Michigan State University | College of Engineering | Engineering Undergraduate Studies
1410 Engineering Building, East Lansing, MI 48824-1226 | (517) 355-6616 ext. 1
http://www.egr.msu.edu/undergraduate/academics/programs

Biosystems Engineering

Accredited by the Engineering Accreditation Commission of ABET, www.abet.org

1. University Requirements: (23)

Writing, Rhetoric and American Cultures (WRA)		4
Integrative Studies in Humanities (IAH)		8
Integrative Studies in Social Sciences (ISS)		8
Bioscience: BS 161	Cell and Molecular Biology	3

2. College Requirements: (30)

CEM 141	General Chemistry	4
EGR 100	Introduction to Engineering Design	2
EGR 102	Introduction to Engineering Modeling	2
MTH 132	Calculus I	3
MTH 133	Calculus II	4
MTH 234	Multivariable Calculus	4
MTH 235	Differential Equations	3
PHY 183	Physics for Scientists & Engineers I	4
PHY 184	Physics for Scientists & Engineers II	4

3. Major Requirements: (67-69)

a. Complete all of the following courses: (47)

BE 101	Introduction to Biosystems Engineering	1
BE 230	Engineering Analysis of Biological Systems	3
BE 332	Engineering Properties of Biological Materials	3
BE 334	Biosystems Engineering Laboratory Practice	3
BE 350	Heat and Mass Transfer in Biosystems	3
BE 351	Thermodynamics for Biological Engineering	3
BE 360	Microbial Systems Engineering	3
BE 385	Egr Design & Optimization for Biological Sys	3
BE 485	Biosystems Design Techniques	3
BE 487	Biosystems Design Project (W)	3
BS 162	Organismal and Population Biology	3
CE 221	Statics	3
CE 321	Introduction to Fluid Mechanics	4
CEM 143	Survey of Organic Chemistry	4
CEM 161	Chemistry Laboratory I	1

b. Select one of the following courses: (2)

BS 171	Cell and Molecular Biology Laboratory	2
BS 172	Organismal and Population Biology Laboratory	2

c. Select one of the following courses: (3-4)

MMG 301	Introductory Microbiology	3
PLB 301	Introductory Plant Physiology	3
PSL 250	Introductory Physiology	4
ZOL 341	Fundamental Genetics	4
ZOL 355	Ecology	3

d. Select one of the following courses: (3-4)

BLD 450	Eukaryotic Pathogens	3
CSS 442	Agricultural Ecology	3
FOR 404	Forest Ecology	3
FSC 440	Food Microbiology	3
MMG 425	Microbial Ecology	3
MMG 445	Microbial Biotechnology (W)	3
PLB 402	Biology of Fungi	3
PLB 424	Algal Biology	4
PSL 425	Physiological Biophysics	3

e. Select four of the following courses: (12)

BE 445	Biosensors for Medical Diagnostics	3
BE 456	Electric Power and Control	3
BE 469	Sustainable Bioenergy Systems	3
BE 477	Food Engineering: Fluids	3
BE 478	Food Engineering: Solids	3
BE 481	Water Resources Sys Anlys & Modeling	3
BE 482	Diffuse-Source Pollution Engineering	3
CHE 468	Biomass Conversion Engineering	3
ECE 445	Biomedical Instrumentation	3

Optional Concentrations

The department offers concentrations for students who wish to focus on a specific application area in the discipline. The concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in Biosystems Engineering. Courses completed to satisfy requirement 3. above may also be used to satisfy the requirements of a concentration. The concentration will be noted on the student's transcript.

Bioenergy Engineering Concentration

To earn a Bachelor of Science degree in Biosystems Engineering with a bioenergy engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. All of the following courses: (9)

BE 469	Sustainable Bioenergy Systems	3
CHE 468	Biomass Conversion Engineering	3
CSS 467	Bioenergy Feedstock Production	3

2. One of the following courses: (3-4)

MMG 445	Microbial Biotechnology (W)	3
PLB 402	Biology of Fungi	3
PLB 424	Algal Biology	4

3. One of the following courses: (3-4):

CHE 481	Biochemical Engineering	3
CHE 882	Advanced Biochemical Engineering	3
CHE 883	Multidisciplinary Bioprocessing Laboratory	3
GLG 471	Applied Geophysics	4
MC 450	International Environmental Law & Policy	3
ME 417	Design of Alternative Energy Systems	3
ME 422	Introduction to Combustion	3
MMG 445	Microbial Biotechnology (W)	3
PLB 402	Biology of Fungi	3
PLB 424	Algal Biology	4

Courses used to fulfill requirement 2. in this concentration may not be used to fulfill requirement 3.

