



UNDERGRADUATE MAJOR IN

PENN STATE ENGINEERING

Biological Engineering

For more information, contact:

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PROGRAM GOALS

The educational goals of the biological engineering program are described online at www.abe.psu.edu/programobj.html.

A student can select the Agricultural Engineering Option or the Biological and Food Engineering Option.

The Agricultural Engineering Option provides emphasis in one or more of the following three areas;

1. Engineering for the protection of the environment from non-point source pollution, including sedimentation loss, nutrient and chemical run-off, and stormwater management.
2. Structural design and environmental control with a focus on design of wood structures.
3. Machinery design and systems management, including off-road equipment for agricultural production, construction, forestry, and food processing.

The Biological and Food Engineering Option provides specialization in the many engineering aspects associated with the following two areas:

1. Engineering of microbiological systems for pharmaceuticals, renewable energy, biomass conversion, vitamin and food supplements, and systems to eradicate pathogens for food safety.
2. Food processing, handling, and storage from the time food is produced until it reaches consumers.

The biological engineering major leads to the bachelor of science degree. Like other engineering majors,

Biological engineers apply engineering principles to biological and agricultural systems, both of which greatly impact our food and fiber supply. A degree in biological engineering prepares students for many exciting career opportunities in the diverse areas of production of food and other biological materials, processing systems, and protection of land and water resources. Employment opportunities for biological engineers will continue to increase as the world's population demands more abundant supplies of nutritious, high-quality food at affordable prices while decreasing the environmental impact of biological and agricultural materials production and processing. The major offers challenging and rewarding careers for students who:

- wish to combine interests in engineering, biological sciences, and the environment;
- want to apply engineering to living, biological systems;
- like to experiment with machinery, structures, processes, or electronic systems;
- enjoy finding engineering solutions to critical problems in food production, food safety, and environmental resources; or
- enjoy working outdoors part of the time.

students in this major take courses in mathematics, physics, chemistry, solid mechanics, and general engineering. The curriculum is broadened by courses in communication skills, arts, humanities, social sciences, and other engineering disciplines.

COOPERATIVE EDUCATION

The College of Engineering's Cooperative Education program is available in this major. Beginning with the junior year, co-op students alternate semesters of work and study (using the summer sessions preceding the junior and senior years) to accrue a year's work experience. Typically, co-op delays graduation by at least one semester to earn a bachelor of science degree with a Certificate in Engineering Cooperative Education. For more information about the Biological Engineering Cooperative Education Program, contact:

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CAREER OPPORTUNITIES

Biological engineering graduates are in demand and are typically employed in a variety of career opportunities. About half of the department's graduates of the last 40 years work in private industry. The rest are employed in government service, at universities, and in other areas.

Graduates may work in research, design, development, testing, sales, and management positions.

Many of these jobs are with industries associated with biological and food processing, off-road machinery development, irrigation and drainage, environmental consulting, soil conservation, and materials handling or structures for animals, plants, and crop storage.

Opportunities abound for biological engineers with industry, consulting engineering firms, land-reclamation firms, and governmental agencies in the United States as well as international locations. Agricultural and biological engineers are especially qualified to cope with the various engineering aspects associated with food and fiber production within the constraints of environmental protection and natural resource conservation.

DEPARTMENT STATISTICS

The Department of Agricultural and Biological Engineering is composed of approximately 17 faculty, 130 undergraduate students, and 40 graduate students. The department offers B.S., M.S., and Ph.D. degrees in biological engineering.

ADMISSION REQUIREMENTS

To be eligible for consideration for entrance into the biological engineering major, a student must have completed, with a grade of C or better, the following requirements: CHEM 110, MATH 140, MATH 141, and PHYS 211.

