Department of Agricultural and Biological Engineering

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Biosystems Engineering (BSE)

Biosystems Engineering is the branch of the engineering profession that deals with problems encountered in biological systems including ecology, the rural environment, and agriculture. The responsibilities of the Biosystems Engineer often include designing solutions to problems in the following applications:

a. water issues in the rural environment such as infiltration, runoff, and evapotranspiration in crops.
b. biomass for energy and bio-based products
c. autonomous systems including sensors, artificial intelligence, and robotics and for agriculture and food-production systems.

The curriculum in Biosystems Engineering is designed to give the student a thorough grounding in the basic sciences of biological systems, mathematics, physics, and chemistry, followed by a series of fundamental and applied courses in engineering. Apart from preparing students to work in natural resources and agriculture, the B.S. in Biosystems Engineering is an excellent foundation for graduate study in biosystems engineering and other engineering disciplines, and preparation for entry into certain professional schools including law school. Biosystems Engineering students can choose to focus their course sequence on one of two emphasis areas:

Natural Resources and Environment. Agricultural activities and climatic changes affect the rural environment. Engineers are needed to design solutions to problems in this area, which can involve improving sustainable land-use practices, developing efficient water-usage strategies, improving water quality, and protecting and conserving soil and water resources. Students in this emphasis will take courses on soil and water management, nonpoint-source pollution, remote sensing, and geospatial computing. This emphasis prepares students for careers in land-use permitting, natural resource management, and conservation.

Autonomous Agricultural Systems. Worldwide trends demand that significantly more food be produced per acre, with less environmental risk, and with significantly less labor. This requirement can be met only with autonomous agricultural systems, which involve sensors, analytical tools like artificial intelligence, and mechatronic and robotic systems. Examples of such technologies include self-driving tractors, agricultural drones, and robotic harvesters. Students in this emphasis will take courses on sensors, imaging, machinery, and robotics. This emphasis prepares students for careers in design of agricultural machinery and systems as well as precision agriculture.

The B. S. program in Biosystems Engineering program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the commission's General Criteria and Program Criteria for Biological and Similarly Named Engineering Programs.

Biomedical Engineering (BME)

Biomedical Engineering (BME)

Biomedical Engineering is an interdisciplinary field of engineering that integrates engineering and life sciences to solve problems associated with the human body and human health. Biomedical engineers combine engineering principles with medical and biological sciences to design and create materials and devices, computer systems, software and equipment for use in healthcare. Examples include orthopaedic implants, drug pumps, cardiac assist devices, and bio-engineered skin.

The curriculum in Biomedical Engineering is designed to give the student a thorough grounding in the basic sciences of biological and medical sciences, mathematics, physics, and chemistry, followed by a series of fundamental and applied courses in engineering. Apart from preparing students to work in the biomedical industry, the B.S. in Biomedical Engineering is an excellent foundation for graduate study in many fields, including the further study of biomedical engineering, and preparation for entry into professional schools, including medical school, dental school, veterinary school, and law school. Biomedical engineering students can choose to focus their course sequence on one of three emphasis areas:

Biomaterials. Biomaterials play an integral role in medicine today – restoring function and facilitating healing for people after injury or disease. Biomaterials may be natural or synthetic and are used in medical applications to support, enhance, or replace damaged tissue or a biological function. The modern field of biomaterials combines medicine, biology, physics, and chemistry. Students in this emphasis will take courses in mechanics of materials, biomedical materials, and immunology. This emphasis prepares students for careers in the biomedical device industry.

Sensors and Instrumentation. In medicine and biotechnology, biomedical sensors are used to detect specific biological, chemical, or physical processes, which then transmit or report the monitored data. These sensors can also be components in systems that process clinical samples, such as increasingly common lab-on-a-chip devices. This emphasis also encompasses medical imaging technologies that are used to view the human body in order to diagnose, monitor, or treat medical conditions. Students in this emphasis will take courses in digital devices, machine control, artificial

intelligence (e.g. machine learning), and biological imaging. This emphasis prepares students for careers in the biomedical instrumentation and medical imaging industries.

Premedical. The Biomedical Engineering curriculum 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 B. S. program in Biomedical Engineering program is accredited by the Engineering Accreditation Commission of ABET, https://www.abet.org, under the commission's General Criteria and Program Criteria for Bioengineering and Biomedical and similarly named engineering programs.

The Biosystems Engineering and the Biomedical Engineering 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.

Biosystems Engineering

English Composition		
EN 1103	English Composition I	3
or EN 1104	Expanded English Composition I	
EN 1113	English Composition II	3
or EN 1173	Accelerated Composition II	
Mathematics		
See Major Core		
Science		
See Major Core		
Humanities		**6**
Any Gen Ed course		
Fine Arts		**3**
Any Gen Ed course		
Social/Behavioral Sciences		**6**
Any Gen Ed course		
Major Core		
Math and Basic Science		29
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	
PH 2213	Physics I	
PH 2223	Physics II	
Engineering Topics		40
ABE 1912	Computer Based Problem Solving in Biosystems Engineering	
ABE 1922	Introduction to Engineering Design	
ABE 3303	Transport in Biological Engineering	
ABE 3413	Bioinstrumentation I	
ABE 3513	The Global Positional System and Geographic Information Systems in Agriculture and Engineering	
ABE 3813	Biophysical Properties of Materials	
ABE 4803	Biosystems Simulation	
ABE 4813	Principles of Engineering Design	
ABE 4833	Practices of Engineering Design	
EM 2413	Engineering Mechanics I	
EM 2433	Engineering Mechanics II	

