BS ENVIRONMENTAL 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 factor.
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</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 113</td>
<td>Computer Aided Drafting in Civil Engineering</td>
<td>2</td>
</tr>
<tr>
<td>Select one of the following two options:</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>CE 204 &amp; CE 207</td>
<td>Mechanics of Materials I &amp; Mechanics of Materials II</td>
<td>2</td>
</tr>
<tr>
<td>or CE 208</td>
<td>Mechanics of Materials</td>
<td></td>
</tr>
<tr>
<td>CE 251</td>
<td>Programming Applications in Engineering</td>
<td>2</td>
</tr>
<tr>
<td>CE 336</td>
<td>Water Resources Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CE 337</td>
<td>Hydraulics Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CE 381</td>
<td>Geotechnical Engineering</td>
<td>4</td>
</tr>
<tr>
<td>CE 434</td>
<td>Groundwater Hydraulics and Hydrology</td>
<td>4</td>
</tr>
<tr>
<td>CE 465</td>
<td>Civil Engineering Professional Practice</td>
<td>1</td>
</tr>
</tbody>
</table>

ENVE 111 Introduction to the Environmental Engineering Profession 1
ENVE 264 Environmental Fluid Mechanics 4
ENVE 304 Process Thermodynamics 3
ENVE 309 Noise and Vibration Control 3
ENVE 325 Air Quality Engineering 4
ENVE 331 Fundamentals of Environmental Engineering 4
ENVE 421 Mass Transfer Operations 4
ENVE 426 Air Quality Measurements 3
ENVE 434 Water Chemistry and Water Quality Measurements 4
ENVE 438 Water and Wastewater Treatment Design 3
ENVE 450 Industrial Pollution Prevention 4
ENVE 466 & ENVE 467 Senior Project Design Laboratory I & II 4
Select from the following: 12
ENVE 411 Air Pollution Control
ENVE 436 Introduction to Hazardous Waste Management
ENVE 439 Sustainable Solid Waste Engineering
ENVE 443 Bioremediation Engineering
ENVE 455 Environmental Health and Safety
ENVE 480 Environmental Engineering of Energy
Technical Electives 2, 3 10
Select from the below Technical Electives list

SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 124</td>
<td>General Chemistry for Physical Science and Engineering I (B1 &amp; B3)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 125</td>
<td>General Chemistry for Physical Science and Engineering II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 126</td>
<td>General Chemistry for Physical Science and Engineering III</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 312</td>
<td>Survey of Organic Chemistry</td>
<td>5</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II (B4)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III (Area B Electives)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
</tr>
<tr>
<td>MATH 244</td>
<td>Linear Analysis I</td>
<td>4</td>
</tr>
<tr>
<td>MCRO 221 or MCRO 224</td>
<td>Microbiology (B2)</td>
<td>4-5</td>
</tr>
<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 141</td>
<td>General Physics I (Area B Electives)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 142</td>
<td>General Physics II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 143</td>
<td>General Physics III</td>
<td>4</td>
</tr>
<tr>
<td>STAT 312</td>
<td>Statistical Methods for Engineers (Upper-Division B)</td>
<td>4</td>
</tr>
</tbody>
</table>

GENERAL EDUCATION (GE)
(See GE program requirements below.) 44

FREE ELECTIVES
Free Electives 0
Total units 190-191

1 Transfer students take CE 208 in the Fall Quarter.
2 To be selected in consultation with your academic advisor.
3 A student may petition to take a course not included in the list of electives and receive Technical Elective credit, but they must first obtain approval from a faculty advisor, before taking the course.
4 Required in Major or Support; also satisfies General Education (GE) requirement.
5 CHEM 212 substitutes, but will not be counted as upper-division units.

Technical Electives
Technical Electives may be chosen from any 300-500 level CE/ENVE courses not taken to satisfy other curriculum requirements, with the following exceptions: senior project, co-op, graduate seminar, comprehensive exam, and thesis; and ENVE 324, ENVE 323, ENVE 570, ENVE 571.

Technical Electives cannot be used to satisfy other Major or Support requirements. No double counting is allowed.

No more than 4 units in total from CE 400/ENVE 400, CE 500/ENVE 500, ENVE 405, ENVE 407, and ENVE 471 combined can be counted towards Technical Electives.

No more than 4 units of coursework other than CE/ENVE may be used to satisfy the Technical Electives degree requirement.

Air Quality and Climate
ERSC/GEOG 414 Global and Regional Climatology
PHYS 313 Introduction to Atmospheric Physics

Appropriate Technology
PSC/UNIV 492 Appropriate Technology for the World's People: Design

Biology/Biochemistry/Microbiology
BIO 363 Principles of Conservation Biology
ENGR/ENVE 581 Biochemical Engineering
MCRO 342 Public Health Microbiology

Computer Applications and Computations
LA/NR 317 The World of Spatial Data and Geographic Information Technology
STAT 313 Applied Experimental Design and Regression Models
STAT 323 Design and Analysis of Experiments I

Chemistry
CHEM 313 Survey of Biochemistry and Biotechnology
CHEM 341 Environmental Chemistry: Water Pollution

Energy
BRAE 448 Bioconversion
PHYS 310 Physics of Energy

Hydrology and Soils
BRAE 532 Water Wells and Pumps

Law and Policy

CRP/NR 408 Water Resource Law and Policy
IME 314 Engineering Economics
or IME 315 Financial Decision Making for Engineers

General Education (GE) Requirements
- 72 units required, 28 of which are specified in Major and/or Support.
- If any of the remaining 44 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

Area B Scientific Inquiry and Quantitative Reasoning
B1 Physical Science (4 units in Support) 1
B2 Life Science (4 units in Support) 1
B3 One lab taken with either a B1 or B2 course
B4 Mathematics/Quantitative Reasoning (8 units in Support) 1

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

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.

Upper-Division C 4

Area D Social Sciences
D1 American Institutions (Title 5, Section 40404 Requirement) 4

Area D Elective - Select either a lower-division D2 or upper-division D course.

Area E Lifelong Learning and Self-Development

Area F Ethnic Studies

Total units 44
Required in Major or Support; also satisfies General Education (GE) requirement.