**BS ENVIRONMENTAL EARTH AND SOIL SCIENCES**

**Program Learning Objectives**
1. Demonstrate critical thinking and problem solving skills.
2. Effectively communicate scientific and technical knowledge in a professional manner.
3. Demonstrate the ability to integrate and apply technical knowledge in the following key areas:
   a. Geology & Climate – rock materials and processes of the lithosphere, plate tectonics; deformational histories, and past climates;
   b. Soils & Water – morphology, ecology, chemistry, physics, and health;
   c. Geography & Geospatial Technology – human cultural impacts, resource utilization trends and spatial patterns, geographic information systems and modeling;
   d. Resource Management – effects of land management activities on, and restoration and rehabilitation of, soil and water resources.
4. Demonstrate proficiency in quantitative skills and information management specific to their discipline areas.
5. Exhibit an understanding of their professional and ethical responsibilities, including respect for diversity.
6. Promote life-long learning habits by exposing students to the discovery process of applied research and demonstration projects conducted by the faculty.

**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, support or concentration 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>SS 432</td>
<td>Environmental Soil Physics</td>
<td>5</td>
</tr>
<tr>
<td>SS 423</td>
<td>Environmental Soil and Water Chemistry</td>
<td>5</td>
</tr>
</tbody>
</table>

Select one of the following courses to fulfill the senior project requirement:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERSC/NR 476</td>
<td>Senior Project - Advanced Internship Experience in Environmental Science/Management</td>
<td></td>
</tr>
<tr>
<td>ERSC/NR 477</td>
<td>Senior Project - Research Experience in Environmental Science</td>
<td></td>
</tr>
<tr>
<td>ERSC/NR 478</td>
<td>Senior Project - Current Topics in Environmental Science/Management</td>
<td></td>
</tr>
<tr>
<td>ERSC/NR 479</td>
<td>Senior Project - Independent Study</td>
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<tr>
<td>BOT 121</td>
<td>General Botany (B2 &amp; B4)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 127</td>
<td>General Chemistry for Agriculture and Life Science I (B3 &amp; B4)</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 128</td>
<td>General Chemistry for Agriculture and Life Science II</td>
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<td>CHEM 129</td>
<td>General Chemistry for Agriculture and Life Science III</td>
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<tr>
<td>CHEM 312</td>
<td>Survey of Organic Chemistry</td>
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</tr>
<tr>
<td>GEOG 150</td>
<td>Human Geography (D3)</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 301</td>
<td>Geography of Resource Utilization (D5)</td>
<td>4</td>
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<tr>
<td>SS 321</td>
<td>Soil Morphology</td>
<td>4</td>
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<tr>
<td>SS 422</td>
<td>Soil Ecology</td>
<td>4</td>
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<tr>
<td>SS 422</td>
<td>Soil Ecology</td>
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<tr>
<td>ERSC/NR 479</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>GEOG 301</td>
<td>Geography of Resource Utilization (D5)</td>
<td>4</td>
</tr>
<tr>
<td>or GEOG 308</td>
<td>Global Geography</td>
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<tr>
<td>GEOL 201</td>
<td>Physical Geology</td>
<td>3</td>
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<tr>
<td>GEOL 241</td>
<td>Physical Geology Laboratory</td>
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<tr>
<td>GEOL 415</td>
<td>Structural Geology</td>
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<tr>
<td>MATH 161</td>
<td>Calculus for the Life Sciences I (B1)</td>
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<tr>
<td>or MATH 141</td>
<td>Calculus I</td>
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<tr>
<td>NR/LA 218</td>
<td>Introduction to Geographic Information Systems (GIS)</td>
<td>3-4</td>
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<tr>
<td>or GEOG 318</td>
<td>Applications in GIS</td>
<td></td>
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<tr>
<td>PHYS 121</td>
<td>College Physics I</td>
<td>4</td>
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<tr>
<td>or PHYS 141</td>
<td>General Physics I</td>
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<tr>
<td>STAT 218</td>
<td>Applied Statistics for the Life Sciences (B1)</td>
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</tbody>
</table>

Concentration (32 units) or Approved Electives (20 units) in combination with Free Electives

**GENERAL EDUCATION (GE)**

(See GE program requirements below.)