EM 3213	Mechanics of Materials	
EM 3313	Fluid Mechanics	
Oral Communication Requirement		
Fulfilled in GE 3513 and other ABE courses		
Writing Requirement		
GE 3513	Technical Writing	3
Computer Literacy		
Fulfilled in Engineering Topics courses		
Major Requirements and Engineering Electives		
ADS 1113	Animal Science	3
PSS 1313	Plant Science	3
PSS 3303	Soils	3
PSS 3301	Soils Laboratory	1
Restricted Engineering Electives *		9
Approved Engineering Electives **		6
ABE Electives		6
Math Elective (3000- or 4000-level MA or ST)		3
Laboratory or Seminar		1
Total Hours		**128**

* Restricted Engineering Electives: ABE 4313, ABE 4483, ABE 4990, CE 2803, CE 3503, CSE 4643, ME 3133, ME 3423, ME 3613, ME 4643

** Engineering Electives: ABE 2873, ABE 4263, ABE 4313, ABE 4483, ABE 4443, ABE 4463, ABE 4990, ASE 4423, ASE 4713, CE 2803, CE 3313, CE 3413, CE 3503, CE 3603, CE 3823, CE 4233, CE 4243, CE 4513, CE 4523, CE 4533, CE 4563, CE 4843, CE 4923, CE 4963, CE 4983, CHE 3113, CHE 3123, CHE 4163, CHE 4173, CHE 4613, CHE 4673, CHE 4683, CSE 3713, CSE 4153, CSE 4243, CSE 4413, CSE 4423, CSE 4503, CSE 4613, CSE 4623, CSE 4633, CSE 4643, CSE 4683, CSE 4693, ECE 3283, ECE 3443, ECE 4413, ECE 4423, ECE 4783, ECE 4813, ECE 4823, ECE 4943, IE 3323, IE 3913, IE 4113, IE 4173, IE 4333, IE 4353, IE 4513, IE 4533, IE 4553, IE 4573, IE 4613, IE 4623, IE 4653, IE 4673, IE 4683, IE 4713, IE 4743, IE 4753, IE 4923, ME 3133, ME 3103, ME 3163, ME 3313, ME 3403, ME 3423, ME 3513, ME 3523, ME 3613, ME 4113, ME 4123, ME 4133, ME 4193, ME 4223, ME 4233, ME 4343, ME 4353, ME 4403, ME 4413, ME 4423, ME 4443, ME 4453, ME 4543, ME 4623, ME 4643, ME 4833

Biomedical Engineering

English Composition		
EN 1103	English Composition I	3
or EN 1104	Expanded English Composition I	
EN 1113	English Composition II	3
or EN 1173	Accelerated Composition II	
Mathematics		
See Major Core		
Science		
See Major Core		
Humanities		**6**
Any Gen Ed course		
Fine Arts		**3**
Any Gen Ed course		
Social/Behavioral Sciences		**6**
Any Gen Ed course		
Major Core		
Math and Basic Science		33
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	
PH 2213	Physics I	
PH 2223	Physics II	
BIO 1134	Biology I	
Engineering Topics		43
ABE 1912	Computer Based Problem Solving in Biosystems Engineering	
ABE 1922	Introduction to Engineering Design	
ABE 3303	Transport in Biological Engineering	
ABE 3413	Bioinstrumentation I	
ABE 3813	Biophysical Properties of Materials	
ABE 4803	Biosystems Simulation	
ABE 4323	Physiological Systems in Biomedical Engineering	
ABE 4423	Bioinstrumentation II	
ABE 4813	Principles of Engineering Design	
ABE 4833	Practices of Engineering Design	
MA 3123	Introduction to Statistical Inference	
or IE 4613	Engineering Statistics I	
EM 2413	Engineering Mechanics I	
EM 2433	Engineering Mechanics II	
EM 3213	Mechanics of Materials	
EM 3313	Fluid Mechanics	
Oral Communication Requirement		
Satisfied by successful completion of GE 3513		
Writing Requirement		
GE 3513	Technical Writing	3
Computer Literacy		
Fulfilled in Engineering Topics courses		
Major Requirements and Engineering Electives		
BIO Science Elective *		3
Engineering/Technical Elective **		10
Engineering Electives		6
Engineering or Math/Physics Elective ***		3
ABE Elective ****		6
Total Hours		**128**

* Bio Sci Electives: BIO 2103, BIO 3004, BIO 3014, BIO 3103, BIO 3443, BIO 3504, BIO 3524, BIO 4113, BIO 4133, BIO 4143, BIO 4405, BIO 4413, BIO 4433, BIO 4503, BIO 4504, BIO 4514, ADS 4613, BCH 2023, BCH 4113, BCH 4443, CVM 2443, CVM 4193

** Engineering/Technical Electives: ABE 4911, ASE 3213, BIO 3304, BCH 4013, CH 2503, CH 2501, CH 4331, CH 4341, CH 4461, CH 4513, CH 4511, CH 4523, CH 4521, CHE 3413, CHE 4143, CSE 1233, CSE 1273, CSE 4613, CSE 4623, CSE 4683, ECE 3213, ECE 3413, ECE 3283, ECE 3423, ECE 3421, ECE 3424, ECE 3443, ECE 3714, ECE 4273, ECE 4293, IE 3121, EM 3413, EM 4123, EM 4133, EM 4143, EM 4213, IE 3123, IE 3913, IE 4113, IE 4553, IE 4623, IE 4683, IE 4733, IE 4743, IE 4753, EG 1143, ME 3113, ME 3163, ME 3403, ME 3423, ME 3513, ME 3613, ME 4113, ME 4123, ME 4233, ME 4643, ME 4723, ME 4833, SBP 3133

*** Math/Physics Electives: MA 3113, MA 3353, MA 4143, MA 4373, PH 2233, PH 3613, PH 4113

**** ABE Elective: ABE 3773, ABE 4443, ABE 4463, ABE 4523, ABE 4613, ABE 4723