AGRICULTURAL ENGINEERING OPTION

First Semester	CR	Second Semester	CR	Third Semester	CR	Fourth Semester	CR
(a) CHEM 110 Chemical Principles 3 EDSGN 100 Engineering Design 3 ENGL 015 Rhetoric & Comp 3 First-Year Seminar 1 GA, GH, or GS course 3 (a,c) MATH 140 or Math 140E Calculus I 4 Total 17		CHEM 111 Chemistry Lab 1 (b,d) E MCH 211 Statics 3 GA, GH, or GS course 3 Health & Phys Activity (GHA) 1.5 (a,c) MATH 141 or MATH 141E Calculus II 4 (a) PHYS 211 Mechanics 4 Total 16.5		(b,d) E MCH 213 Strength of Materials 3 (d) ECON 002, ECON 004, or AG BM 101 Economics (GS) 3 GA, GH, or GS course 3 Health & Phys Activity (GHA) 1.5 MATH 231 Vector Analysis 2 PHYS 212 Electricity & Mag 4 Total 16.5		(d) CAS 100A/B Effective Speech 3 (b,d) E MCH 212 Dynamics 3 (b) M E 300 Engr Thermo 3 MATH 251 Differential Equations 4 Math/Basic Science Selection 3 Total 16	
Fifth Semester	CR	Sixth Semester	CR	Seventh Semester	CR	Eighth Semester	CR
(b) B E 300 Bio Systems 3 (b) B E 301 Modeling Bio Sys 3 (b) B E 304 Engr Properties 3 (b) B E 308 Engr Biochem & Micro 3 (b) C E 360 Fluid Mechanics 3 Total 15		B E 391 Contextual Integration of Communication Skills 2 (b) B E 302 Transport Proc 3 (b) B E 303 Struc Sys Ag 2 (b) B E 305 Instrumentation 3 (b) B E 306 Power Sys Ag 2 B E 307 Soil & Water 2 GA, GH, or GS course 3 Total 17		B E 392 Contextual Integration of Leadership Skills 2 B E 46X Engineering Selection 3 Biology/Agriculture Selection 3 Engineering Science/Design Selection 3 I E 424 Statistical Quality Control 3 (f) Technical Elective 3 Total 17		B E 46X Engineering Selection 3 B E 469W Optimization 3 Engineering Science/Design Selection 3 GA, GH, or GS course 3 (f) Technical Elective 3 Total 15	

BIOLOGICAL AND FOOD ENGINEERING OPTION

First Semester	CR	Second Semester	CR	Third Semester	CR	Fourth Semester	CR
(a) CHEM 110 Chemical Principles 3 EDSGN 100 Engineering Design 3 ENGL 015 Rhetoric & Comp 3 First-Year Seminar 1 GA, GH, or GS course 3 (a,c) MATH 140 or Math 140E Calculus I 4 Total 17		CHEM 111 Chemistry Lab 1 (b,e) E MCH 211 Statics 3 GA, GH, or GS course 3 Health & Phys Activity (GHA) 1.5 (a,c) MATH 141 or MATH 141E Calculus II 4 (a) PHYS 211 Mechanics 4 Total 16.5		CAS 100A/B Effective Speech 3 (b,e) E MCH 213 Strength of Materials 3 GA, GH, or GS course 3 Health & Phys Activity (GHA) 1.5 MATH 231 Vector Analysis 2 PHYS 212 Electricity & Mag 4 Total 16.5		CHEM 202 Organic Chemistry 3 (b) E MCH 212 Dynamics 3 (e) ECON 002, ECON 004, or AG BM 101 Economics (GS) 3 (b) M E 300 Engr Thermo 3 MATH 251 Differential Equations 4 Total 16	
Fifth Semester	CR	Sixth Semester	CR	Seventh Semester	CR	Eighth Semester	CR
(b) B E 300 Bio Systems 3 (b) B E 301 Modeling Bio Sys 3 (b) B E 308 Engr Biochem & Microbiology 3 GA, GH, or GS course 3 (b) M E 320 Fluid Mechanics 3 Total 15		B E 391 Contextual Integration of Communication Skills 2 (b) B E 302 Transport Proc 3 (b) B E 305 Instrumentation 3 B M B 211 Biochemistry 3 GA, GH, or GS course 3 I E 424 Statistical Quality Control 3 Total 17		B E 392 Contextual Integration of Leadership Skills 2 (b) B E 304 Engr Properties 3 B E 465 Food Process Engr 3 Emphasis Technical Selection (Department List) 3 Engineering Science/Design Selection 3 (f) Technical Elective 3 Total 17		B E 468 Microbiol Engr 3 B E 469W Optimization 3 Emphasis Technical Selection (Department List) 3 Engineering Science/Design Selection 3 (f) Technical Elective 3 Total 15	

NOTE: All B E courses are offered only once a year in the semester shown on the schedules above (odd-numbered semesters correspond to Fall, even-numbered semesters correspond to Spring).

(a) Courses listed in **boldface italic type** require a grade of C or better for entrance to this major.

(b) Courses listed in **boldface type** require a grade of C or better for graduation in this major.

(c) MATH 140E and 141E are only available at University Park.

(d) At Commonwealth Campuses, students should take:
ECON 002 or ECON 004 instead of E MCH 211 in the second semester;
CAS 100 instead of ECON 002 or ECON 004 and E MCH 211 instead of E MCH 213 in the third semester; and
E MCH 213 instead of CAS 100 in the fourth semester.

(e) At Commonwealth Campuses, students should take:
ECON 002 or 004 instead of EMCH 211 in the second semester;
E MCH 211 instead of E MCH 213 in the third semester; and
E MCH 213 instead of ECON 002 or ECON 004 in the fourth semester.

(f) Six credits of ROTC may be substituted for six technical elective credits.

This publication is available in alternative media on request.

Penn State is committed to affirmative action, equal opportunity, and the diversity of its workforce.

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