

# AGRICULTURAL & BIOLOGICAL ENGINEERING: AGRICULTURAL ENGINEERING, BS

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

**department website:** <https://abe.illinois.edu/undergraduate/>  
**department faculty:** Agricultural & Biological Engineering Faculty  
(<https://abe.illinois.edu/directory/faculty/>)  
**college websites:** <https://aces.illinois.edu/> and <https://grainger.illinois.edu/>  
**email:** [abe@illinois.edu](mailto:abe@illinois.edu)

## Agricultural Engineering Concentration

Students pursuing B.S. Degree in Agricultural and Biological Engineering choose from one of two concentrations, one of which is the concentration in *Agricultural Engineering*. This concentration includes the integration of physical and biological sciences as a foundation for engineering applications in agriculture, food systems, energy, natural resources, the environment, and related biological systems. Students pursuing this concentration are involved in the design of systems for renewable energy, off-road equipment, water quality, and the utilization and protection of soil and water resources. Important design constraints are economics, conservation of materials and energy, safety, and environmental quality. Within this concentration, students are strongly encouraged to select a set of coherent courses that constitutes a specialization in their area of career interest either from the following list or a customized area chosen in consultation with an advisor.

- Bioenvironmental Engineering
- Renewable Energy Systems
- Off-Road Equipment Engineering
- Soil and Water Resources Engineering

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## Graduation Requirements

**Minimum Overall GPA: 2.0**

**Minimum hours required for graduation: 128 hours**

**General education: Students must complete the Campus General Education** (<https://courses.illinois.edu/gened/DEFAULT/DEFAULT/>) **requirements including the campus general education language requirement. One of the SBS courses must be an introductory economics course (ECON 102 or ECON 103 or ACE 100). Specific Advanced Composition course required for this degree is listed below.**

## Orientation and Professional Development

Code	Title	Hours
ABE 100	Intro Agric & Biological Engrg <sup>1</sup>	1
ENG 100	Engineering Orientation <sup>1</sup>	0
Total Orientation Hours:		1

## 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 <sup>2</sup>	4
MATH 225	Introductory Matrix Theory	2
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 285	Intro Differential Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
Total Foundational Mathematics and Science Hours:		34

## Agricultural and Biological Engineering Technical Core

Code	Title	Hours
<b>For Both Concentrations:</b>		
ABE 141	ABE Principles: Biological	2
ABE 223	ABE Principles: Machine Syst	2
ABE 224	ABE Principles: Soil & Water	2
ABE 225	ABE Principles: Bioenvironment	2
ABE 226	ABE Principles: Bioprocessing	2
ABE 430	Project Management	2
ABE 469	Industry-Linked Design Project <sup>3</sup>	4
CS 101	Intro Computing: Engrg & Sci	3
ECE 205	Electrical and Electronic Circuits	3
SE 101	Engineering Graphics & Design	3
TAM 210	Introduction to Statics <sup>4</sup>	2
or TAM 211	Statics	
TAM 212	Introductory Dynamics	3
Total Agricultural and Biological Engineering Technical Core Hours:		30
Total Hours		60

## Electives

Code	Title	Hours
	The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts <sup>5</sup>	6
	Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree. <sup>6</sup>	6
<b>Total Hours of Curriculum to Graduate</b>		<b>128</b>

<sup>1</sup> External transfer students take ENG 300 instead.

<sup>2</sup> MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

<sup>3</sup> ABE 469 satisfies the general education advanced composition requirement.

<sup>4</sup> The extra hour of credit for this course may be used to help meet free elective requirements.

<sup>5</sup> The Grainger College of Engineering approved liberal education course list can be found here (<https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-GeneralEducationElectives>).

<sup>6</sup> The Grainger College of Engineering restrictions to free electives can be found here (<https://wiki.illinois.edu/wiki/display/ugadvise/Degree+Requirements/#DegreeRequirements-FreeElectives>).

## Agricultural Engineering Concentration Requirements

Code	Title	Hours
ECE 206	Electrical and Electronic Circuits Lab	1
ME 200	Thermodynamics	3
TAM 251	Introductory Solid Mechanics	3
	Select one of the following:	3
ABE 440	Applied Statistical Methods I <sup>1</sup>	
CEE 202	Engineering Risk & Uncertainty	
IE 300	Analysis of Data	
STAT 400	Statistics and Probability I <sup>1</sup>	
	Select one of the following:	4
CHBE 421	Momentum and Heat Transfer	
ME 310	Fundamentals of Fluid Dynamics	
TAM 335	Introductory Fluid Mechanics	

### Electives

This elective course work must be completed to fulfill each Concentration. The subjects build upon the agricultural and biological engineering technical core.

