AGRICULTURAL & BIOLOGICAL ENGINEERING: BIOPROCESS ENGINEERING AND INDUSTRIAL BIOTECHNOLOGY, BS

for the degree of Bachelor of Science in Agricultural & Biological Engineering, Bioprocess Engineering and Industrial Biotechnology Concentration

Graduates design and develop equipment and systems for the processing of food for human and animal use, biofuels, and other biological materials. Utilization of agricultural and biological materials presents unique engineering challenges to sustainably convert these natural resources into products needed by society. Examples include designing bioprocesses to convert cereal crops into food ingredients that optimize human and animal health and processing designs to convert biological materials into fuels and biochemicals while minimizing their environmental footprint.

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Graduation Requirements
Minimum Overall GPA: 2.0
Minimum hours required for graduation: 128 hours.

University Requirements
Minimum of 40 hours of upper-division coursework, generally at the 300- and 400-level. These hours can be drawn from all elements of the degree. Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (https://studentcode.illinois.edu/article3/part8/3-801/) (§ 3-801) and in the Academic Catalog (http://catalog.illinois.edu/general-information/degree-general-education-requirements/).

General Education Requirements
Students must complete the campus General Education (Gen Ed) requirements (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/), including the campus Gen Ed language requirement.

Code	Title	Hours
Composition I		4-6
Advanced Composition		3
	fulfilled by ABE 469	
Humanities & the Arts (6 hours)		6
Natural Sciences & Technology (6 hours)		6
	fulfilled by CHEM 102, CHEM 104, PHYS 211, PHYS 212, and MCB 100	
Social & Behavioral Sciences (6 hours)		6
	fulfilled by ECON 102, ACE 100, ACE 210, ACE 251, or ACE 255 and one other course approved as Social and Behavioral Sciences	
Cultural Studies: Non-Western Cultures (1 course)		3
Cultural Studies: US Minority Cultures (1 course)		3
Cultural Studies: Western/Comparative Cultures (1 course)		3
Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)		6-10
	fulfilled by CS 101, MATH 220 or MATH 221, MATH 231, MATH 241, MATH 285, PHYS 211, and PHYS 212	
Language Requirement (Completion of the third semester or equivalent of a language other than English is required)		0-15

Orientation and Professional Development

Code	Title	Hours
ABE 127	Introduction to Agricultural & Biological Engineering	2
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
Total Hours		**3**

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
Total Hours		**33**

Foundational Economics

Code	Title	Hours
Select one of the following:		
ECON 102	Microeconomic Principles	3
ACE 100	Introduction to Applied Microeconomics	4
ACE 210	Environmental Economics & Policy	3
ACE 251	The World Food Economy	3
ACE 255	Economics of Food and Environmental Justice	3

Agricultural and Biological Engineering Technical Core

Code	Title	Hours
ABE 128	Applied Biology for Agricultural and Biological Engineers	3

ABE 227	Computer-Aided Problem-Solving for ABE I	3
ABE 228	Computer-Aided Problem-Solving for ABE II	3
ABE 340	Thermodynamics for Agricultural and Biological Engineering	3
ABE 430	Project Management	2
ABE 469	Capstone Design Experience	4
CS 101	Intro Computing: Engrg & Sci	3
ECE 205	Electrical and Electronic Circuits	3
SE 101	Engineering Graphics & Design	3
IE 300	Analysis of Data	3
or STAT 400	Statistics and Probability I	
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
Total Hours		**36**

Concentration Requirements: complete a minimum of 30 hours from courses below

Code	Title	Hours
Required courses		
ABE 341	Transport Processes in ABE	3
ABE 425	Engrg Measurement Systems	4
ABE 483	Engineering Properties of Food Materials	3
ABE 488	Bioprocessing Biomass for Fuel	4
CHEM 232	Elementary Organic Chemistry I	4
MCB 100	Introductory Microbiology	3
Total Hours		**21**

Code	Title	Hours
Select 3 hours from the following:		
FSHN 471	Food & Industrial Microbiology	3
FSHN 481	Food Processing Unit Operations I	2
FSHN 482	Food Processing Unit Operations I Lab	1

Code	Title	Hours
Select an additional 6 hours from the following:		
FSHN 414	Food Chemistry	3
FSHN 471	Food & Industrial Microbiology	3
FSHN 472	Applied Food Microbiology	3
FSHN 481 & FSHN 482	Food Processing Unit Operations I and Food Processing Unit Operations I Lab	3
FSHN 483 & FSHN 484	Food Processing Unit Operations II and Food Processing Unit Operations II Lab	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 478	Bioenergy Technology	3

Code	Title	Hours
Total Minimum Concentration Hours		**30**

Code	Title	Hours
Free Electives		**10**
Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. (https://go.grainger.illinois.edu/FreeElectives/)		
Total Hours of Curriculum to Graduate		**128**

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Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. See the corresponding section on the Degree and General Education Requirements *(*http://catalog.illinois.edu/general-information/degree-general-education-requirements/*).*

Free Electives: Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives *(*https://go.grainger.illinois.edu/FreeElectives/*), so that there are at least 128 credit hours earned toward the degree.*

First Year

First Semester	Hours	Second Semester	Hours
ABE 127	2	ABE 128	3
ENG 100	1	PHYS 211	4
MATH 221 or 220	4	MATH 231	3
CHEM 102	3	CHEM 104	3
CHEM 103	1	CHEM 105	1
Composition I or General Education course	4	General Education course or Composition I	3
	15		**17**

Total Hours 32

Second Year

First Semester	Hours	Second Semester	Hours
ABE 227	3	ABE 228	3
CS 101	3	PHYS 212	4
MATH 241	4	MATH 285	3
SE 101	3	MATH 257	3
TAM 211	3	TAM 212	3
	16		**16**

Total Hours 32

Third Year

First Semester	Hours	Second Semester	Hours
ABE 340	3	IE 300 or STAT 400	3
ECE 205	3	ABE 425	4
MCB 100	3	ABE 341	3
CHEM 232	4	Choose 3 hours from 'Select 3 hours' list	3
General Education course	3	Foundational Economics course	3
	16		**16**

Total Hours 32

Fourth Year

First Semester	Hours	Second Semester	Hours
ABE 430	2	ABE 469	4
ABE 488	4	Choose 3 hours from 'Select 6 hours' list	3
Choose 3 hours from 'Select 6 hours' list	3	ABE 483	3
General Education course (choose one course that fulfills two categories)	3	General Education course	3
Language Other than English (3rd level)	4	General Education course	3
	16		**16**

Total Hours 32

Total Hours: 128

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1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

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Agricultural and Biological Engineering (https://abe.illinois.edu/undergraduate/)

Agricultural & Biological Engineering Faculty (https://abe.illinois.edu/directory/faculty/)

College of Agricultural, Consumer & Environmental Sciences (https://aces.illinois.edu/)
Grainger College of Engineering (https://grainger.illinois.edu/)