PreHealth ADVISING

Biomedical Engineering

WHAT IS BIOMEDICAL ENGINEERING?

- Biomedical engineers apply the concepts of engineering – mathematical modeling, analysis, design – to living systems, improving lives by solving problems in biology and medicine. The field is rapidly expanding to include many exciting research areas:
  - Bioinstrumentation: developing tools for biological research
  - Biomaterials: creating synthetic materials intended to interact with living systems
  - Biomechanics: analyzing the mechanics of living organisms
  - Cell and tissue engineering: repairing or replacing living cells with synthetic cells
  - Drug delivery: improving the way medications are administered
  - Medical imaging: creating images of the body using light, sound, radiation, electrodes, etc.

WHAT DO BIOMEDICAL ENGINEERS DO?

- Biomedical engineers' work may include designing surgical robots and artificial organs, making synthetic lubricants for aging joints, improving techniques for DNA sequencing and making MRI machines smaller and more powerful.
- New job opportunities for biomedical engineering are constantly emerging – U.S. News & World Report ranks biomedical engineering among the top ten engineering jobs and the US Bureau of Labor Statistics predicts faster than average job growth.
- Many graduates work in the biotechnology industry, in pharmaceutical and medical device companies. Others work in hospitals, medical research facilities and government regulatory agencies. Many of our students go on to medical school and then use their knowledge of technology to improve patient care and conduct research.

BIOMEDICAL ENGINEERING SPECIALTIES

- Bioinstrumentation uses electronics, computer science, and measurement principles to develop instruments used in the diagnosis and treatment of medical problems.
- Biomaterials is the study of naturally occurring or laboratory-designed materials that are used in medical devices or as implantation materials.
- Biomechanics involves the study of mechanics, such as thermodynamics, to solve biological or medical problems.
- Clinical engineering applies medical technology to optimize healthcare delivery.
- Rehabilitation engineering is the study of engineering and computer science to develop devices that assist individuals recovering from or adapting to physical and cognitive impairments.
- Systems physiology uses engineering tools to understand how systems within living organisms, from bacteria to humans, function and respond to changes in their environment.

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BIOMEDICAL ENGINEERING

DEGREE OPTIONS

- Careers in BME are diverse and may be pursued with a variety of educational backgrounds.
- Students with bachelor's degrees in Biology, Engineering, or related fields may pursue BME after graduation and then decide on an advanced degree based on their career trajectory.
- To advance in the field, a few degrees are common, including a Master of Engineering (M Eng), a Master of Science (MS), or a doctoral degree (PhD).
- Some students opt to combine biomedical engineering and medical training in MD/PhD or MD/Masters dual degree programs.

ADMISSIONS REQUIREMENTS

- Will vary depending on the program, but will likely include:
  - Degree in engineering or a science discipline, or course work in physics, chemistry, advanced mathematics, and biology
  - Graduate Record Exam
  - Personal statement
  - Letters of recommendation
  - Application deadlines generally in the academic year prior to matriculation
- Students applying for the MD/PhD will follow regular medical school admissions requirements
- and may have additional requirements set by the PhD program.
  - Most MD/PhD programs accept the MCAT in lieu of the GRE.
  - Students will apply about 15 months prior to matriculation

FACTORS IN SELECTING SCHOOLS

- Availability of specialty area(s) of interest. BME encompasses diverse areas of study, from Computational Biology to Systems Neuroscience to Tissue Engineering.
- Different programs specialize in different areas.
- Research opportunities
- The student and professional community
- Curriculum
- Location
- Cost / availability of financial support

FOR MORE INFORMATION

- Bioengineering at Princeton: Princeton.edu/CBE/Research/Bio/
- Career Development Grad School Guide:
- careerdevelopment.princeton.edu/sites/careerdevelopment/files/graduate_school_guide_2020.pdf
- AIMBE.org American Institute for Medical and Biological Engineering
- BMES.org Biomedical Engineering Society, Advancing Human Health and Well Being
- IEEE.org The Institute of Electrical and Electronics Engineers is the world's largest professional association for the advancement of technology.
- EMBS.org The Engineering in Medicine and Biology Society is your global connection to the biomedical engineering community.

PUBLICATIONS OF INTEREST

- Designing a Career in Biomedical Engineering
- IEEE PULSE

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