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 129 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>111-114</td>
</tr>
</tbody>
</table>

27-30 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; and 0-3 credits of GHW courses.

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 (http://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.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Knowledge Domains
- Arts (GA): 6 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 6 credits
- Social and Behavioral Sciences (GS): 6 credits
- Natural Sciences (GN): 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)
- Inter-Domain or Approved Linked Courses: 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 (http://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.

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 (http://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>Prescribed Courses: Require a grade of C or better</td>
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<td></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>Engineering Properties of Food and Biological Materials</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>
</tbody>
</table>
Agricultural Engineering Option (36 credits)

Requirements for the Option

Select one of the following:
- 6 credits in technical selection
- 6 credits in biological/engineering science
- 6 credits in engineering science/design
- 3 credits in math/basic science
- Supporting Courses and Related Areas

Supporting Courses and Related Areas

Select one of the following:
- CE 360 Engineering Thermodynamics I
- ENGL 15 Rhetoric and Composition
- MATH 140 Calculus With Analytic Geometry I
- MATH 141 Calculus With Analytic Geometry II
- MATH 251 Ordinary and Partial Differential Equations
- ME 300 Engineering Thermodynamics I
- PHYS 211 General Physics: Mechanics
- PHYS 212 General Physics: Electricity and Magnetism

Additional Courses

Select 3 credits in technical selection

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

Additional Courses: Require a grade of C or better

CAS 100A Effective Speech
or CAS 100B Effective Speech

Food and Biological Processing Engineering Option (39 credits)

Prescribed Courses

BE 465 Food and Biological Process Engineering
BE 468 Microbiological Engineering
BMB 211 Elementary Biochemistry
CHEM 202 Fundamentals of Organic Chemistry I
IE 424 Process Quality Engineering
NUTR 100 Nutrition Applications for a Healthy Lifestyle

Additional Courses

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

Additional Courses: Require a grade of C or better

CE 360 Fluid Mechanics
or ME 320 Fluid Flow

Supporting Courses and Related Areas

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.

Natural Resources Engineering Option (36 credits)

Prescribed Courses

BE 467 Design of Stormwater and Erosion Control Facilities
BE 477 Land-Based Waste Disposal
BE 487
SOILS 101 Introductory Soil Science

Additional Courses

IE 424 Process Quality Engineering
or STAT 401 Experimental Methods

Supporting Courses and Related Areas

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.

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