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

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

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

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

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ABE 100</td>
<td>Intro Agric &amp; Biological Engrg</td>
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<tr>
<td>ENG 100</td>
<td>Engineering Orientation</td>
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Foundational Mathematics and Science

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<tr>
<td>CHEM 102</td>
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<td>CHEM 104</td>
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<td>MATH 225</td>
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<td>MATH 231</td>
<td>Calculus II</td>
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<tr>
<td>MATH 241</td>
<td>Calculus III</td>
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<tr>
<td>MATH 285</td>
<td>Intro Differential Equations</td>
<td>3</td>
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<td>PHYS 211</td>
<td>University Physics: Mechanics</td>
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</tr>
<tr>
<td>PHYS 212</td>
<td>University Physics: Elec &amp; Mag</td>
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Agricultural and Biological Engineering Technical Core

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<tr>
<td>For Both Concentrations:</td>
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<tr>
<td>ABE 141</td>
<td>ABE Principles: Biological</td>
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<tr>
<td>ABE 223</td>
<td>ABE Principles: Machine Syst</td>
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<tr>
<td>ABE 224</td>
<td>ABE Principles: Soil &amp; Water</td>
<td>2</td>
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<tr>
<td>ABE 225</td>
<td>ABE Principles: Bioenvironment</td>
<td>2</td>
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<tr>
<td>ABE 226</td>
<td>ABE Principles: Bioprocessing</td>
<td>2</td>
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<tr>
<td>ABE 430</td>
<td>Project Management</td>
<td>2</td>
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<td>ABE 469</td>
<td>Industry-Linked Design Project</td>
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<tr>
<td>CS 101</td>
<td>Intro Computing: Engrg &amp; Sci</td>
<td>3</td>
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<tr>
<td>ECE 205</td>
<td>Electrical and Electronic Circuits</td>
<td>3</td>
</tr>
<tr>
<td>SE 101</td>
<td>Engineering Graphics &amp; Design</td>
<td>3</td>
</tr>
<tr>
<td>TAM 210</td>
<td>Introduction to Statics</td>
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<tr>
<td>TAM 211</td>
<td>Statics</td>
<td>4</td>
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<tr>
<td>or TAM 211</td>
<td>Statics</td>
<td>2</td>
</tr>
<tr>
<td>TAM 212</td>
<td>Introductory Dynamics</td>
<td>3</td>
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<tr>
<td></td>
<td>Total Hours</td>
<td>60</td>
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Information listed in this catalog is current as of 02/2022
Electives

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.

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.

Total Hours of Curriculum to Graduate

128

1. External transfer students take ENG 300 instead.
2. 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.
3. ABE 469 satisfies the general education advanced composition requirement.
4. The extra hour of credit for this course may be used to help meet free elective requirements.
5. The Grainger College of Engineering approved liberal education course list can be found here (https://go.grainger.illinois.edu/ LiberalEducation/).
6. The Grainger College of Engineering restrictions to free electives can be found here (https://go.grainger.illinois.edu/ FreeElectives/).

Agricultural Engineering Concentration Requirements

<table>
<thead>
<tr>
<th>Code</th>
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<th>Hours</th>
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<tbody>
<tr>
<td>ECE 206</td>
<td>Electrical and Electronic Circuits Lab</td>
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<tr>
<td>ME 200</td>
<td>Thermodynamics</td>
<td>3</td>
</tr>
<tr>
<td>TAM 251</td>
<td>Introductory Solid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Select one of the following:</td>
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<td></td>
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<tr>
<td>ABE 440</td>
<td>Applied Statistical Methods I</td>
<td>1</td>
</tr>
<tr>
<td>CEE 202</td>
<td>Engineering Risk &amp; Uncertainty</td>
<td>1</td>
</tr>
<tr>
<td>IE 300</td>
<td>Analysis of Data</td>
<td>1</td>
</tr>
<tr>
<td>STAT 400</td>
<td>Statistics and Probability I</td>
<td>1</td>
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<tr>
<td>Select one of the following:</td>
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<tr>
<td>CHBE 421</td>
<td>Momentum and Heat Transfer</td>
<td>1</td>
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<tr>
<td>ME 310</td>
<td>Fundamentals of Fluid Dynamics</td>
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<tr>
<td>TAM 355</td>
<td>Introductory Fluid Mechanics</td>
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</table>