**FREE ELECTIVES**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free Electives</td>
<td></td>
<td>0-12</td>
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</table>

Total units: 180-181

1. Required in Major; also satisfies GE.
2. Students in the Geology concentration need to take MATH 141 to meet prerequisites for courses in the concentration. Students interested in the Soil Geotechnical Studies career electives area need to take MATH 141 to meet prerequisites for courses in that area.
3. Students in the Geology concentration need to take PHYS 141 to meet prerequisites for courses in the concentration. Students interested in the Soil Geotechnical Studies career electives area need to take PHYS 141 to meet prerequisites for courses in that area.
Unless a concentration is declared, the default will be a combination of Approved Electives and Free Electives.

Students who do not declare a concentration are encouraged to use Approved Electives and Free Electives to earn a minor. See the below Approved Electives Guide for recommended minors.

### Concentrations

- [Geology](http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences/naturalresourcesmanagementenvironmentalsciences/bsenvironmentalearthsosciences/geologyconcentration)
- [Hydrology](http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences/naturalresourcesmanagementenvironmentalsciences/bsenvironmentalearthsosciences/hydrologyconcentration)

### Approved Electives Guide

Approved electives are courses that support the below career areas. Refer to number(s) next to each course to identify which courses align with each of the career areas. Consultation with an advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

1. Climate Change Science
2. Environmental Mitigation Strategies
3. Environmental Policy and Management
4. Environmental Soil Science
5. Forest and Environmental Practices
6. Geospatial Technology
7. Soil Geotechnical Studies
8. Sustainable Agriculture
9. Urban Forestry

Additionally, a student may earn one or more of the following minors through the appropriate selection of approved electives in combination with free electives (refer to advising materials for the minor):

- Anthropology and Geography
- Biology
- Geographic Information Systems for Agriculture
- Indigenous Studies in Natural Resources and the Environment
- Sustainable Environments
- Water Science

### Approved Electives

Select from the following:

