AGRICULTURAL & BIOLOGICAL ENGINEERING: BIOLOGICAL ENGINEERING, BS

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

department catalog page: Agricultural & Biological Engineering (http://catalog.illinois.edu/aces/ag-bio-eng)
department website: https://abe.illinois.edu/undergraduate/
department faculty: Agricultural & Biological Engineering Faculty (https://abe.illinois.edu/directory/faculty)
overview of college admissions & requirements: college websites: https://aces.illinois.edu/ and https://engineering.illinois.edu
e-mail: abe@illinois.edu

Agricultural and biological engineering is the application of mathematics, physical and biological science, and engineering to agriculture, food systems, energy, natural resources, the environment, and related biological systems. This ABET-accredited program has special emphasis on environmental protection and the biological interface of plants, animals, soils, and microorganisms with the design and performance of environments, machines, mechanisms, processes, and structures.

The Department of Agricultural and Biological Engineering offers programs through the College of ACES and the College of Engineering.

Students pursuing the B.S. Degree in Agricultural and Biological Engineering choose from one of two concentrations, one of which is the concentration in Biological Engineering. This concentration integrates biology and engineering to provide solutions to problems related to living systems (plants, animals, and microorganisms). Engineered biological systems vary widely in scale. At the molecular level, nanometer-scale devices consist of a few biomolecules inside individual cells. At the other extreme, regionally-scaled complex ecosystems depend upon multiple species of interacting living organisms. Such systems are becoming increasingly important in areas such as bioenergy, bioprocessing, nanotechnology, biosensing, bio-informatics, and bioenvironment. 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
- Ecological Engineering
- Food and Bioprocess Engineering
- Nanoscale Biological Engineering

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Prescribed Courses for Core Curriculum (including Campus General Education)
The curriculum requires 128 hours for graduation.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABE 100</td>
<td>Intro Agric &amp; Biological Engrg</td>
<td>1</td>
</tr>
<tr>
<td>ENG 100</td>
<td>Engineering Orientation</td>
<td>0</td>
</tr>
<tr>
<td>Total Orientation Hours:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Composition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RHET 105</td>
<td>Writing and Research</td>
<td>4</td>
</tr>
<tr>
<td>Electives from the campus General Education Humanities and the Arts list.</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Electives from the campus General Education Social and Behavioral Sciences list.</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Electives either from a list approved by the college, or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts.</td>
<td>6</td>
<td></td>
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<tr>
<td>Foundational Mathematics and Science</td>
<td></td>
<td></td>
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<tr>
<td>CHEM 102</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 103</td>
<td>General Chemistry Lab I</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 104</td>
<td>General Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 105</td>
<td>General Chemistry Lab II</td>
<td>1</td>
</tr>
<tr>
<td>MATH 211</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 225</td>
<td>Introductory Matrix Theory</td>
<td>2</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus II</td>
<td>3</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>MATH 285</td>
<td>Intro Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>MATH 211</td>
<td>University Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>University Physics: Elec &amp; Mag</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 213</td>
<td>Univ Physics: Thermal Physics</td>
<td>2</td>
</tr>
<tr>
<td>Total Foundational Mathematics and Science Hours:</td>
<td>34</td>
<td></td>
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</table>

Agricultural and Biological Engineering Technical Core

These courses stress fundamental concepts and basic laboratory techniques that comprise the common intellectual understanding of agricultural and biological engineering and the background for the technical courses and electives in each student’s concentration.

For Both Concentrations:

| ABE 141 | ABE Principles: Biological | 2 |
| ABE 223 | ABE Principles: Machine Syst | 2 |
| ABE 224 | ABE Principles: Soil & Water | 2 |

Information listed in this catalog is current as of 04/2019
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ABE 225  ABE Principles: Bioenvironment  2  
ABE 226  ABE Principles: Bioprocessing  2  
ABE 430  Project Management  2  
ABE 469  Industry-Linked Design Project  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  2  
TAM 212  Introductory Dynamics  3  

Free Electives  6  
These unrestricted electives, subject to certain exceptions as noted at the College of Engineering Advising Website, give the student the opportunity to explore any intellectual area of unique interest. This freedom plays a critical role in helping students to define research specialties or to complete minors.  

Total Agricultural and Biological Engineering Technical Core Hours: 30

Biological Engineering Concentration Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABE 341</td>
<td>Transport Processes in ABE</td>
<td>3</td>
</tr>
<tr>
<td>CHBE 321</td>
<td>Thermodynamics</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 232</td>
<td>Elementary Organic Chemistry 1</td>
<td>3</td>
</tr>
<tr>
<td>MCB 150</td>
<td>Molec &amp; Cellular Basis of Life</td>
<td>4</td>
</tr>
</tbody>
</table>

Electives

Biological and natural sciences electives chosen from a departmentally approved list of Biological and Natural Sciences Electives – Group B; must include 1 course with a lab component.  

