

# Department of Agricultural and Biological Engineering

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## Biological Engineering (BE)

Biological Engineering is that branch of the engineering profession which deals with engineering problems encountered in biological systems.

The responsibilities of the Biological Engineer may include the need for more complex food-producing systems, controlling and monitoring the deterioration of the earth's environment, the replacement of living organs and artificial organs, the use of new technologies to assist the disabled, and the creation of new engineering designs based on the inherently creative characteristics of living systems.

The curriculum in Biological Engineering is designed to give the student a thorough grounding in the basic sciences of mathematics, physics, chemistry, taken with and followed by a series of courses in the engineering and biological sciences and biological engineering.

The educational objectives of the program are as follows:

1. To educate students in the academic discipline of Biological Engineering so that they can formulate and solve engineering problems involving biological systems.
2. To ensure that students develop effective written and oral communication skills.
3. To instruct students in the latest computer-based technology in engineering.
4. To develop the students' ability to work individually and in teams to complete engineering design projects.
5. To prepare students for employment in engineering jobs or for study in graduate and professional schools and for continual professional development.

**Biomedical Engineering Concentration.** Students interested in Biomedical Engineering may choose to pursue a concentration in Biomedical Engineering. This concentration is designed for undergraduate students in Biological Engineering who choose to pursue biomedical engineering as a career option. Biomedical Engineering is the rapidly growing interdisciplinary field of engineering that studies the integration of the engineering and biomedical sciences to solve problems associated with the human body and human health. The department has a rich history of biomedical engineering research and teaching that goes back to the early 1970s when the Biological Engineering curriculum at MSU was in its infancy. Students concentrating in biomedical engineering will gain knowledge in biomechanics, biomaterials, bioinstrumentation, physiology, and other topic areas germane to the field. The undergraduate Biomedical Engineering concentration is excellent preparation for students wishing to pursue graduate studies in Biomedical Engineering.

**Ecological Engineering Emphasis.** The Ecological Engineering program at Mississippi State University addresses environmental problems through the application of basic engineering in concert with principles of ecology and biology. Man has shown repeatedly that working opposition to natural processes leads either to failure or

to expensive and energy-intensive temporary solutions. Ecological engineering attempts to apply and emulate the rules that govern natural systems in order to meet human needs in ways that are sustainable.

**Bioenergy Emphasis.** Biological engineers can engage in environmental conservation and Bioenergy technologies use renewable biomass resources to produce an array of energy-related products including electricity, liquid, solid, and gaseous fuels, heat, chemicals, and other high volume materials. Students in this emphasis area gain knowledge in the fundamentals of energy production, thermodynamics, alternative energy sources and biomass conversion into biofuels. The Bioenergy program prepares students to take up a career in the energy sector industry or government agencies, as well as pursue research in energy production from renewable sources.

**Premedical Emphasis.** The Biological Engineering curriculum offers a premedical emphasis which not only leads to a degree in Biological Engineering but also prepares students for acceptance into most medical, dental, and veterinary schools. Students completing this program have demonstrated their ability to tackle tough subjects, perform well under stressful conditions, work together in teams, learn new material, and achieve ambitious goals - characteristics desired by the best medical, dental, and veterinary schools.

The Biological Engineering degree and the Biomedical Engineering concentration curricula are offered by the Department of Agricultural and Biological Engineering which is jointly administered by the College of Engineering and the College of Agricultural and Life Sciences.

The Biological Engineering Program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

## General Education Requirements

### English Composition

EN 1103	English Composition I	3
or EN 1163	Accelerated Composition I	
EN 1113	English Composition II	3
or EN 1173	Accelerated Composition II	

### Mathematics

See Major Core

### Science

See Major Core

### Humanities

See General Education courses 6

### Fine Arts

See General Education courses 3

### Social/Behavioral Sciences

See General Education courses 6

### Major Core

**Math and Basic Science** 40

MA 1713	Calculus I	
MA 1723	Calculus II	
MA 2733	Calculus III	
MA 2743	Calculus IV	
MA 3253	Differential Equations I	
CH 1213	Chemistry I	
CH 1211	Investigations in Chemistry I	

CH 1223	Chemistry II
CH 1221	Investigations in Chemistry II
CH 2503	Elementary Organic Chemistry
CH 2501	Elementary Organic Chemistry Laboratory
PH 2213	Physics I
PH 2223	Physics II
BIO 3304	General Microbiology
BCH 4013	Principles of Biochemistry

**Engineering Topics** 39

ABE 1911	Engineering in the Life Sciences
ABE 1921	Introduction to Engineering Design
ABE 4803	Biosystems Simulation
ABE 3413	Bioinstrumentation I
ABE 3303	Transport in Biological Engineering
ABE 4423	Bioinstrumentation II
ABE 3813	Biophysical Properties of Materials
ABE 4813	Principles of Engineering Design
ABE 4833	Practices of Engineering Design
ABE 4911	Engineering Seminar
CSE 1233	Computer Programming with C
EM 2413	Engineering Mechanics I
EM 2433	Engineering Mechanics II
EM 3213	Mechanics of Materials
EM 3313	Fluid Mechanics

**Oral Communication Requirement**

GE 3513	Technical Writing (Satisfied by successful completion of GE 3513)	3
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**Writing Requirement**

GE 3513	Technical Writing	3
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**Computer Literacy**

Fulfilled in Engineering Topics courses

**Choose one of the following sets of courses to complete the degree:** 25-26**Biological Engineering Degree Requirements**

ABE 4313	Biological Treatment of Nonpoint Source Pollutants
ABE 4323	Physiological Systems in Biomedical Engineering
BIO Science Elective	
BIO Science Elective	
BIO Science Elective or Engineering elective	
Approved Engineering Electives	
ABE Elective	

**Biomedical Engineering Concentration (BME)**

ABE 4323	Physiological Systems in Biomedical Engineering	
ABE 4523	Biomedical Materials	
ABE 4613	Biomechanics	
ABE 4723	Tissue Engineering and Regeneration	
BIO 1134	Biology I	4
Restricted BIO Science Elective	<sup>1</sup>	
Restricted Engineering/Math Electives	<sup>2</sup>	

**Total Hours** <sup>128</sup>

- 1 Restricted BIO Science Electives. Select from: BIO 2103, BIO 3504, BIO 4114, BIO 4405, BIO 4413, BIO 4433, BIO 4503, BIO 4504, BIO 4514, ADS 4613, BCH 4113, CVM 2443.
- 2 Restricted Engineering Electives. Select from: EM 4123, EM 4133, EM 4213, ME 3113, ME 3533, ME 4123, ME 4743, ME 4833, EG 1143, CSE 4613, CSE 4623, IE 4113, IE 4173, IE 4533. **Restricted Engineering/Math Electives:** ABE 4513, ABE 4533, ABE 4624, ABE 4723, MA 3113, MA 3353, MA 4373, MA 4543, ECE 3714, ECE 3443, IE 4733, IE 4743.