<b>Biological and Natural Sciences Electives (at least 3 hours at 300 or 400 level)</b>		<b>6</b>
ANSC 100	Intro to Animal Sciences	4
ANSC 221	Cells, Metabolism and Genetics	3
ANSC 350	Cellular Metabolism in Animals	3
ANSC 350	Cellular Metabolism in Animals	3
ANSC 363	Behavior of Domestic Animals	4
ANSC 400	Dairy Herd Management	3
ANSC 401	Beef Production	3
ANSC 402	Sheep and Goat Production	3

ANSC 403	Pork Production	3
ANSC 404	Poultry Science	3
ANSC 406	Zoo Animal Conservation Sci	3
ANSC 450	Comparative Immunobiology	4
ATMS 201	General Physical Meteorology	3
ATMS 307	Climate Processes	3
CHEM 232	Elementary Organic Chemistry I	3 or 4
CHEM 233	Elementary Organic Chem Lab I	2
CHEM 312	Inorganic Chemistry	3
CHEM 332	Elementary Organic Chem II	4
CHEM 360	Chemistry of the Environment	3
CHEM 460	Green Chemistry	3 or 4
CPSC 112	Introduction to Crop Sciences	4
CPSC 261	Biotechnology in Agriculture	3
CPSC 265	Genetic Engineering Lab	3
CPSC 270	Applied Entomology	3
CPSC 352	Plant Genetics	4
CPSC 414	Forage Crops & Pasture Ecology	3
CPSC 415	Bioenergy Crops	3
CPSC 418	Crop Growth and Management	3
CPSC 431	Plants and Global Change	3
CPSC 437	Principles of Agroecology	3
CPSC 473	Mgmt of Field Crop Insects	3
FSHN 101	The Science of Food and How it Relates to You	3
FSHN 414	Food Chemistry	3
FSHN 416	Food Chemistry Laboratory	3
FSHN 461		
FSHN 471	Food & Industrial Microbiology	3
GEOL 107	Physical Geology	4
GEOL 380	Environmental Geology	4
HORT 100	Introduction to Horticulture	3
HORT 341	Greenhouse Mgmt and Production	4
HORT 344	Planting for Biodiversity and Aesthetics	3
HORT 360	Vegetable Crop Production	3
HORT 361	Small Fruit Production	2
HORT 362	Tree Fruit Production	2
HORT 363	Postharvest Handling Hort Crop	2
HORT 421	Horticultural Physiology	4
HORT 435	Urban Food Production	3
IB 103	Introduction to Plant Biology	4
IB 150	Organismal & Evolutionary Biol	4
IB 151	Organismal & Evol Biol Lab	1
IB 203	Ecology	4
IB 329	Animal Behavior	3
IB 335	Plant Systematics	4
IB 411	Bioinspiration	3
IB 420	Plant Physiology	3
IB 439	Biogeography	3
IB 444	Insect Ecology	3 or 4
IB 452	Ecosystem Ecology	3
IB 482	Insect Pest Management	3