Technical electives chosen in consultation with an advisor. At least 8 hours must be Agricultural and Biological Engineering Technical Electives - Group B, and the remainder approved Other Technical Electives – Group B; must include one course with a lab component.  

Total Hours  35

1 External transfer students take ENG 300 instead.  
2 ECON 102 (http://catalog.illinois.edu/search/?P=ECON%20102) or ACE 100 (http://catalog.illinois.edu/search/?P=ACE%20100) will fulfill this requirement.  
3 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 liberal education courses that simultaneously satisfy these cultural studies requirements.  
4 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.  
5 The extra hour of credit for this course may be used to help meet free elective requirements.  
6 College of Engineering Advising Website (https://wiki.cites.illinois.edu/wiki/display/ugadvice/Undergrad+Advising+Home)

Suggested Sequence

First Year

First Semester  
ABE 100  Intro Agric Biological Engrg  1  
ENG 100  Engineering Orientation  0  
CHEM 102 General Chemistry I  3  
CHEM 103 General Chemistry Lab I  1  
SE 101  Engineering Graphics Design  3-4  
or RHET 105  Calculus I  4  
Liberal education elective  3  

Semester Hours  15-16

Second Semester  
ABE 141  ABE Principles: Biological  2  
CHEM 104 General Chemistry II  3  
CHEM 105 General Chemistry Lab II  1  
PHYS 211  University Physics: Mechanics  4  
MATH 231 Calculus II  3  
RHET 105  Writing and Research  4-3  
or SE 101  

Semester Hours  17-16

Second Year

First Semester  
ABE 223  ABE Principles: Machine Syst  2  
ABE 224  ABE Principles: Soil Water  2  
CS 101  Intro Computing: Engrg Sci  3  
MATH 241 Calculus III  4  
PHYS 212  University Physics: Elec Mag  4  
TAM 210  Introduction to Statics  2-3  
or 211  

Semester Hours  17-18

Second Semester  
ABE 225  ABE Principles: Bioenvironment  2  

1 May be taken for 4 credit hours; the extra hour may be used to help meet free elective requirements.  
3 Technical electives chosen in consultation with an advisor. At least 8 hours must be Agricultural and Biological Engineering Technical Electives - Group B (http://abe.illinois.edu/undergrad/ABE-Curriculum/BIOE-TechElectives), and the remainder approved Other Technical Electives – Group B (http://abe.illinois.edu/undergrad/ABE-Curriculum/BIOE-TechElectives/#tag1) for the degree of Bachelor of Science Major in Agricultural & Biological Engineering. Biological Engineering Concentration
ABE 226  ABE Principles: Bioprocessing  2
MATH 225 Introductory Matrix Theory  2
MATH 285 Intro Differential Equations  3
CHEM 232 Elementary Organic Chemistry I  3-4
PHYS 213 Univ Physics: Thermal Physics  2
TAM 212 Introductory Dynamics  3

Semester Hours 17-18

Third Year
First Semester
ABE 341 Transport Processes in ABE  3
ECE 205 Electrical and Electronic Circuits  3
MCB 150 Molec Cellular Basis of Life  4
Agricultural and biological engineering technical elective  7
Liberal education elective  3

Semester Hours 16

Second Semester
ECON 103, 102, or ACE 100  3
CHBE 321 Thermodynamics  4
Agricultural and biological engineering technical elective  7
Biological and natural sciences elective  3
Liberal education elective  3

Semester Hours 16

Fourth Year
First Semester
ABE 430 Project Management  2
Agricultural and biological engineering technical elective  7
Other technical elective  3
Liberal education elective  3
Free elective  3

Semester Hours 14

Second Semester
ABE 469 Industry-Linked Design Project  4
Biological and natural sciences elective  3
Other technical elective  3
Liberal education elective  3
Free elective  3

Semester Hours 16-14

Total Hours: 128

1 RHET 105 may be taken in the first or second semester of the first year as authorized. The alternative is SE 101. Students may take CMN 111 and CMN 112 in place of RHET 105.
2 MATH 220—Calculus 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 Liberal education electives must include 6 hours of social & behavioral sciences and 6 hours of humanities & the arts course work from the campus General Education lists. ECON 103 (or ECON 102 or ACE 100 by permission) must be one of the social & behavioral sciences courses, recommended to be taken early. The remaining 6 hours may be selected from a list maintained by the college, or additional course work from the campus General Education lists for social & behavioral sciences or humanities & the arts. 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 liberal education courses that simultaneously satisfy these cultural studies requirements.
4 ABE 469 satisfies the General Education Advanced Composition requirement.
5 The extra hour of credit for this course may be used to help meet free elective requirements.
6 Students must complete 6 hours from the approved list of Biological and Natural Sciences Electives. Students in the Biological Engineering Concentration must complete at least one course with a laboratory component.
7 Students must complete 15 hours of Technical Electives. Students in the Biological Engineering Concentration must complete at least one course with a laboratory component.
8 May be taken for 4 credit hours; the extra hour may be used to help meet free elective requirements.