Gibbs function. Chemical equilibrium of reactions in gas and solution phase. Macromolecular structure and interactions in solution. Driving forces for molecular self-assembly. Binding cooperativity, solvation, titration of macromolecules

COURSE 20-FRIENDLY RESEARCH AREAS/ LABS

Koch Institute for Integrated Cancer Research

Health Sciences and Technology (HST)

Broad Institute

MIT Synthetic Biology Center

GET INVOLVED WITH COURSE 20

Biological Engineering Undergraduate Student Board	HST Student Community
Biotechnology Group	Pre-Medical Society
GlobeMed	The BioMakers Group
Hacking Medicine	Undergraduate Biochemistry Association

SKILLS

Prepare project plans for equipment or facility improvements (project management)

Adapt or design computer hardware or software for medical science uses

Lead studies to examine or recommend changes in process sequences or protocols.

Research new materials to be used for products, such as implanted artificial organs

POSSIBLE FUTURE POSITIONS

- **Research and development engineer:** Develop new products and improve existing products for groundbreaking medical device equipment.
- **Regulatory affairs specialist:** Coordinate and document internal regulatory processes, such as internal audits, inspections, license renewals, or registrations. Prepare submissions and obtain approval for products and therapies to markets worldwide.
- **Bioprocessing/food engineer:** Integrate biology and engineering to design sustainable systems that produce high quality food, renewable energy, and biomaterials for consumers while protecting the environment.

CAREER INDUSTRY EXAMPLES

Environmental engineering	Materials Handling	Pharmaceuticals
Government	Medicine	Research
Management	Medical Technology	Zoology

SAMPLE EMPLOYERS

AthenaHealth	CRISPR Therapeutics	Motif FoodWorks
Biogen	Diagnostic Biochips	NIH
Broad Institute	Illumina	Vertex