Biomedical Engineering, BSE

The major in biomedical engineering builds on the foundation provided by the BSE core requirements, preparing students for the challenges and opportunities associated with careers in the profession.

Focus Areas

All BSE students complete a focus area within their chosen major. Students majoring in biomedical engineering select one of four preapproved focus areas: bioimaging, biomechanics and biomaterials, cellular engineering, or computational bioengineering. Each focus area may be designated pre-medicine by completing a specific set of electives.

Bioimaging

Bioimaging represents the acquisition, processing, and visualization of structural or functional images of living systems. Medical imaging and image processing are integral to the extraction of anatomical and biological information from the systems level down to the molecular level. Bioimaging clinically seeks to reveal, diagnose, or examine diseases and also investigates normal anatomy and physiology.

Biomechanics and Biomaterials

Biomechanics is the study of structure and function. It is the application of principles from classical mechanics to problems in biological systems. This focus area emphasizes cardiovascular and/or musculoskeletal biomechanics. The study of biomaterials plays an important role in the design of implants and surgical instrumentation for both cardiovascular and musculoskeletal applications.

Cellular Engineering

Cellular engineering involves the application of engineering principles to problems in cellular and molecular biology, particularly as they relate to human health. The goal of this focus area is to equip students with the quantitative tools necessary to understand, manipulate, and control cellular and subcellular processes for a range of biomedical applications, including those related to stem cells, tissue engineering, and regenerative medicine.

Computational Bioengineering

Computational bioengineering is an interdisciplinary field that develops methods and software tools for modeling and understanding biological data and systems that are typically represented by large amounts of data. Computational bioengineering is a combination of computer science, statistics, informatics, and engineering to analyze and interpret biological and genomic data. It is used for the identification of candidate genes to better understand the genetic basis of disease, unique adaptations, and differences between populations.

Educational Objectives

The department provides undergraduate students with a contemporary education in a multidisciplinary field of engineering. Its objective is to produce graduates who:

- advance the biomedical field through the responsible analysis and development of devices, systems, processes, and policies that improve human health;
- pursue a wide range of career options, including those in industry, academia, and medicine; and
- collaborate on multidisciplinary teams and become leaders in their chosen fields.