Overview

The Bachelor of Science in Bioengineering is offered by the Department of Bioengineering.

The Bioengineering program integrates engineering science, rigorous mathematical tools and a quantitative approach to the life sciences and applies this spectrum of knowledge in an interdisciplinary fashion to provide solutions to basic and applied biological and medical problems. This goal will be accomplished by offering to the students an integrated set of courses aimed at providing a thorough introduction to the complex and interdisciplinary field of Bioengineering:

- Teach engineering science, analysis, and design in the context of quantitative approaches to solving life science and medicine-related problems.
- Integrate interdisciplinary aspects of biology, physiology, and engineering within courses and design projects.
- Emphasize the interdisciplinary nature of Bioengineering, in terms of problem solving, design, within the framework of interdisciplinary teams focusing on the dialogue between "biology-inspired engineering" and "biology as a specific arm of applied engineering principles."
- Immerse students in key life science and medical principles, while focusing on understanding cell/molecular-level events through quantitative analysis and modeling.
- Provide an exceptional learning environment with significant instruction by Bioengineering faculty and researchers in collaboration with experts from other fields, especially the Health Science Campus.

In this curriculum, incoming students will first and foremost be trained as solid Temple engineers, focusing on applying engineering science, design, and analysis to real life problems specifically in the areas of biology and medicine. Hands-on engineering experience will be gained through intense laboratory coursework and by solving real-life biomedical problems.

Bioengineering study leads to careers in several fields.

Students must select from one of three concentrations in:

- Cellular Engineering,
- Engineering Devices, or
- Pre-Health.

Cellular Engineering Concentration

A concentration in Cellular Engineering provides students with the skills to apply quantitative approaches to problem solving in cellular and molecular engineering, particularly as they relate to human health. A range of courses include design, development and uses of biomaterials; building functional tissues using cells and scaffolds; and repairing diseased tissues and organs at the cellular and molecular level. It also explores the host-biomaterial interface and interactions.

Campus Location: Main

Program Code: EN-BIOE-BSBE

Accreditation

The Bioengineering (BS) program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the General Criteria and Program Criteria for Bioengineering and Biomedical and Similarly Named Engineering Programs. ABET is a non-profit and non-governmental accrediting agency for academic programs in the disciplines of applied science, computing, engineering, and engineering technology recognized by the Council for Higher Education Accreditation (CHEA).

+1 Bachelor to Master's Accelerated Degree Program

High-achieving undergraduates can earn both a bachelor's degree and a master's degree within five years. Students apply for this program in sophomore year, and four graduate-level courses are taken in place of undergraduate requirements during junior and senior years. After the bachelor's degree is earned, one graduate-level course is taken in the summer followed by full-time study in the subsequent Fall and Spring semesters to complete the master's degree study. The following accelerated program is available:

- Bachelor of Science in Bioengineering and Master of Science in Bioengineering

Contact Information

Peter Lelkes, PhD, Chair
Learn more about the Bachelor of Science in Bioengineering.

These requirements are for students who matriculated in academic year 2023-2024. Students who matriculated prior to fall 2023 should refer to the Archives to view the requirements for their Bulletin year.

Summary of Requirements

University Requirements

All new students are required to complete the university's General Education (GenEd) curriculum.

All Temple students must take a minimum of two writing-intensive courses for a total of at least six credits. The writing-intensive course credits are counted as part of the major; they are not General Education (GenEd) or elective credits. The writing-intensive courses must be completed at Temple University and students may not transfer in credits to satisfy this requirement. The specific writing-intensive courses required for this major are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 2196</td>
<td>Technical Communication</td>
<td>3</td>
</tr>
<tr>
<td>or ENGR 2996</td>
<td>Honors Technical Communication</td>
<td></td>
</tr>
<tr>
<td>ENGR 4296</td>
<td>Capstone Senior Design Project</td>
<td>3</td>
</tr>
<tr>
<td>or ENGR 4996</td>
<td>Honors Capstone Senior Design Project</td>
<td></td>
</tr>
</tbody>
</table>

