BIOLOGICAL ENGINEERING, B.S.

Begin Campus: Any Penn State Campus
End Campus: University Park

Degree Requirements
For the Bachelor of Science degree in Biological Engineering, a minimum of 128 credits is required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>110-111</td>
</tr>
</tbody>
</table>

27 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 3 credits of GS courses; 9 credits of GWS courses.

Requirements for the Major
To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44).

Common Requirements for the Major (All Options)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 460W</td>
<td>Biological Engineering Design I</td>
<td>2</td>
</tr>
<tr>
<td>BE 466W</td>
<td>Biological Engineering Design II</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>Experimental Chemistry I</td>
<td>1</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Several Variables</td>
<td>2</td>
</tr>
<tr>
<td>BE 301</td>
<td>Mathematical Modeling of Biological and Physical Systems</td>
<td>3</td>
</tr>
<tr>
<td>BE 302</td>
<td>Heat and Mass Transfer in Biological Systems</td>
<td>4</td>
</tr>
<tr>
<td>BE 304</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>BE 305</td>
<td>Agricultural Measurements and Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>BE 308</td>
<td>Engineering Elements of Biochemistry and Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BE 391</td>
<td>Communication Skills for BE and ABSM Students</td>
<td>2</td>
</tr>
<tr>
<td>BE 392</td>
<td>Leadership and Ethics for BE and ABSM Students</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 110</td>
<td>Chemical Principles I</td>
<td>3</td>
</tr>
<tr>
<td>EDSGN 100</td>
<td>Cornerstone Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 211</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 212</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EMCH 213</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATH 140</td>
<td>Calculus With Analytic Geometry I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus with Analytic Geometry II</td>
<td>4</td>
</tr>
<tr>
<td>ME 300</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics: Electricity and Magnetism</td>
<td>4</td>
</tr>
</tbody>
</table>

Additional Courses
Select one of the following: 3

- AGBM 101 Economic Principles of Agribusiness Decision Making
- ECON 102 Introductory Microeconomic Analysis and Policy
- ECON 104 Introductory Macroeconomic Analysis and Policy

Additional Courses: Require a grade of C or better
Select one of the following: 3

- IE 424 Process Quality Engineering
- STAT 240 Introduction to Biometry
- STAT 250 Introduction to Biostatistics
- STAT/MATH 318 Elementary Probability
- STAT 401 Experimental Methods
- STAT/MATH 418 Introduction to Probability and Stochastic Processes for Engineering

Supporting Courses and Related Areas
Select credits from the following: 6

- BE 303 Structural Systems in Agriculture
- BE 306 Machines for Agricultural and Biological Processing
- BE 307 Principles of Soil and Water Engineering

Additional Courses: Require a grade of C or better
Select credits from the following: 3

- CAS 100 Effective Speech
- CAS 100A Effective Speech
- CAS 100B Effective Speech
- CAS 100C Effective Speech
- CAS/ENGL 138T Rhetoric and Civic Life II

Select credits from the following: 3

- ENGL 15 Rhetoric and Composition
- ENGL 30H Honors Rhetoric and Composition
- ENGL/CAS 137H Rhetoric and Civic Life I

Supporting Courses and Related Area: Require a grade of C or better
Select credits from the following: 6

Additional Courses
Select credits from the following: 3

- MATH 251 Ordinary and Partial Differential Equations
- MATH 250 Ordinary Differential Equations
- MATH 252 Ordinary Differential Equations

Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. These courses must be chosen so that...
the engineering design and engineering science requirements for the major are met.  

2 Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHW category upon completion of the ROTC program.

### Food and Biological Processing Engineering Option (33-34 credits)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE 465</td>
<td>Food and Biological Process Engineering</td>
<td>3</td>
</tr>
<tr>
<td>BE 468</td>
<td>Microbiological Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

### Additional Courses

- Select one of the following: 3-4 credits
  - BIOL 230W: Biology: Molecules and Cells
  - BMB 211: Elementary Biochemistry
  - BMB/MICRB 251: Molecular and Cell Biology I
  - BME 201: Fundamentals of Cells and Molecules

### Supporting Courses and Related Areas

- Select 6 credits in emphasis technical elective
- Select 6 credits in engineering science/design
- Select 6 credits in technical selection

1 Courses to be selected from a list approved by the Agricultural and Biological Engineering faculty. These courses must be chosen so that the engineering design and engineering science requirements for the major are met.  

2 Students may apply 3 credits of ROTC to the technical selection category and 3 credits to the GHW category upon completion of the ROTC program.

### General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

#### Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

#### Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)
- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

### Integrative Studies
- Inter-Domain Courses (Inter-Domain): 6 credits

### Exploration
- GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student's degree program, whichever is higher: 6 credits

### University Degree Requirements

#### First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.
First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

**Cultures Requirement**
6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

**Writing Across the Curriculum**
3 credits required from the college of graduation and likely prescribed as part of major requirements.

**Total Minimum Credits**
A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

**Quality of Work**
Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

**Limitations on Source and Time for Credit Acquisition**
The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.