

AGRICULTURAL & BIOLOGICAL ENGINEERING: SYNTHETIC BIOLOGICAL ENGINEERING, BS

for the degree of Bachelor of Science in Agricultural & Biological Engineering, Synthetic Biological Engineering Concentration

Graduates apply engineering principles to improve organisms by introducing new capabilities vital to food, energy, water, agricultural, and environmental sectors.

for the degree of Bachelor of Science in Agricultural & Biological Engineering, Synthetic Biological Engineering Concentration

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- or 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 150	
	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 or STAT 400	Analysis of Data Statistics and Probability I	3
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 446	Biological Nanoengineering	3
CHEM 232	Elementary Organic Chemistry I (with lab option)	4
MCB 150	Molecular & Cellular Basis of Life	4
Total Hours		18

Code	Title	Hours
Select one of the following:		
BIOE 430	Intro Synthetic Biology	3
CHBE 458	Synthetic Nanomaterials	3
CHBE 472	Techniques in Biomolecular Eng	3
CHBE 473	Biomolecular Engineering	3
CHBE 474	Metabolic Engineering	3
MSE 470	Design and Use of Biomaterials	3

Code	Title	Hours
Select 9 hours from the following (no more than 3 hours at 100 or 200 level):		
ANSC 100	Intro to Animal Sciences	4
ANSC 221	Cells, Metabolism and Genetics	3
ANSC 224	Animal Reproduction and Growth	4
ANSC 350	Principles of Biochemistry in Animals	3
ANSC 431	Advanced Reproductive Biology	3
ANSC 446	Population Genetics	3 or 4
CPSC 261	Biotechnology in Agriculture	3
CPSC 265	Genetic Engineering Lab	3
CPSC 352	Plant Genetics	4
CPSC 452	Advanced Plant Genetics	3
CPSC 466	Genomics for Plant Improvement	2
IB 103	Introduction to Plant Biology	4
IB 104	Animal Biology	4
IB 150	Organismal & Evolutionary Biol	4
IB 204	Genetics	4
IB 411	Bioinspiration	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 432	Genes and Behavior	3
MCB 100	Introductory Microbiology	3
MCB 250	Molecular Genetics	3

MCB 252	Cells, Tissues & Development	3
MCB 450	Introductory Biochemistry	3
MCB 424	Microbial Biochemistry	3
NRES 201	Introductory Soils	4
NRES 475	Environmental Microbiology	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
--	------------

for the degree of Bachelor of Science in Agricultural & Biological Engineering, Synthetic Biological Engineering Concentration

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		Hours
First Semester	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
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
Choose one concentration course from 'Select 9 hours' list	3	ABE 341	3
MCB 150	4	CHEM 232	4
General Education course	3	Foundational Economics course	3
		16	17

Total Hours 33**Fourth Year**

First Semester	Hours	Second Semester	Hours
ABE 430	2	ABE 469	4
Choose one concentration course from 'select one' list	3	ABE 446	3
Choose one concentration course from 'Select 9 hours' list	3	Choose one concentration course from 'Select 9 hours' list	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
		15	16

Total Hours 31**Total Hours: 128**

for the degree of Bachelor of Science in Agricultural & Biological Engineering, Synthetic Biological Engineering Concentration

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.

for the degree of Bachelor of Science in Agricultural & Biological Engineering, Synthetic Biological Engineering Concentration

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/>)