AGRICULTURAL & BIOLOGICAL ENGINEERING: AGRICULTURAL ENGINEERING, BS

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

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 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**).** ABE 469 **will satisfy a technical core course and the Campus General Education Advanced Composition requirement.**

Orientation and Professional Development

Code	Title	Hours
ABE 100		1
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
Total Hours		**2**

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
For Both Concentrations:		
ABE 141		2
ABE 223		2
ABE 224		2
ABE 225		2
ABE 226		2
ABE 430	Project Management	2
ABE 469	Capstone Design Experience (satisfies the general education advanced composition requirement)	4
CS 101	Intro Computing: Engrg & Sci	3
ECE 205	Electrical and Electronic Circuits	3
SE 101	Engineering Graphics & Design	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
Total Hours		**31**

Concentration

Code	Title	Hours
Student chooses 1 of 2 Concentrations listed below.		**35-36**
Agricultural Engineering		35-36
Biological Engineering		35

Free Electives

Code	Title	Hours
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/)		**10-11**
Total Hours of Curriculum to Graduate		**128**

Agricultural Engineering Concentration Requirements

Code	Title	Hours
Required courses for the Agricultural Engineering Concentration Core:		**14-15**
ABE 340	Thermodynamics for Agricultural and Biological Engineering	4
TAM 251	Introductory Solid Mechanics	3
Select one of the following:		3-4

ABE 440	(the extra 1 credit hour may be used towards free electives.)	4
CEE 202	Engineering Risk & Uncertainty	3
IE 300	Analysis of Data	3
STAT 400	Statistics and Probability I (the extra 1 credit hour may be used towards free electives.)	4
Select one of the following:		4
ME 310	Fundamentals of Fluid Dynamics	4
TAM 335	Introductory Fluid Mechanics	4
Electives		**21**
From Departmentally Approved List of Electives, to include: 6 hours of Biological and Natural Sciences Electives and 15 hours of Technical Electives.		
Biological and Natural Sciences Electives (at least 3 hours at 300 or 400 level)		**6**
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 471	Food & Industrial Microbiology	3
FSHN 481	Food Processing Unit Operations I	2
FSHN 482	Food Processing Unit Operations I Lab	1
FSHN 483	Food Processing Unit Operations II	2
FSHN 484	Food Processing Unit Operations II Lab	1
GEOL 107	Physical Geology	4
GEOL 380	Environmental Geology	4
GGIS 379	Introduction to Geographic Information Systems	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		
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		
IB 486		
MCB 100	Introductory Microbiology	3
MCB 101	Intro Microbiology Laboratory	2
MCB 150	Molec & Cellular Basis of Life	4
MCB 151	Molec & Cellular Laboratory	1
MCB 244	Human Anatomy & Physiology I	3
MCB 245	Human Anat & Physiol Lab I	2
MCB 250	Molecular Genetics	3
MCB 251	Exp Techniqs in Molecular Biol	2
MCB 252	Cells, Tissues & Development	3
MCB 253	Exp Techniqs in Cellular Biol	2
MCB 300	Microbiology	3
MCB 301	Experimental Microbiology	3
MCB 314	Introduction to Neurobiology	3
MCB 316	Genetics and Disease	4
MCB 450	Introductory Biochemistry	3
NRES 201	Introductory Soils	4
NRES 219	Applied Ecology	3
NRES 348	Fish and Wildlife Ecology	3
NRES 351	Introduction to Environmental Chemistry	3
NRES 419	Env and Plant Ecosystems	3
NRES 420	Restoration Ecology	4
NRES 429	Aquatic Ecosystem Conservation	3