Biomedical Engineering Concentration

To earn a Bachelor of Science degree in Biosystems Engineering with a biomedical engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. The following course: (3)

BE 445	Biosensors for Medical Diagnostics	3

2. One of the following courses: (3)

ECE 445	Biomedical Instrumentation	3
ME 494	Biofluid Mechanics and Heat Transfer	3

3. One of the following courses: (3)

BLD 450	Eukaryotic Pathogens	3
PSL 425	Physiological Biophysics	3

4. Two of the following: (5-6)

BLD 204	Mechanisms of Disease	3
BLD 430	Molecular Laboratory Diagnostics	2
BLD 434	Clinical Immunology	3
BLD 450	Eukaryotic Pathogens	3
ECE 445	Biomedical Instrumentation	3
ME 494	Biofluid Mechanics and Heat Transfer	3
MSE 425	Biomaterials and Biocompatibility	3
PLB 400	Introduction to Bioinformatics	3
PSL 425	Physiological Biophysics	3

Courses used to fulfill requirements 2. and 3. in this concentration may not be used to fulfill requirement 4.

Ecosystems Engineering Concentration

To earn a Bachelor of Science degree in Biosystems Engineering with an ecosystems engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

1. All of the following courses: (9)

BE 481	Water Resources Systems Analysis and Modeling	3
BE 482	Diffuse-Source Pollution Engineering	3
MMG 425	Microbial Ecology	3

2. Two of the following courses: (5-6)

CE 422	Applied Hydraulics	3
CSS 210	Fundamentals of Soil Science	3
CSS 330	Soil Chemistry	2
CSS 360	Soil Biology	3
CSS 442	Agricultural Ecology	3
CSS 455	Pollutants in the Soil Environment	3
FOR 404	Forest Ecology	3
FW 417	Wetland Ecology and Management	3
FW 420	Stream Ecology	3
FW 443	Restoration Ecology	3

Food Engineering Concentration

To earn a Bachelor of Science degree in Biosystems Engineering with a food engineering concentration, students must complete requirements 1., 2., and 3. above and the following:

All of the following courses: (9)

BE 477	Food Engineering: Fluids	3
BE 478	Food Engineering: Solids	3
FSC 440	Food Microbiology	3

Two of the following courses, one of which must be at the 400-level: (6-7)

BMB 200	Introduction to Biochemistry	4
FSC 211	Principles of Food Science	3
FSC 401	Food Chemistry	3
FSC 430	Food Processing: Fruits & Vegetables	3
FSC 431	Food Processing: Cereals	3
FSC 432	Food Processing: Dairy Foods	3
FSC 433	Food Processing: Muscle Foods	3

Other Electives (Variable)

Total Credits Required for Degree **128**

These requirements are effective for students admitted to the Biosystems Engineering major beginning Fall 2011. The Department of Biosystems and Agricultural Engineering (BAE) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with his/her adviser to obtain assistance in planning an appropriate schedule of courses. Students who have questions about Biosystems Engineering should contact the Biosystems Engineering Advising Office, 103 B Farrall Hall, phone (517) 355-3274. For scheduling academic advising appointments visit: https://www.egr.msu.edu/adcalendar/

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Sample Program

Freshman Year

Fall	Credits	Spring	Credits
BE 101	1	BS 161	3
CEM 141	4	EGR 102	2
CEM 161	1	ISS 2XX	4
EGR 100	2	MTH 133	4
MTH 132	3	PHY 183	4
WRA 1XX	4		
Total	**15**	**Total**	**17**

Sophomore Year

Fall	Credits	Spring	Credits
BS 162	3	BE 230	3
IAH 201-210 (A)	4	CE 221	3
MTH 234	4	CEM 143	4
PHY 184	4	IAH 211 or higher (B)	4
BE Choice B	2	MTH 235	3
Total	**17**	**Total**	**17**

Junior Year

Fall	Credits	Spring	Credits
BE 332	3	BE 350	3
BE 334	3	BE 360	3
BE 351	3	BE 385	3
CE 321	4	BE Choice C	3-4
ISS 3XX	4	Elective	3
Total	**17**	**Total**	**15-16**

Senior Year

Fall	Credits	Spring	Credits
BE 485	3	BE 487	3
BE Choice D	3-4	BE Choice E	3
BE Choice E	3	BE Choice E	3
Elective	3	Elective	3
BE Choice E	3	Elective	3
Total	**15-16**	**Total**	**15**

PROGRAM EDUCATIONAL OBJECTIVES

The overall purpose of the MSU Biosystems Engineering Undergraduate Program is to prepare graduates who will integrate and apply principles of engineering and biology to a wide variety of globally important problems. To achieve that purpose, the primary objectives of the Biosystems Engineering Program are to prepare graduates to:

- identify and solve problems at the interface of biology and engineering, using modern engineering techniques and the systems approach, and
- analyze, design, and control components, systems, and processes that involve critical biological components.

Additionally, the Biosystems Engineering Program is designed to help graduates succeed in diverse careers by developing a professional foundation that includes vision, adaptability, creativity, a practical mindset, effective communication skills for technical and non-technical audiences, the ability to work in diverse, cross-disciplinary teams, and a commitment to sustainability, continuing professional growth, and ethical conduct.

Approved by the Biosystems Engineering faculty (26 February 2010), the Biosystems Engineering Industry Advisory Board (15 April 2010), and the Biosystems Engineering Student Group (30 April 2010).

Last revised April 2011