IB 485	Environ Toxicology & Health	3	ABE 488	Bioprocessing Biomass for Fuel	4
IB 486	Pesticide Toxicology	3 or 4	BIOE 301		
MCB 100	Introductory Microbiology	3	BIOE 416	Biosensors	3
MCB 101	Intro Microbiology Laboratory	2	BIOE 461	Cellular Biomechanics	4
MCB 150	Molec & Cellular Basis of Life	4	BIOE 467	Biophotonics	3
MCB 151	Molec & Cellular Laboratory	1	BIOE 473		
MCB 244	Human Anatomy & Physiology I	3	BIOE 474		
MCB 245	Human Anat & Physiol Lab I	2	BIOE 476	Tissue Engineering	3
MCB 250	Molecular Genetics	3	CHBE 221	Principles of CHE	3
MCB 251	Exp Techniqs in Molecular Biol	2	CHBE 422	Mass Transfer Operations	4
MCB 252	Cells, Tissues & Development	3	CHBE 424	Chemical Reaction Engineering	3
MCB 253	Exp Techniqs in Cellular Biol	2	CHBE 471	Biochemical Engineering	3 or 4
MCB 300	Microbiology	3	CHBE 472	Techniques in Biomolecular Eng	3 or 4
MCB 301	Experimental Microbiology	3	CHBE 473	Biomolecular Engineering	3 or 4
MCB 314	Introduction to Neurobiology	3	CHBE 475	Tissue Engineering	3
MCB 316	Genetics and Disease	4	CHBE 476	Biotransport	3
MCB 450	Introductory Biochemistry	3	CHBE 478	Bioenergy Technology	3
NRES 201	Introductory Soils	4	CEE 300	Behavior of Materials	4
NRES 219	Applied Ecology	3	CEE 330	Environmental Engineering	3
NRES 348	Fish and Wildlife Ecology	3	CEE 350	Water Resources Engineering	3
NRES 351	Introduction to Environmental Chemistry	3	CEE 360	Structural Engineering	3
NRES 419	Env and Plant Ecosystems	3	CEE 380	Geotechnical Engineering	3
NRES 420	Restoration Ecology	4	CEE 430	Ecological Quality Engineering	2
NRES 429	Aquatic Ecosystem Conservation	3	CEE 432	Stream Ecology	3 or 4
NRES 439	Env and Sustainable Dev	3	CEE 434	Environmental Systems I	3
NRES 471	Pedology	3	CEE 437	Water Quality Engineering	3
NRES 475	Environmental Microbiology	3	CEE 440	Fate Cleanup Environ Pollutant	4
NRES 487	Soil Chemistry	3	CEE 442	Environmental Engineering Principles, Physical	4
NRES 488	Soil Fertility and Fertilizers	3	CEE 443	Env Eng Principles, Chemical	4
PLPA 204			CEE 444	Env Eng Principles, Biological	4
PLPA 405	Plant Disease Diagnosis & Mgmt	3	CEE 445	Air Quality Modeling	4
PLPA 407			CEE 446	Air Quality Engineering	4
<b>Technical electives chosen in consultation with an advisor. At least 8 hours must be Agricultural and Biological Engineering courses</b>		<b>15</b>	CEE 447	Atmospheric Chemistry	4
ABE 341	Transport Processes in ABE	3	CEE 449	Environmental Engineering Lab	3
ABE 361	Off-Road Machine Design	3	CEE 450	Surface Hydrology	3
ABE 425	Engr Measurement Systems	4	CEE 451	Environmental Fluid Mechanics	3
ABE 436	Renewable Energy Systems	3 or 4	CEE 452	Hydraulic Analysis and Design	3
ABE 446	Biological Nanoengineering	3 or 4	CEE 453	Urban Hydrology and Hydraulics	4
ABE 454	Environmental Soil Physics	3	CEE 457	Groundwater	3
ABE 455	Erosion and Sediment Control	2	CEE 458	Water Resources Field Methods	4
ABE 456	Land & Water Resources Engr	3 or 4	CEE 461	Reinforced Concrete I	3
ABE 457	NPS Pollution Processes	2	CEE 463	Reinforced Concrete II	3 or 4
ABE 458	NPS Pollution Modeling	2	CEE 465	Design of Structural Systems	3
ABE 459	Drainage and Water Management	3 or 4	CEE 470	Structural Analysis	4
ABE 463	Electrohydraulic Systems	3	CEE 480		
ABE 466	Engineering Off-Road Vehicles	3	CEE 483	Soil Mechanics and Behavior	4
ABE 474	Indoor Environmental Control	3 or 4	CEE 484	Applied Soil Mechanics	3 or 4
ABE 476	Indoor Air Quality Engineering	4	CS 466	Introduction to Bioinformatics	3 or 4
ABE 482	Package Engineering	3	ECE 333	Green Electric Energy	3
ABE 483	Engineering Properties of Food Materials	3	ECE 468	Optical Remote Sensing	3
			ECE 470	Introduction to Robotics	4

ECE 481	Nanotechnology	4
ENG 471	Seminar Energy & Sustain Engrg	1
SE 320	Control Systems	4
SE 423	Mechatronics	3
IE 431	Design for Six Sigma	3
ME 320	Heat Transfer	4
ME 330	Engineering Materials	4
ME 340	Dynamics of Mechanical Systems	3.5
ME 370	Mechanical Design I	3
ME 371	Mechanical Design II	3
ME 400	Energy Conversion Systems	3 or 4
ME 402	Design of Thermal Systems	3 or 4
ME 403	Internal Combustion Engines	3 or 4
ME 461	Computer Cntrl of Mech Systems	3 or 4
ME 483	Mechanobiology	4
MSE 280	Engineering Materials	3
MSE 401	Thermodynamics of Materials	3
MSE 470	Design and Use of Biomaterials	3
MSE 473	Biomolecular Materials Science	3
MSE 474	Biomaterials and Nanomedicine	3
MSE 489	Matl Select for Sustainability	3 or 4
NPRE 201	Energy Systems	2 or 3
NPRE 470	Fuel Cells & Hydrogen Sources	3
NPRE 475	Wind Power Systems	3 or 4

<sup>1</sup> The extra hour of credit for this course may be used to help meet free elective requirements.

## Suggested Sequence

The curriculum sequence below is a suggested sequence, as all Grainger Engineering students work with a department academic advisor to achieve their educational goals, specific to their needs and preparation. Dynamic and Static curricular maps, which include prerequisite sequencing, can be found here (<https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/cee-map/>).