Department and Major Requirements

Required Math & Basic Science Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1041</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 1941</td>
<td>Honors Calculus I</td>
<td></td>
</tr>
<tr>
<td>MATH 1042</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 1942</td>
<td>Honors Calculus II</td>
<td></td>
</tr>
<tr>
<td>MATH 2043</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 2943</td>
<td>Honors Calculus III</td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>MATH 2041</td>
<td>Differential Equations I</td>
<td></td>
</tr>
<tr>
<td>or MATH 2941</td>
<td>Honors Differential Equations I</td>
<td></td>
</tr>
<tr>
<td>MATH 3041</td>
<td>Differential Equations I</td>
<td></td>
</tr>
<tr>
<td>or MATH 3941</td>
<td>Honors Differential Equations I</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following: 4

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 2112</td>
<td>Introduction to Cellular and Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>or BIOL 2912</td>
<td>Honors Introduction to Cellular and Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOL 1112</td>
<td>Introduction to Biomolecules, Cells and Genomes</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1031</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 1951</td>
<td>Honors General Chemical Science I</td>
<td></td>
</tr>
<tr>
<td>CHEM 1033</td>
<td>General Chemistry Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 1953</td>
<td>Honors General Chemical Science Laboratory I</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following: 4

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 1061</td>
<td>Elementary Classical Physics I</td>
<td>4</td>
</tr>
<tr>
<td>or PHYS 1961</td>
<td>Honors Elementary Classical Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS 2021</td>
<td>General Physics I</td>
<td></td>
</tr>
</tbody>
</table>
Bioengineering BSBIOE with Cellular Engineering Concentration

Select one of the following: 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 1062</td>
<td>Elementary Classical Physics II</td>
</tr>
<tr>
<td>or PHYS 1962</td>
<td>Honors Elementary Classical Physics II</td>
</tr>
<tr>
<td>PHYS 2022</td>
<td>General Physics II</td>
</tr>
<tr>
<td>or PHYS 2922</td>
<td>Honors General Physics II</td>
</tr>
</tbody>
</table>

**Required General Education Courses**

Select one of the following: 4

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG 0802</td>
<td>Analytical Reading and Writing</td>
</tr>
<tr>
<td>ENG 0812</td>
<td>Analytical Reading and Writing: ESL</td>
</tr>
<tr>
<td>ENG 0902</td>
<td>Honors Writing About Literature</td>
</tr>
<tr>
<td>IH 0851</td>
<td>Intellectual Heritage I: The Good Life</td>
</tr>
<tr>
<td>or IH 0951</td>
<td>Honors Intellectual Heritage I: The Good Life</td>
</tr>
<tr>
<td>IH 0852</td>
<td>Intellectual Heritage II: The Common Good</td>
</tr>
<tr>
<td>or IH 0952</td>
<td>Honors Intellectual Heritage II: The Common Good</td>
</tr>
<tr>
<td>GenEd 08xx or 09xx (Human Behavior)</td>
<td>3</td>
</tr>
<tr>
<td>GenEd 08xx or 09xx (Race and Diversity)</td>
<td>3</td>
</tr>
<tr>
<td>GenEd 08xx or 09xx (Global/World Society)</td>
<td>3</td>
</tr>
<tr>
<td>GenEd 08xx or 09xx (U.S. Society)</td>
<td>3</td>
</tr>
<tr>
<td>GenEd 08xx or 09xx (Arts)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Required Bioengineering & Engineering Courses (Common for all Pathways)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 2001</td>
<td>Frontiers in Bioengineering</td>
</tr>
<tr>
<td>BIOE 2101</td>
<td>Engineering Principles of Physiological Systems</td>
</tr>
<tr>
<td>BIOE 3001</td>
<td>Research Design and Methods in Bioengineering</td>
</tr>
<tr>
<td>BIOE 3101</td>
<td>Bioelectrical Engineering Lab</td>
</tr>
<tr>
<td>BIOE 3102</td>
<td>Biomaterials Lab</td>
</tr>
<tr>
<td>BIOE 3201</td>
<td>Biomedical Instrumentation</td>
</tr>
<tr>
<td>BIOE 4101</td>
<td>Biomechanics Lab</td>
</tr>
<tr>
<td>BIOE 4311</td>
<td>The Entrepreneurial Bioengineer</td>
</tr>
<tr>
<td>ENGR 1101</td>
<td>Introduction to Engineering &amp; Engineering Technology</td>
</tr>
<tr>
<td>or ENGR 1901</td>
<td>Honors Introduction to Engineering</td>
</tr>
<tr>
<td>ENGR 1102</td>
<td>Introduction to Engineering Problem Solving</td>
</tr>
<tr>
<td>ENGR 2196</td>
<td>Technical Communication (WI)</td>
</tr>
<tr>
<td>or ENGR 2996</td>
<td>Honors Technical Communication</td>
</tr>
<tr>
<td>ENGR 3571</td>
<td>Classical and Statistical Thermodynamics</td>
</tr>
</tbody>
</table>