Electives

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

Biological and Natural Sciences Electives (at least 3 hours at 300 or 400 level)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>ANSC 100</td>
<td>Intro to Animal Sciences</td>
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<tr>
<td>ANSC 221</td>
<td>Cells, Metabolism and Genetics</td>
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<tr>
<td>ANSC 350</td>
<td>Cellular Metabolism in Animals</td>
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<tr>
<td>ANSC 350</td>
<td>Cellular Metabolism in Animals</td>
<td>3</td>
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<tr>
<td>ANSC 363</td>
<td>Behavior of Domestic Animals</td>
<td>4</td>
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<tr>
<td>ANSC 400</td>
<td>Dairy Herd Management</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 401</td>
<td>Beef Production</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 402</td>
<td>Sheep and Goat Production</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 403</td>
<td>Pork Production</td>
<td>3</td>
</tr>
<tr>
<td>ANSC 404</td>
<td>Poultry Science</td>
<td>3</td>
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</tbody>
</table>

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     |
FOSH 101  | The Science of Food and How it Relates to You | 3 | 3

FOSH 414  | Food Chemistry                         | 3     |
FOSH 416  | Food Chemistry Laboratory              | 3     |
FOSH 461  | Food Chemistry                          | 3     |
FOSH 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     |
IB 486   | Pesticide Toxicology                   | 3 or 4|

Information listed in this catalog is current as of 02/2022
Technical electives chosen in consultation with an advisor. At least 8 hours must be Agricultural and Biological Engineering courses.
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 Ctrl 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

SE 101  Engineering Graphics Design  3-4
or RHET 105

Semester Hours  16-17

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  2

Semester Hours  17

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 3,4  3

Semester Hours  17

Third Year
First Semester
CEE 202,  Engineering Risk Uncertainty  3
IE 300,  ABE 440,  or STAT 4005
ECE 205  Electrical and Electronic Circuits  3
TAM 335,  Introductory Fluid Mechanics  4
CHBE 421,  or ME 310
Agricultural and biological engineering technical elective  6  3
General education elective 3,4  3

Semester Hours  16

Second Semester
ECON 103, Macroeconomic Principles  3
102, or  ACE 1003
ME 200  Thermodynamics  3
ECE 206  Electrical and Electronic Circuits Lab  1
TAM 251  Introductory Solid Mechanics  3
Agricultural and biological engineering technical elective  6  3
Biological and Natural Sciences Electives 7  3

Semester Hours  16

Fourth Year
First Semester
ABE 430  Project Management  2
Agricultural and biological engineering technical elective  6  3
Other technical elective  3  3
General education elective 3,4  3

Semester Hours  16

1 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/abe-ag-engr-map/).

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

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

Semester Hours  16

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  2

Semester Hours  17

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 3,4  3

Semester Hours  17

Third Year
First Semester
CEE 202,  Engineering Risk Uncertainty  3
IE 300,  ABE 440,  or STAT 4005
ECE 205  Electrical and Electronic Circuits  3
TAM 335,  Introductory Fluid Mechanics  4
CHBE 421,  or ME 310
Agricultural and biological engineering technical elective  6  3
General education elective 3,4  3

Semester Hours  16

Second Semester
ECON 103, Macroeconomic Principles  3
102, or  ACE 1003
ME 200  Thermodynamics  3
ECE 206  Electrical and Electronic Circuits Lab  1
TAM 251  Introductory Solid Mechanics  3
Agricultural and biological engineering technical elective  6  3
Biological and Natural Sciences Electives 7  3

Semester Hours  16

Fourth Year
First Semester
ABE 430  Project Management  2
Agricultural and biological engineering technical elective  6  3
Other technical elective  3  3
General education elective 3,4  3

Semester Hours  16

Information listed in this catalog is current as of 02/2022
Free elective 3

**Semester Hours** 14

**Second Semester**

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<th>Course Name</th>
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<td>ABE 469</td>
<td>Industry-Linked Design Project</td>
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<tr>
<td>Biological and natural sciences elective 6</td>
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<td></td>
</tr>
<tr>
<td>Other technical elective 7</td>
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<td></td>
</tr>
<tr>
<td>Free elective</td>
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**Semester Hours** 16

**Total Hours:** 128

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1. 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.

2. 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.

3. 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.

4. 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.

5. ABE 469 satisfies the General Education Advanced Composition requirement.

6. The extra hour of credit for this course may be used to help meet free elective requirements.

7. 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.

7. 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.