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>CE 113</td>
<td>Computer Aided Drafting in Civil Engineering</td>
<td>2</td>
</tr>
<tr>
<td>CE 204</td>
<td>Mechanics of Materials I</td>
<td>3</td>
</tr>
<tr>
<td>CE 207</td>
<td>Mechanics of Materials II</td>
<td>2</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>
<tr>
<td>ENVE 111</td>
<td>Introduction to the Environmental Engineering Profession</td>
<td>1</td>
</tr>
<tr>
<td>ENVE 264</td>
<td>Environmental Fluid Mechanics</td>
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</tbody>
</table>

ENVE 304 Process Thermodynamics 3
ENVE 309 Noise and Vibration Control 3
ENVE 325 Air Quality Engineering 4
ENVE 331 Introduction to 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 Senior Project Design Laboratory I 4
ENVE 467 Senior Project Design Laboratory 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 1, 2 10

Select from the technical electives list below

SUPPORT COURSES

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 124</td>
<td>General Chemistry for Physical Science and Engineering I (B3 &amp; B4)</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 (trans equiv CHEM 212)</td>
<td>5</td>
</tr>
<tr>
<td>ENGL 149</td>
<td>Technical Writing for Engineers (A3)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141</td>
<td>Calculus I (B1) 3</td>
<td>4</td>
</tr>
<tr>
<td>MATH 142</td>
<td>Calculus II (B1) 3</td>
<td>4</td>
</tr>
<tr>
<td>MATH 143</td>
<td>Calculus III (Add'l Area B) 3</td>
<td>4</td>
</tr>
<tr>
<td>MATH 241</td>
<td>Calculus IV</td>
<td>4</td>
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<tr>
<td>MATH 244</td>
<td>Linear Analysis I</td>
<td>4</td>
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<tr>
<td>MCRO 221</td>
<td>Microbiology (B2) 3</td>
<td>4-5</td>
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<tr>
<td>ME 211</td>
<td>Engineering Statics</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 141</td>
<td>General Physics IA (Add'l Area B) 3</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 132</td>
<td>General Physics II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 133</td>
<td>General Physics III</td>
<td>4</td>
</tr>
<tr>
<td>STAT 312</td>
<td>Statistical Methods for Engineers (B6) 3</td>
<td>4</td>
</tr>
</tbody>
</table>

GENERAL EDUCATION (GE)

(See GE program requirements below.) 40

FREE ELECTIVES

Free Electives 0

Total units 190-191
To be selected in consultation with your academic advisor.

A student may petition to take a course not included in the list of electives and receive major technical elective credit, but they must first obtain approval from a faculty advisor, before taking the course.

Required in Support; also satisfies GE.

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, support, or general education 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 ENVE Engineering technical elective 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 401 Principles of Conservation Biology
- ENGR/ENVE 581 Biochemical Engineering
- MIRIO 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
- CHEM 350 Chemical Safety

Energy
- BRAE 448 Bioconversion
- PHYS 310 Physics of Energy

Hydrology and Soils
- BRAE 532 Water Wells and Pumps

Law and Policy
- CRP/NR 404 Environmental Law
- CRP/NR 408 Water Resource Law and Policy
- IME 314 Engineering Economics

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
- Minimum of 8 units required at the 300 level.

Area A
- Expository Writing
- Oral Communication
- Reasoning, Argumentation and Writing (4 units in Support)

Area B
- Mathematics/Statistics (8 units in Support)
- Life Science (4 units in Support)
- Physical Science (4 units in Support)
- Upper-division Area B (4 units in Support)

Additional Area B units (8 units in Support)

Area C
- Literature
- Philosophy
- Fine/Performing Arts
- Upper-division elective (PHIL 340 or NR 360 recommended)

Area D/E
- The American Experience (Title 5, Section 40404 requirement)
- Political Economy
- Comparative Social Institutions
- Self Development (CSU Area E)

Total units

1 Required in Support; also satisfies GE