Bioengineering Design Course - select one of the following: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 3402</td>
<td>Design Elective: Biodesign</td>
</tr>
<tr>
<td>BIOE 3512</td>
<td>Capstone Senior Design Project (WI)</td>
</tr>
<tr>
<td>BIOE 4279</td>
<td>Honors Capstone Senior Design Project</td>
</tr>
</tbody>
</table>

**Required Bioengineering Electives (minimum of 9 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 2201</td>
<td>Modeling Fundamentals in Bioengineering</td>
</tr>
<tr>
<td>BIOE 2202</td>
<td>Programming Fundamentals in Bioengineering</td>
</tr>
<tr>
<td>BIOE 3303</td>
<td>Biotransport Phenomena</td>
</tr>
</tbody>
</table>

Select from the following list: 3

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 2312</td>
<td>Mechanics for Bioengineering I</td>
</tr>
<tr>
<td>BIOE 2401</td>
<td>Biodesign - Needs and Ideation</td>
</tr>
<tr>
<td>BIOE 3302</td>
<td>Drug Delivery</td>
</tr>
<tr>
<td>BIOE 3331</td>
<td>Principles of Macromolecular Science</td>
</tr>
<tr>
<td>BIOE 3401</td>
<td>Biodesign - Testing and Validation</td>
</tr>
<tr>
<td>BIOE 3511</td>
<td>Interactions of Biomaterials with Living Tissues</td>
</tr>
</tbody>
</table>
Bioengineering BSBIOE with Cellular Engineering Concentration

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 3725</td>
<td>Cell Biology for Engineers</td>
</tr>
<tr>
<td>BIOE 4278</td>
<td>Cardiac Devices</td>
</tr>
<tr>
<td>BIOE 3301</td>
<td>Biomedical Signals and Systems (with additional prerequisites)</td>
</tr>
</tbody>
</table>

**Required Technical Electives**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 1032</td>
<td>General Chemistry II</td>
</tr>
<tr>
<td>or CHEM 1952</td>
<td>Honors General Chemical Science II</td>
</tr>
<tr>
<td>CHEM 1034</td>
<td>General Chemistry Laboratory II</td>
</tr>
<tr>
<td>or CHEM 1954</td>
<td>Honors Chemical Science Laboratory II</td>
</tr>
<tr>
<td>CHEM 2201</td>
<td>Organic Chemistry I</td>
</tr>
<tr>
<td>or CHEM 2921</td>
<td>Organic Chemistry for Honors I</td>
</tr>
<tr>
<td>CHEM 2203</td>
<td>Organic Chemistry Laboratory I</td>
</tr>
<tr>
<td>or CHEM 2923</td>
<td>Organic Honors Laboratory I</td>
</tr>
<tr>
<td>CHEM 2202</td>
<td>Organic Chemistry II</td>
</tr>
<tr>
<td>or CHEM 2922</td>
<td>Organic Chemistry for Honors II</td>
</tr>
<tr>
<td>CHEM 2204</td>
<td>Organic Chemistry Laboratory II</td>
</tr>
<tr>
<td>or CHEM 2924</td>
<td>Organic Honors Laboratory II</td>
</tr>
<tr>
<td>CHEM 3401</td>
<td>Applications of Biochemistry</td>
</tr>
</tbody>
</table>

**Bioengineering Capstone Course**

Select one of the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 4333</td>
<td>Capstone Elective: Applied Biospectroscopy</td>
</tr>
<tr>
<td>BIOE 4411</td>
<td>Capstone Elective: Biomaterials</td>
</tr>
<tr>
<td>BIOE 4431</td>
<td>Capstone Elective: Neuroengineering</td>
</tr>
<tr>
<td>BIOE 4461</td>
<td>Capstone Elective: Principles of Tissue Engineering</td>
</tr>
<tr>
<td>BIOE 4501</td>
<td>Capstone Elective: Regenerative Engineering</td>
</tr>
<tr>
<td>BIOE 4555</td>
<td>Capstone Elective - Biophotonics: Seeing is Believing</td>
</tr>
</tbody>
</table>

**Free Electives**

Free Elective #1 3
Free Elective #2 3

**Total Credit Hours**

128

**Suggested Academic Plan**

Please note that this is a suggested academic plan. Depending on your situation, your academic plan may look different.