- At least 8 units must be upper division (300-400 level)
- No more than 6 units of ERSC 339, SS 339, or NR 339 may count towards the degree.
- Courses used to meet a degree requirement cannot double count as an elective.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Notes</th>
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<tbody>
<tr>
<td>AEPS 123</td>
<td>Landscape Installation and Maintenance</td>
<td>5, 9</td>
</tr>
<tr>
<td>AEPS 124</td>
<td>Plant Propagation</td>
<td>5, 9</td>
</tr>
<tr>
<td>AEPS 233</td>
<td>Plant Materials I</td>
<td>5, 9</td>
</tr>
<tr>
<td>AEPS 234</td>
<td>Plant Materials II</td>
<td>5, 9</td>
</tr>
<tr>
<td>AEPS 203</td>
<td>Organic Enterprise</td>
<td>6</td>
</tr>
<tr>
<td>AEPS 230</td>
<td>Environmental Horticulture</td>
<td>8, 9</td>
</tr>
<tr>
<td>AEPS 244</td>
<td>Precision Farming</td>
<td>6, 8</td>
</tr>
<tr>
<td>AEPS 250</td>
<td>California Fruit Growing</td>
<td>8</td>
</tr>
<tr>
<td>AEPS 260</td>
<td>Introduction to Vegetable Science</td>
<td>8</td>
</tr>
<tr>
<td>AEPS 313</td>
<td>Agricultural Entomology</td>
<td>7</td>
</tr>
<tr>
<td>AEPS/AG 315</td>
<td>Organic Crop Production</td>
<td>8</td>
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<tr>
<td>AEPS 321</td>
<td>Weed Biology and Management</td>
<td>5, 8</td>
</tr>
<tr>
<td>AEPS 323</td>
<td>Plant Pathology</td>
<td>8</td>
</tr>
<tr>
<td>AEPS 327</td>
<td>Vertebrate Pest Management</td>
<td>5</td>
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<tr>
<td>AEPS 350</td>
<td>Abiotic Plant Problems</td>
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<tr>
<td>AEPS 381</td>
<td>Native Plants for California Landscapes</td>
<td>8, 9</td>
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<tr>
<td>AEPS 425</td>
<td>Arboriculture</td>
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<td>AEPS 431</td>
<td>Insect Pest Management</td>
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<td>AEPS 441</td>
<td>Biological Control for Pest Management</td>
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<td>AEPS 445</td>
<td>Cropping Systems</td>
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<tr>
<td>AG 339</td>
<td>Internship in Agriculture</td>
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<tr>
<td>AG/EDES/ENGR/ISLA/SCM/UNIV 350</td>
<td>The Global Environment</td>
<td>1, 8</td>
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<tr>
<td>AG 360</td>
<td>Holistic Management</td>
<td>6, 8</td>
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<tr>
<td>AGB 212</td>
<td>Agricultural Economics</td>
<td>8</td>
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<tr>
<td>AGB 312</td>
<td>Agricultural Policy</td>
<td>8</td>
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<tr>
<td>AGB 369</td>
<td>Agricultural Personnel Management</td>
<td>8</td>
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<tr>
<td>ANT 201</td>
<td>Cultural Anthropology</td>
<td>1</td>
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<tr>
<td>or ANT 202</td>
<td>World Prehistory</td>
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<tr>
<td>ANT 250</td>
<td>Biological Anthropology</td>
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<tr>
<td>ARCE 211</td>
<td>Structures I</td>
<td>7</td>
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<tr>
<td>or CE 204</td>
<td>Mechanics of Materials I</td>
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<tr>
<td>ARCE 212</td>
<td>Structures II</td>
<td>7</td>
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<tr>
<td>or ME 211</td>
<td>Engineering Static</td>
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<tr>
<td>ARCE 223</td>
<td>Mechanics of Structural Members</td>
<td>7</td>
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<tr>
<td>or CE 207</td>
<td>Mechanics of Materials II</td>
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<tr>
<td>ARCE 422</td>
<td>Foundation Design</td>
<td>7</td>
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<tr>
<td>ASCI 112</td>
<td>Principles of Animal Science</td>
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<tr>
<td>ASCI 221</td>
<td>Introduction to Beef Production</td>
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<tr>
<td>ASCI 223</td>
<td>Systems of Small Ruminant Management</td>
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</tr>
<tr>
<td>ASCI 311</td>
<td>Advanced Beef Cattle System Management</td>
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<tr>
<td>BIO 329</td>
<td>Vertebrate Field Zoology</td>
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<td>BIO 427</td>
<td>Wildlife Management</td>
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<tr>
<td>BIO 435</td>
<td>Plant Physiology</td>
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<tr>
<td>BOT 326</td>
<td>Plant Ecology</td>
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<tr>
<td>BRAE 133</td>
<td>Introduction to Engineering Design Graphics</td>
<td>5, 6</td>
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<tr>
<td>BRAE 141</td>
<td>Agricultural Machinery Safety</td>
<td>8</td>
</tr>
<tr>
<td>BRAE 142</td>
<td>Agricultural Power and Machinery Management</td>
<td>8</td>
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<tr>
<td>BRAE 151</td>
<td>CAD for Agricultural Engineering</td>
<td>5, 6</td>
</tr>
<tr>
<td>BRAE 237</td>
<td>Introduction to Engineering Surveying</td>
<td>5</td>
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</tbody>
</table>
BRAE 239  Engineering Surveying 5,6
BRAE/NR 247  Forest Surveying 5
BRAE 340  Irrigation Water Management 5,8
BRAE 345  Aerial Photogrammetry and Remote Sensing 6
BRAE 348  Energy for a Sustainable Society 1
BRAE 447  Advanced Surveying with GIS Applications 6
CE 112  Design Principles in Civil Engineering 6
CE 113  Computer Aided Drafting in Civil Engineering 6
CE 204  Mechanics of Materials I 7
CE 381 & CE 382  Geotechnical Engineering and Geotechnical Engineering Laboratory 7
or ARCE 421  Soil Mechanics
CHEM 313  Survey of Biochemistry and Biotechnology 4
CHEM 331  Quantitative Analysis 4
CHEM 341  Environmental Chemistry: Water Pollution 4
CRP 212  Introduction to Urban Planning 3,5,6,9
CRP 336  Introduction to Environmental Planning 5,6
CRP/NR 404  Environmental Law 1
CRP/NR 408  Water Resource Law and Policy 2,3,5,8
CRP 420  Land Use Law 3,5
CSC/CPE 101  Fundamentals of Computer Science 6
CSC 235  Fundamentals of Computer Science for Scientists and Engineers I 6
ECON 221  Microeconomics 3
EDES 406  Sustainable Environments 8
ENVE 264  Environmental Fluid Mechanics 7
ENVE 324  Introduction to Air Pollution 1
ERSC/GEOG 250  Physical Geography 1
ERSC 323  Geomorphology 4,6
ERSC/GEOG 325  Climate and Humanity 1
ERSC/SS 339  Internship in Environmental Earth and Soil Sciences 1,2,3,4,5,6,7,8,9
or NR 339  Internship in Forest and Natural Resources
ERSC/GEOG 414  Global and Regional Climatology 1
ERSC/GEOG 415  Applied Meteorology and Climatology 1
ES 241  Survey of Indigenous Studies 9
GEOG 308  Global Geography 1
GEOG 328  Applications in Remote Sensing 1,6
GEOG 440  Advanced Applications in GIS 1
GEOL 203  Fossils and the History of Life 1
GEOL 205  Earthquakes 7
GEOL 305  Fundamentals of Seismology 7
GEOL 420  Applied Geophysics 7
JOUR 203  News Reporting and Writing 5
JOUR 205  Agricultural Communications 5
MATH 142  Calculus II 4
or MATH 162  Calculus for the Life Sciences II
MATH 143  Calculus III 7
MATH 241  Calculus IV 7
MCRO 221  Microbiology 5
MCRO 436  Microbial Ecology 5
ME 320  Consumer Energy Guide 1
NR 141  Introduction to Forest Ecosystem Management 5,9
NR 142  Environmental Management 8,9
NR 204  Wildland Fire Control 5,9
NR 208  Dendrology 5,9
NR 215  Land and Resource Measurements 5
NR 260  Forest Practices and Environmental Protection 5
NR 306  Natural Resource Ecology and Habitat Management 5,6,8,9
NR/ES 308  Fire and Society 5
NR 312  Technology of Wildland Fire Management 5
NR 315  Measurements and Sampling in Forested Environments 6
NR 320  Watershed Processes and Management 5
NR 324  Social Dimensions of Sustainable Food and Fiber Systems 5
NR 326  Natural Resources Economics and Valuation 1,3,5
NR 340  Wildland Fire Management 5,9
NR 350  Urban Forestry 5,9
NR/ES 360  Ethnicity and the Land 5
NR 365  Silviculture and Vegetation Management 5
NR 400  Special Problems for Advanced Undergraduates 9
NR/ES 406  Indigenous Peoples and International Law and Policy 5
NR 418  Applied GIS 1,6,9
NR 420  Watershed Assessment and Protection 5
NR 434  Wood Properties, Products and Sustainable Uses 5,9
NR 435  Environmental Policy Analysis 1,3
NR 455  Wildland-Urban Fire Protection 5,9
NR 475  Sustainable Forest and Environmental Practices 1,2,3,4,5,6,7,8,9
PHIL 340  Environmental Ethics 1,3
PHYS 122  College Physics II 4
or PHYS 132  General Physics II
PHYS 133  General Physics III 7
PHYS 410  Physics of Solid Earth 7
POLS 112  American and California Government 3
### General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext).
- Minimum of 12 units required at the 300 level.

