Biomedical Engineering

The Sc.B. program in Biomedical Engineering is accredited by the Engineering Accreditation Commission of ABET http://www.abet.org/. It is jointly offered by the School of Engineering and the Division of Biology and Medicine as an interdisciplinary concentration designed for students interested in applying the methods and tools of engineering to the subject matter of biology and the life sciences. Alumni of the Biomedical Engineering (BME) program will achieve one or more of these program educational objectives (PEOs) within five (5) years of graduation: (1) Serve society through work or advanced study in a broad range of fields including, but not limited to, medicine, healthcare, industry, government, and academia; (2) Apply their deeply creative and versatile biomedical engineering education to solve a broad spectrum of engineering and societal challenges; and (3) Contribute as role models, mentors, or leaders in their fields. The student outcomes of this program are the ABET (1) - (7) Student Outcomes as defined by the ABET Criteria for Accrediting Engineering Programs (available online at http://www.abet.org/accreditation-criteria-policies-documents/). The Biomedical Engineering concentration shares much of the core with the other engineering programs, but is structured to include more courses in biology and chemistry, and a somewhat different emphasis in mathematics.

The requirements regarding Mathematics, Advanced Placement, Transfer Credit, Substitutions for Required Courses, and Humanities and Social Science Courses are identical to those of the Sc.B. degree programs in Engineering. Please refer to the Engineering section of the University Bulletin for explicit guidelines.

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**Standard program for the Sc.B. degree**

1. **Core Courses**
   - ENGN 0030 Introduction to Engineering
   - or ENGN 0031 Honors Introduction to Engineering
   - ENGN 0040 Dynamics and Vibrations
   - ENGN 0510 Electricity and Magnetism
   - or ENGN 0520 Electrical Circuits and Signals
   - ENGN 0720 Thermodynamics
   - ENGN 0810 Fluid Mechanics
   - CHEM 0330 Equilibrium, Rate, and Structure
   - CHEM 0350 Organic Chemistry
   - MATH 0190 Advanced Placement Calculus (Physics/Engineering)
     - or MATH 0170 Advanced Placement Calculus
     - or MATH 0100 Introductory Calculus, Part II
   - MATH 0200 Intermediate Calculus (Physics/Engineering)
     - or MATH 0180 Intermediate Calculus
     - or MATH 0350 Honors Calculus
   - APMA 0330 Methods of Applied Mathematics I
     - or APMA 0350 Applied Ordinary Differential Equations
   - APMA 1650 Statistical Inference I
     - or BIOL 0495 Statistical Analysis of Biological Data
     - or PHP 1510 Principles of Biostatistics and Data Analysis
     - or APMA 1655 Honors Statistical Inference I

2. **Upper Level Biomedical Engineering Curriculum**
   - ENGN 1110 Transport and Biotransport Processes
   - ENGN 1210 Biomechanics
   - ENGN 1230 Instrumentation Design
   - ENGN 1490 Biomaterials

### 3. Additional Biomedical Engineering Electives (Complete at least 3 courses from the following groups):

Select one or two of the following:

- ENGN 1220 Neuroengineering
- ENGN 1510 Nanoengineering and Nanomedicine
- ENGN 1520 Cardiovascular Engineering
- ENGN 1930B Biomedical Optics
- ENGN 2910S Cancer Nanotechnology
- ENGN 2912R Implantable Devices
- BIOL 1140 Tissue Engineering
- CSCI 1810 Computational Molecular Biology
  - or CSCI 1820 Algorithmic Foundations of Computational Biology
- ENGN 0500 Digital Computing Systems
- ENGN 1740 Computer Aided Visualization and Design
- ENGN 2911R Analytical Modeling for Biomechanical and Biomedical Systems
- ENGN 2625 Optical Microscopy: Fundamentals and Applications
- BIOL 1150 Stem Cell Engineering
- BIOL 2110 Drug and Gene Delivery

At least one or two more courses from:

- BIOL 0280 Biochemistry
- BIOL 0470 Genetics
- BIOL 0500 Cell and Molecular Biology
- BIOL 0510 Introductory Microbiology
- BIOL 0530 Principles of Immunology
- BIOL 1100 Cell Physiology and Biophysics
- BIOL 1555 Methods in Informatics and Data Science for Health
- BIOL 2010 Quantitative Approaches to Biology
- APMA 1070 Quantitative Models of Biological Systems
- CHEM 0360 Organic Chemistry
- CLPS 1520 Computational Vision
  - or CLPS 1590 Visualizing Vision
- ENGN 2910G Topics in Translational Research and Technologies
- NEUR 1020 Principles of Neurobiology
- NEUR 1440 Mechanisms and Meaning of Neural Dynamics
- PHYS 1610 Biological Physics
- BIOL 1810 21st Century Applications in Cell and Molecular Biology

4. **Capstone Design**

- ENGN 1930L Biomedical Engineering Design and Innovation
- ENGN 1931L Biomedical Engineering Design and Innovation II

5. **General Education Requirement:** At least four approved courses must be taken in the humanities and social sciences.

**Total Credits** 21

1 In some cases, Independent Study may be substituted subject to Concentration Advisor approval.