**Bachelor of Science in Bioengineering with Concentration in Cellular Engineering**

**Suggested Plan for New Students Starting in the 2023-2024 Academic Year**

**Year 1**

**Fall**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1041</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 1941</td>
<td>or Honors Calculus I</td>
<td></td>
</tr>
<tr>
<td>CHEM 1031</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>or CHEM 1951</td>
<td>or Honors General Chemical Science I</td>
<td></td>
</tr>
<tr>
<td>CHEM 1033</td>
<td>General Chemistry Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>or CHEM 1953</td>
<td>or Honors Chemical Science Laboratory I</td>
<td></td>
</tr>
<tr>
<td>ENGR 1101</td>
<td>Introduction to Engineering &amp; Engineering Technology</td>
<td>3</td>
</tr>
<tr>
<td>or ENGR 1901</td>
<td>or Honors Introduction to Engineering</td>
<td></td>
</tr>
<tr>
<td>ENG 0802</td>
<td>Analytical Reading and Writing</td>
<td>4</td>
</tr>
<tr>
<td>or ENG 0812</td>
<td>or Analytical Reading and Writing: ESL</td>
<td></td>
</tr>
<tr>
<td>or ENG 0902</td>
<td>or Honors Writing About Literature</td>
<td></td>
</tr>
</tbody>
</table>

**Credit Hours**

15

**Spring**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1042</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 1942</td>
<td>or Honors Calculus II</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following:

4
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 1061/1961</td>
<td>Elementary Classical Physics I/Honors Elementary Classical Physics I</td>
<td></td>
</tr>
<tr>
<td>PHYS 2021/2921</td>
<td>General Physics I/Honors General Physics I</td>
<td></td>
</tr>
<tr>
<td>BIOE 2001</td>
<td>Frontiers in Bioengineering</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 1102</td>
<td>Introduction to Engineering Problem Solving</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1032/1952</td>
<td>General Chemistry II/Honors General Chemical Science II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 1034/1954</td>
<td>General Chemistry Laboratory II/Honors Chemical Science Laboratory II</td>
<td>1</td>
</tr>
</tbody>
</table>

**Credit Hours: 17**

### Year 2

#### Fall

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 2043/2943</td>
<td>Calculus III/Honors Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1062/1962</td>
<td>Elementary Classical Physics II/Honors Elementary Classical Physics II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 2022/2922</td>
<td>General Physics II/Honors General Physics II</td>
<td></td>
</tr>
<tr>
<td>CHEM 2201/2921</td>
<td>Organic Chemistry I/Honors Organic Chemistry for Honors I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 2203/2923</td>
<td>Organic Chemistry Laboratory I/Honors Organic Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>BIOE 3001</td>
<td>Research Design and Methods in Bioengineering</td>
<td>2</td>
</tr>
<tr>
<td>BIOL 2112/2912</td>
<td>Introduction to Cellular and Molecular Biology/Honors Introduction to Cellular and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 1112</td>
<td>Introduction to Biomolecules, Cells and Genomes</td>
<td></td>
</tr>
</tbody>
</table>

**Credit Hours: 18**

#### Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 3201</td>
<td>Biomedical Instrumentation</td>
<td>2</td>
</tr>
<tr>
<td>BIOE 2101</td>
<td>Engineering Principles of Physiological Systems</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 3102</td>
<td>Biomaterials Lab</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 2202/2922</td>
<td>Organic Chemistry II/Honors Organic Chemistry for Honors II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 2204/2924</td>
<td>Organic Chemistry Laboratory II/Honors Organic Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>ENGR 3571</td>
<td>Classical and Statistical Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 2201</td>
<td>Modeling Fundamentals in Bioengineering</td>
<td>1.5</td>
</tr>
<tr>
<td>BIOE 2202</td>
<td>Programming Fundamentals in Bioengineering</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**Credit Hours: 18**

### Year 3

#### Fall

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 3101</td>
<td>Bioelectrical Engineering Lab</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 3303</td>
<td>Biotransport Phenomena</td>
<td>3</td>
</tr>
<tr>
<td>IH 0851/0951</td>
<td>Intellectual Heritage I: The Good Life/Honors Intellectual Heritage I: The Good Life</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 2196/2996</td>
<td>Technical Communication/Honors Technical Communication</td>
<td>3</td>
</tr>
<tr>
<td>MATH 2041/2941</td>
<td>Differential Equations I/Honors Differential Equations I</td>
<td>3</td>
</tr>
</tbody>
</table>

