BS BIORESOURCE AND AGRICULTURAL ENGINEERING

Program Learning Outcomes
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.

Degree Requirements and Curriculum
In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (http://catalog.calpoly.edu/ generalrequirementsbachelorsdegree/#generaleducationtext) section of this catalog, including:

- 60 units of upper-division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No Major or Support courses may be selected as credit/no credit.

MAJOR COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRAE 128</td>
<td>Careers in Bioresource and Agricultural Engineering</td>
<td>2</td>
</tr>
<tr>
<td>BRAE 129</td>
<td>Laboratory Skills and Safety</td>
<td>1</td>
</tr>
<tr>
<td>BRAE 150</td>
<td>Design Graphics and CAD for Agricultural Engineering</td>
<td>2</td>
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<tr>
<td>BRAE 152</td>
<td>3-D Solids Modeling</td>
<td>1</td>
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<tr>
<td>BRAE 216</td>
<td>Fundamentals of Electricity</td>
<td>4</td>
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<tr>
<td>BRAE 232</td>
<td>Agricultural Structures Planning</td>
<td>4</td>
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<tr>
<td>BRAE 234</td>
<td>Introduction to Mechanical Systems in Agriculture</td>
<td>4</td>
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<tr>
<td>BRAE 236</td>
<td>Principles of Irrigation</td>
<td>4</td>
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<tr>
<td>BRAE 239</td>
<td>Engineering Surveying</td>
<td>4</td>
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<tr>
<td>BRAE 312</td>
<td>Hydraulics</td>
<td>4</td>
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<tr>
<td>BRAE 320</td>
<td>Principles of Bioresource Engineering</td>
<td>4</td>
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<tr>
<td>BRAE 328</td>
<td>Measurements and Computer Interfacing</td>
<td>4</td>
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<td>BRAE 331</td>
<td>Irrigation Theory</td>
<td>3</td>
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<tr>
<td>BRAE 332</td>
<td>Environmental Controls for Agricultural Structures</td>
<td>4</td>
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<tr>
<td>BRAE 403</td>
<td>Agricultural Systems Engineering</td>
<td>4</td>
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<tr>
<td>BRAE 414</td>
<td>Irrigation Engineering</td>
<td>4</td>
</tr>
<tr>
<td>BRAE 421</td>
<td>Equipment Engineering</td>
<td>3</td>
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<tr>
<td>BRAE 422</td>
<td>Equipment Engineering</td>
<td>4</td>
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<tr>
<td>BRAE 428</td>
<td>Agricultural Robotics and Automation</td>
<td>4</td>
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<td>BRAE 433</td>
<td>Agricultural Structures Design</td>
<td>4</td>
</tr>
<tr>
<td>BRAE 460</td>
<td>Senior Project Organization</td>
<td>1</td>
</tr>
<tr>
<td>BRAE 461</td>
<td>Senior Project I</td>
<td>2</td>
</tr>
</tbody>
</table>

Approved Electives
Select from the following: 7-9

- BRAE 302 Servo Hydraulics
- BRAE 333 Aquacultural Engineering
- BRAE 335 Internal Combustion Engines
- BRAE 345 Aerial Photogrammetry and Remote Sensing
- BRAE 348 Energy for a Sustainable Society
- BRAE 400 Special Problems (4 units maximum)
- BRAE 405 Chemigation
- BRAE/EE 434 Automotive Engineering for a Sustainable Future
- BRAE 435 Drainage
- BRAE 436 Food and Agriculture Process Water Engineering
- BRAE 447 Advanced Surveying with GIS Applications
- BRAE 448 Bioconversion
- BRAE 450 Solar Photovoltaic System Engineering
- BRAE 532 Water Wells and Pumps
- BRAE 533 Irrigation Project Design
- CHEM 312 Survey of Organic Chemistry
- IME 319 Human Factors Engineering
- MCRO 421 Food Microbiology
- any upper-division CE course
- any upper-division EE course
- any upper-division ENVE course
- any upper-division ME course

SUPPORT COURSES
Select from the following: 4

- BRAE/BMED 213 Bioengineering Fundamentals
- BIO 213 and Life Science for Engineers (B2) 2
- MCRO 221 Microbiology (B2) 2
- CE 204 Mechanics of Materials I
- CE 207 Mechanics of Materials II
- CHEM 124 General Chemistry for Physical Science and Engineering I (B1 & B3) 2
- CHEM 125 General Chemistry for Physical Science and Engineering II (Area B Electives) 2

Select from the following: 2-3

- CSC 231 Programming for Engineering Students
or CSC 232 Computer Programming for Scientists and Engineers
or CSC 234 C and Unix
ECON 201 Survey of Economics (D2) 2 4
or ECON 222 Macroeconomics
EE 321 Electronics 4
& EE 361 and Electronics Laboratory
ENGL 149 Technical Writing for Engineers (A3) 2 4
MATH 141 Calculus I (B4) 2 4
MATH 142 Calculus II (B4) 2 4
MATH 143 Calculus III (Area B Electives) 2 4
MATH 241 Calculus IV 4
MATH 244 Linear Analysis I 4
ME 211 Engineering Statics 3
ME 212 Engineering Dynamics 3
PHYS 141 General Physics IA 4
PHYS 132 General Physics II 4
PHYS 133 General Physics III 4
STAT 312 Statistical Methods for Engineers (Upper-Division B) 2 4

**GENERAL EDUCATION (GE)**
(See GE program requirements below.) 36

**FREE ELECTIVES**

| Free Electives | 0 |

**Total units** 187-190

1 Consultation with advisor is recommended prior to selecting Approved Electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

2 Required in Major or Support; also satisfies General Education (GE) requirement.

**General Education (GE) Requirements**

- 72 units required, 36 of which are specified in Major and/or Support.
- If any of the remaining 36 units is used to satisfy a Major or Support requirement, additional units of Free Electives may be needed to complete the total units required for the degree.
- See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
- A grade of C- or better is required in one course in each of the following GE Areas: A1 (Oral Communication), A2 (Written Communication), A3 (Critical Thinking), and B4 (Mathematics/Quantitative Reasoning).

**Area A** English Language Communication and Critical Thinking

| A1 | Oral Communication | 4 |
| A2 | Written Communication | 4 |
| A3 | Critical Thinking (4 units in Support) 1 | 0 |

**Area B** Scientific Inquiry and Quantitative Reasoning

| B1 | Physical Science (4 units in Support) 1 | 0 |
| B2 | Life Science (4 units in Support) 1 | 0 |
| B3 | One lab taken with either a B1 or B2 course | |
| B4 | Mathematics/Quantitative Reasoning (8 units in Support) 1 | 0 |

Upper-Division B (4 units in Support) 1 0
Area B Electives (8 units in Support) 1 0

**Area C** Arts and Humanities

Lower-division courses in Area C must come from three different subject prefixes.

| C1 | Arts: Arts, Cinema, Dance, Music, Theater | 4 |
| C2 | Humanities: Literature, Philosophy, Languages other than English | 4 |

Lower-Division C Elective - Select a course from either C1 or C2. 4
Upper-Division C 4

**Area D** Social Sciences

| D1 | American Institutions (Title 5, Section 40404 Requirement) | 4 |
| D2 | Lower-Division D (4 units in Support) 1 | 0 |

Area D Elective - Select either a lower-division or upper-division course. 4

**Area E** Lifelong Learning and Self-Development

| Lower-Division E | 4 |

**Total units** 36

1 Required in Major or Support; also satisfies General Education (GE) requirement.