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. The education objectives of the Biomedical Engineering program are to prepare graduates: (1) to be employed in careers of useful service to society, including scientific and technical areas within medicine, industry, and health care delivery; (2) to demonstrate the ability to apply the basic principles of engineering and science, as well as problem solving skills and critical thinking, to a broad spectrum of biomedical engineering problems; (3) to demonstrate their ability to work in teams, and to effectively communicate and understand the broad social, ethical, economic and environmental consequences of their lifelong education. The student outcomes of this program are the (a) - (k) 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENGN 0030</td>
<td>Introduction to Engineering</td>
<td>1</td>
</tr>
<tr>
<td>or ENGN 0031</td>
<td>Honors Introduction to Engineering</td>
<td>1</td>
</tr>
<tr>
<td>ENGN 0040</td>
<td>Dynamics and Vibrations</td>
<td>1</td>
</tr>
<tr>
<td>ENGN 0510</td>
<td>Electricity and Magnetism</td>
<td>1</td>
</tr>
<tr>
<td>or ENGN 0520</td>
<td>Electrical Circuits and Signals</td>
<td>1</td>
</tr>
<tr>
<td>ENGN 0720</td>
<td>Thermodynamics</td>
<td>1</td>
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<tr>
<td>ENGN 0810</td>
<td>Fluid Mechanics</td>
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</tr>
<tr>
<td>CHEM 0330</td>
<td>Equilibrium, Rate, and Structure</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 0350</td>
<td>Organic Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>MATH 0190</td>
<td>Advanced Placement Calculus (Physics/</td>
<td>1</td>
</tr>
<tr>
<td>or MATH 0170</td>
<td>Engineering)</td>
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<tr>
<td>or MATH 0100</td>
<td>Introductory Calculus, Part II</td>
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<tr>
<td>MATH 0200</td>
<td>Intermediate Calculus (Physics/</td>
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<tr>
<td>or MATH 0180</td>
<td>Engineering)</td>
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<td>or MATH 0350</td>
<td>Honors Calculus</td>
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<tr>
<td>APMA 0330</td>
<td>Methods of Applied Mathematics I, II</td>
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<tr>
<td>or APMA 0350</td>
<td>Applied Ordinary Differential Equations</td>
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<tr>
<td>APMA 1650</td>
<td>Statistical Inference</td>
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<tr>
<td>or APMA 0650</td>
<td>Essential Statistics</td>
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<tr>
<td>or BIOL 0200</td>
<td>The Foundation of Living Systems</td>
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</table>

### 2. Upper Level Biomedical Engineering Curriculum

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ENGN 1110</td>
<td>Transport and Biotransport Processes</td>
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</tr>
<tr>
<td>ENGN 1210</td>
<td>Biomechanics</td>
<td>1</td>
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<tr>
<td>ENGN 1230</td>
<td>Instrumentation Design</td>
<td>1</td>
</tr>
<tr>
<td>ENGN 1490</td>
<td>Biomaterials</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 0800</td>
<td>Principles of Physiology</td>
<td>1</td>
</tr>
</tbody>
</table>

### 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 1930M Industrial Design
  - ENGN 1931K Cell-Material Interactions in Tissue Engineering
  - BIOL 1140 Tissue Engineering
  - ENGN 2910S Cancer Nanotechnology
  - ENGN 2912R Implantable Devices
  - CSCI 1820 Algorithmic Foundations of Computational Biology

At least one or two more courses from:

- CHEM 0360 Organic Chemistry
- BIOL 0280 Biochemistry
- BIOL 0470 Genetics
- BIOL 0500 Cell and Molecular Biology
- BIOL 0510 Introductory Microbiology
- BIOL 0530 Principles of Immunology
- BIOL 1090 Polymer Science for Biomaterials
- BIOL 1110 Cell Physiology and Biophysics
- BIOL 1150 Stem Cell Engineering
- BIOL 1555 Methods in Informatics and Data Science for Health
- APMA 1070 Quantitative Models of Biological Systems
- CLPS 1520 Computational Vision
  or CLPS 1590 Visualizing Vision
- NEUR 1020 Principles of Neurobiology
- NEUR 1440 Neural Dynamics
- PHYS 1610 Biological Physics
- ENGN 2920D Environmental Technologies and Human Health
- BIOL 2010 Quantitative Approaches to Biology
- BIOL 2110 Drug and Gene Delivery
- PHP 2510 Principles of Biostatistics and Data Analysis

### 4. Capstone Design

- ENGN 1930L Biomedical Engineering Design. Research and Modeling

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

Total Credits: 21

1. If BIOL 0200 is counted, a statistics module must be completed in ENGN 1930L or other courses
2. At most one of these two courses may be counted.
3. In some cases, Independent Study may be substituted subject to Concentration Advisor approval.
Font Notice

This document should contain certain fonts with restrictive licenses. For this draft, substitutions were made using less legally restrictive fonts. Specifically:

Helvetica was used instead of Arial.

The editor may contact Leepfrog for a draft with the correct fonts in place.