**Credit Hours: 18**
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 3041</td>
<td>Differential Equations I</td>
<td></td>
</tr>
<tr>
<td>or MATH 3941</td>
<td>or Honors Differential Equations I</td>
<td></td>
</tr>
</tbody>
</table>

**Spring**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 3401</td>
<td>Applications of Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 4101</td>
<td>Biomechanics Lab</td>
<td>3</td>
</tr>
<tr>
<td>IH 0852</td>
<td>Intellectual Heritage II: The Common Good</td>
<td>3</td>
</tr>
<tr>
<td>or IH 0952</td>
<td>or Honors Intellectual Heritage II: The Common Good</td>
<td>3</td>
</tr>
<tr>
<td>GenEd Breadth Course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Free Elective #1</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Credit Hours**

15

**Year 4**

**Fall**

Bioengineering Capstone - select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 4333</td>
<td>Capstone Elective: Applied Biospectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 4411</td>
<td>Capstone Elective: Biomaterials</td>
<td></td>
</tr>
<tr>
<td>BIOE 4431</td>
<td>Capstone Elective: Neuroengineering</td>
<td></td>
</tr>
<tr>
<td>BIOE 4461</td>
<td>Capstone Elective: Principles of Tissue Engine</td>
<td></td>
</tr>
<tr>
<td>BIOE 4501</td>
<td>Capstone Elective: Regenerative Engineering</td>
<td></td>
</tr>
<tr>
<td>BIOE 4555</td>
<td>Capstone Elective - Biophotonics: Seeing is Believing</td>
<td>3</td>
</tr>
</tbody>
</table>

Bioengineering Design Course - select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOE 3402</td>
<td>Design Elective: Biodesign</td>
<td>3</td>
</tr>
<tr>
<td>BIOE 3512</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOE 4279</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOE Elective</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GenEd Breadth Course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GenEd Breadth Course</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Credit Hours**

15

**Spring**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 4296</td>
<td>Capstone Senior Design Project</td>
<td>3</td>
</tr>
<tr>
<td>or ENGR 4996</td>
<td>or Honors Capstone Senior Design Project</td>
<td></td>
</tr>
<tr>
<td>BIOE 4311</td>
<td>The Entrepreneurial Bioengineer</td>
<td>3</td>
</tr>
<tr>
<td>GenEd Breadth Course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>GenEd Breadth Course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Free Elective #2</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Credit Hours**

15

**Total Credit Hours**

128

**Other Approved Technical Electives (check for prerequisites)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 3096</td>
<td>Cell Structure and Function</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 3352</td>
<td>Systems Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>CIS 1057</td>
<td>Computer Programming in C</td>
<td>4</td>
</tr>
<tr>
<td>ECE 2332</td>
<td>Principles of Electric Circuits</td>
<td>5</td>
</tr>
<tr>
<td>&amp; ECE 2333</td>
<td>and Principles of Electric Circuits Lab</td>
<td></td>
</tr>
<tr>
<td>ECE 3412</td>
<td>Classical Control Systems</td>
<td>4</td>
</tr>
<tr>
<td>&amp; ECE 3413</td>
<td>and Classical Control Laboratory</td>
<td></td>
</tr>
<tr>
<td>ECE 3512</td>
<td>Signals: Continuous and Discrete</td>
<td>4</td>
</tr>
<tr>
<td>or ECE 3912</td>
<td>or Honors Signals: Continuous and Discrete</td>
<td></td>
</tr>
<tr>
<td>ENGR 2011</td>
<td>Engineering Analysis &amp; Applications</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 2101</td>
<td>or Linear Algebra</td>
<td></td>
</tr>
<tr>
<td>or MEE 2011</td>
<td>or Linear Systems</td>
<td></td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>ENGR 3117</td>
<td>Computer-Aided Design (CAD)</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 3201</td>
<td>Material Science for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 3553</td>
<td>Mechanics of Fluids</td>
<td>3</td>
</tr>
<tr>
<td>or ENGR 3953</td>
<td>Honors Mechanics of Fluids</td>
<td></td>
</tr>
</tbody>
</table>