NRES 439	Env and Sustainable Dev	3
NRES 471	Pedology	3
NRES 475	Environmental Microbiology	3
NRES 487	Soil Chemistry	3
NRES 488	Soil Fertility and Fertilizers	3
PLPA 405	Plant Disease Diagnosis & Mgmt	3
Technical electives chosen in consultation with an advisor. At least 8 hours must be Agricultural and Biological Engineering courses.		**15**
ABE 341	Transport Processes in ABE	3
ABE 361	Functional Analysis and Design of Agricultural Machine Systems	3
ABE 425	Engrg Measurement Systems	4
ABE 426	Principles of Mobile Robotics	4
ABE 436	Renewable Energy Systems	3 or 4
ABE 446	Biological Nanoengineering	3 or 4
ABE 450	International Water Project I	3
ABE 451	International Water Project II	3
ABE 452	Engineering for Disaster Resilience	3 or 4
ABE 454	Environmental Soil Physics	3
ABE 455	Erosion and Sediment Control	2
ABE 456	Land & Water Resources Engrg	3 or 4
ABE 457	NPS Pollution Processes	2
ABE 458	NPS Pollution Modeling	2
ABE 459	Drainage and Water Management	3 or 4
ABE 463		
ABE 466	Engineering Off-Road Vehicles	3
ABE 474		
ABE 476	Indoor Air Quality Engineering	4
ABE 482	Package Engineering	3
ABE 483	Engineering Properties of Food Materials	3
ABE 488	Bioprocessing Biomass for Fuel	4
BIOE 416	Biosensors	3
BIOE 461	Cellular Biomechanics	4
BIOE 467	Biophotonics	3
BIOE 476	Tissue Engineering	3
CHBE 221	Principles of CHE	3
CHBE 422	Mass Transfer Operations	4
CHBE 424	Chemical Reaction Engineering	3
CHBE 471	Biochemical Engineering	3 or 4
CHBE 472	Techniques in Biomolecular Eng	3 or 4
CHBE 473	Biomolecular Engineering	3 or 4
CHBE 475	Tissue Engineering	3
CHBE 476	Biotransport	3
CHBE 478	Bioenergy Technology	3
CEE 300	Behavior of Materials	4
CEE 330	Environmental Engineering	3
CEE 350	Water Resources Engineering	3
CEE 360	Structural Engineering	3
CEE 380	Geotechnical Engineering	3
CEE 430		
CEE 432	Stream Ecology	3 or 4
CEE 434	Environmental Systems I	3
CEE 437	Water Quality Engineering	3
CEE 440	Fate Cleanup Environ Pollutant	4
CEE 442	Environmental Engineering Principles, Physical	4
CEE 443	Env Eng Principles, Chemical	4
CEE 444	Env Eng Principles, Biological	4
CEE 446		
CEE 447	Atmospheric Chemistry	4
CEE 449	Environmental Engineering Lab	3
CEE 450	Surface Hydrology	3
CEE 451	Environmental Fluid Mechanics	3
CEE 452	Hydraulic Analysis and Design	3
CEE 453	Urban Hydrology and Hydraulics	4
CEE 457	Groundwater	3
CEE 458	Water Resources Field Methods	4
CEE 461	Reinforced Concrete I	3
CEE 463	Reinforced Concrete II	3 or 4
CEE 465	Design of Structural Systems	3
CEE 470	Structural Analysis	4
CEE 483	Soil Mechanics and Behavior	4
CEE 484	Applied Soil Mechanics	3 or 4
CS 466	Introduction to Bioinformatics	3 or 4
ECE 206	Electrical and Electronic Circuits Lab	1
ECE 333	Green Electric Energy	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

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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. The curriculum sequence can also be viewed via dynamic and static curricular maps (https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/abe-ag-engr-map/), which include prerequisite sequencing.

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/*).* One of the SBS courses must be an introductory economics course (ECON 102 or ECON 103 or ACE 100). ABE 469 will satisfy a technical core course and the Campus General Education Advanced Composition requirement.

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 100	1		ABE 141	2
MATH 221 (MATH 220 may be substituted)	4		MATH 231	3
CHEM 102	3		CHEM 104	3
CHEM 103	1		CHEM 105	1
ENG 100	1		PHYS 211	4
Composition I course or SE 101	4-3		SE 101 or Composition I course	3-4
	14			**16**

Second Year

First Semester	Hours		Second Semester	Hours
ABE 223	2		ABE 225	2
MATH 241	4		MATH 285	3
ABE 224	2		ABE 226	2
TAM 211	3		TAM 212	3
CS 101	3		PHYS 212	4
ECON 102 or ECON 103 or ACE 100 (Counts as General Education Elective)	3-4		General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3
	17			**17**

Third Year

First Semester	Hours		Second Semester	Hours
ABE 340	3		CEE 202, IE 300, ABE 440, or STAT 400	3
MATH 257	3		Biological and Natural Sciences Elective course	3
Agricultural and Biological Engineering Technical Elective course	3		Agricultural and Biological Engineering Technical Elective course	3
TAM 335 or ME 310	4		TAM 251	3
ECE 205	3		Free elective course	4
	16			**16**

Fourth Year

First Semester	Hours		Second Semester	Hours
ABE 430	2		ABE 469	4
Biological and Natural Sciences Elective course	3		Technical Elective course	3
Agricultural and Biological Engineering Technical Elective course	3		Technical Elective course	3
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3		General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3
Language Other Than English (3rd level) course	4		Free elective course	4
	15			**17**

Total Hours 128

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Agricultural & Biological Engineering

Agricultural & Biological Engineering website (https://abe.illinois.edu/)
1304 W. Pennsylvania Ave., Urbana, IL 61801
(217) 333-3570
Agricultural & Biological Engineering email (abe@illinois.edu)

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

The Grainger College of Engineering
The Grainger College of Engineering website (https://grainger.illinois.edu/)

ACES Office of Academic Programs
128 Mumford Hall, 1301 West Gregory Drive, Urbana, IL 61801

Advising
(217) 333-3570
ABE Advising email (tsm-etm-abe-advising@rt.aces.illinois.edu)
ABE Advising website (https://abe.illinois.edu/academics/advising/)

Admissions
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