### First Year

First Semester	Hours
ABE 100 Intro Agric Biological Engrg	1
ENG 100 Engineering Orientation	0
MATH 221 <sup>1</sup> Calculus I	4
CHEM 102 General Chemistry I	3
CHEM 103 General Chemistry Lab I	1
RHET 105 Writing and Research or SE 101 <sup>2</sup>	4-3
General education elective <sup>3,4</sup>	3
<b>Semester Hours</b>	<b>16-15</b>

### Second Semester

ABE 141 ABE Principles: Biological	2
MATH 231 Calculus II	3
CHEM 104 General Chemistry II	3
CHEM 105 General Chemistry Lab II	1
PHYS 211 University Physics: Mechanics	4

SE 101 Engineering Graphics Design or RHET 105 <sup>2</sup>	3-4
<b>Semester Hours</b>	<b>16-17</b>

### Second Year

#### First Semester

ABE 223 ABE Principles: Machine Syst	2
ABE 224 ABE Principles: Soil Water	2
MATH 241 Calculus III	4
PHYS 212 University Physics: Elec Mag	4
CS 101 Intro Computing: Engrg Sci	3
TAM 210 Introduction to Statics or 211 <sup>5</sup>	2
<b>Semester Hours</b>	<b>17</b>

#### Second Semester

ABE 225 ABE Principles: Bioenvironment	2
ABE 226 ABE Principles: Bioprocessing	2
MATH 225 Introductory Matrix Theory	2
MATH 285 Intro Differential Equations	3
PHYS 213 Univ Physics: Thermal Physics	2
TAM 212 Introductory Dynamics	3
General education elective <sup>3,4</sup>	3
<b>Semester Hours</b>	<b>17</b>

### Third Year

#### First Semester

CEE 202, Engineering Risk Uncertainty IE 300, ABE 440, or STAT 400 <sup>5</sup>	3
ECE 205 Electrical and Electronic Circuits	3
TAM 335, Introductory Fluid Mechanics CHBE 421, or ME 310	4
Agricultural and biological engineering technical elective <sup>6</sup>	3
General education elective <sup>3,4</sup>	3
<b>Semester Hours</b>	<b>16</b>

#### Second Semester

ECON 103, Macroeconomic Principles 102, or ACE 100 <sup>3</sup>	3
ME 200 Thermodynamics	3
ECE 206 Electrical and Electronic Circuits Lab	1
TAM 251 Introductory Solid Mechanics	3
Agricultural and biological engineering technical elective <sup>6</sup>	3
Biological and Natural Sciences Electives <sup>7</sup>	3
<b>Semester Hours</b>	<b>16</b>

### Fourth Year

#### First Semester

ABE 430 Project Management	2
Agricultural and biological engineering technical elective <sup>6</sup>	3
Other technical elective <sup>6</sup>	3
General education elective <sup>3,4</sup>	3

Free elective	3
Semester Hours	14
<b>Second Semester</b>	
ABE 469 <sup>4</sup> Industry-Linked Design Project	4
Biological and natural sciences elective <sup>7</sup>	3
Other technical elective <sup>6</sup>	3
General education elective <sup>3,4</sup>	3
Free elective	3
Semester Hours	16
Total Hours:	128

<sup>1</sup> *MATH 220 may be substituted with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.*

<sup>2</sup> *RHET 105 (or an alternative Composition I sequence) is taken either in the first or second semester of the first year, according to the student's UIN (Spring if your UIN is Odd). SE 101 is taken the other semester. Composition I guidelines can be found at <http://catalog.illinois.edu/general-information/degree-general-education-requirements/> under Written Communication Requirement.*

<sup>3</sup> *Students must take 6 hours from the campus General Education Social and Behavioral Sciences list, 6 hours from campus General Education Humanities and the Arts list, and 6 hours from a liberal education list approved by the college or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts. ECON 103 (or ECON 102 or ACE 100 by permission) must be one of the social & behavioral sciences courses, recommended to be taken early. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course, (ii) one non-western culture(s) course, and (iii) one U.S. Minority Culture(s) course from the General Education cultural studies lists. Most students select general education courses that simultaneously satisfy these cultural studies requirements.*

<sup>4</sup> *ABE 469 satisfies the General Education Advanced Composition requirement.*

<sup>5</sup> *The extra hour of credit for this course may be used to help meet free elective requirements.*

<sup>6</sup> *Students must complete 15 hours of Technical Electives (<https://abe.illinois.edu/undergraduate/technical-electives/>) chosen in consultation with an advisor. At least 8 hours must be Agricultural and Biological Engineering Technical Electives. Students in the Biological Engineering Concentration must complete at least one course with a laboratory component.*

<sup>7</sup> *Students must complete 6 hours from the approved list of Biological and Natural Sciences Electives (<https://abe.illinois.edu/undergraduate/biological-natural-sciences-electives/>). Students in the Biological Engineering Concentration must complete at least one course with a laboratory component.*