<table>
<thead>
<tr>
<th>Area A</th>
<th>Communication</th>
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<tbody>
<tr>
<td>A1</td>
<td>Expository Writing</td>
</tr>
<tr>
<td>A2</td>
<td>Oral Communication</td>
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<thead>
<tr>
<th>Area B</th>
<th>Science and Mathematics</th>
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<tbody>
<tr>
<td>B1</td>
<td>Mathematics/Statistics (8 units in Major)</td>
</tr>
<tr>
<td>B2</td>
<td>Life Science (4 units in Major)</td>
</tr>
<tr>
<td>B3</td>
<td>Physical Science (4 units in Major)</td>
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<table>
<thead>
<tr>
<th>Area C</th>
<th>Arts and Humanities</th>
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<tbody>
<tr>
<td>C1</td>
<td>Literature</td>
</tr>
<tr>
<td>C2</td>
<td>Philosophy</td>
</tr>
<tr>
<td>C3</td>
<td>Fine/Performing Arts</td>
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<tr>
<td>C4</td>
<td>Upper-division elective</td>
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<table>
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<tr>
<th>Area D/E</th>
<th>Society and the Individual</th>
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<tbody>
<tr>
<td>D1</td>
<td>The American Experience (Title 5, Section 40404 requirement)</td>
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<tr>
<td>D2</td>
<td>Political Economy</td>
</tr>
<tr>
<td>D3</td>
<td>Comparative Social Institutions (4 units in Major)</td>
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<tr>
<td>D4</td>
<td>Self Development (CSU Area E)</td>
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<tr>
<td>D5</td>
<td>Upper-division elective (4 units in Major)</td>
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<tr>
<th>Area F</th>
<th>Technology</th>
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<tbody>
<tr>
<td>F</td>
<td>Upper-division elective (BRAE 340 recommended)</td>
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</table>

**Total units** | 48 |

1 Required in Major; also satisfies GE.