

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.

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Graduation Requirements

Minimum Overall GPA: 2.0

Minimum hours required for graduation: 128 hours, to include a minimum of 40 hours of upper-division coursework generally at the 300 and/or 400 level. These hours can be drawn from all elements of the degree.

General education: Students must complete the Campus General Education requirements including the campus general education language requirement. One of the Social and Behavioral Sciences (SBS) courses must include one of the following economics courses: ECON 102, ACE 100, ACE 210, ACE 251 or ACE 255. ABE 469 will satisfy a technical core course and the Campus General Education Advanced Composition requirement.

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

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	Molec & 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	Cellular Metabolism 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	3 or 4
IB 411	Bioinspiration	3
IB 420	Plant Physiology	3
IB 421	Photosynthesis	3
IB 432	Genes and Behavior	3
IB 472		1
IB 473		1
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
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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. This sample curriculum plan makes the assumption that the foreign language graduation requirement has been satisfied by completing three years of study of a single foreign language in high school. 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		4 MATH 231	3
(MATH 220 may be substituted)			
CHEM 102		3 CHEM 104	3
CHEM 103		1 CHEM 105	1
Composition I or General Education course (Humanities or Social & Behavioral Sciences course with Cultural Studies designation)		4 Composition I or General Education course (Humanities or Social & Behavioral Sciences course with Cultural Studies designation)	3
		15	17

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

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
Free Elective course		3 Choose one course from Social & Behavioral Sciences Course list: ECON 102, ACE 100, ACE 210, ACE 251, ACE 255	3
		16	17

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 (Humanities or Social & Behavioral Sciences course with Cultural Studies designation)	3 General Education course (Humanities or Social & Behavioral Sciences course with Cultural Studies designation)	3
Free Elective course	4 Free Elective course	3
	15	16

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 Website (<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/>)