EMMETT INTERDISCIPLINARY PROGRAM IN ENVIRONMENT AND RESOURCES (E-IPER)

Courses offered by the Emmett Interdisciplinary Program in Environment and Resources are listed under the subject code ENVRES on the Stanford Bulletin’s ExploreCourses web site (http://exploredegrees.stanford.edu/subject?subject=ENVRES). To view the current Ph.D. and M.S. degree requirement documents, see the “Graduate Degrees catalog” section of this bulletin. The E-IPER Ph.D. and M.S. degrees are guided by comprehensive requirements created with faculty and student input and approved by E-IPER’s Executive Committee. To access the current Ph.D. and M.S. degree requirement documents, see the E-IPER web site (https://earth.stanford.edu/eiper).

Mission of the Program

The Emmett Interdisciplinary Program in Environment and Resources develops the knowledge, skills, perspectives, and ways of thinking needed to understand and help solve the world’s most significant environmental and resources sustainability challenges. E-IPER strives to be a model for interdisciplinary graduate education. E-IPER offers a Ph.D. in Environment and Resources, a Joint M.S. exclusively for students in Stanford’s Graduate School of Business or Stanford Law School, and a Dual M.S. for students in the School of Medicine or a Ph.D. program in another department. E-IPER's home is the School of Earth, Energy & Environmental Sciences; affiliated faculty come from all seven Stanford schools.

Graduate Programs in Environment and Resources

The University’s basic requirements for the M.S. and Ph.D. degrees are discussed in the “Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees)” section of this bulletin. The E-IPER Ph.D. and M.S. degrees are guided by comprehensive requirements created with faculty and student input and approved by E-IPER’s Executive Committee. To access the current Ph.D. and M.S. degree requirement documents, see the E-IPER web site (https://earth.stanford.edu/eiper).

Learning Outcomes (Graduate)

Completion of the Ph.D. and M.S. degrees in Environment and Resources provides students with the knowledge, skills, perspectives, and ways of thinking needed to understand and help solve the world’s most significant environmental and resources sustainability challenges.

Master of Science in Environment and Resources

For information on the University’s basic requirements for the master's degree, see the “Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees)” section of this bulletin.

The Master of Science degree, offered as a joint master’s degree or a dual master’s degree, is an option only for: M.B.A. students in the Graduate School of Business; J.D. students in the Stanford Law School; M.D. students in the School of Medicine; students pursuing a Ph.D. in another Stanford department; and for E-IPER Ph.D. students who do not continue in the Ph.D. degree program.

Joint Master’s Degree

Students enrolled in a professional degree program in Stanford’s Graduate School of Business or the Stanford Law School are eligible to apply for admission to the Joint M.S. in Environment and Resources Degree program. Enrollment in the joint M.S. program allows students to pursue an M.S. degree concurrently with their professional degree and to count a defined number of units toward both degrees, resulting in the award of Joint M.B.A. and M.S. in Environment and Resources degree or a Joint J.D. and M.S. in Environment and Resources degree.

The joint M.S.-M.B.A degree program requires a total of 129 units: 84 units for the M.B.A. and 45 units for the M.S. (compared to 100 units for the M.B.A. plus 45 units for the M.S. as separate degrees) to be completed over approximately eight academic quarters.

The joint M.S.-J.D. degree program requires a minimum of 113 units; additional units may be necessary to satisfy all requirements. The J.D. degree requires 111 units (minimum of 80 Law units and 31 non-Law units) and the M.S. degree requires 45 units. The joint degree allows up to 43 overlapping units: 31 non-Law units allowed within the J.D. degree plus 12 professional school units allowed within the M.S. degree. The joint M.S.-J.D. may be completed in three years.

Each student’s program of study focuses on a specific track (see "Joint M.S. and Dual M.S. Course Tracks" below) and is subject to the approval by the student's faculty adviser and E-IPER staff. The joint degree is conferred when the requirements for both the E-IPER M.S. and the professional degree program have been met.

In addition to requirements for the professional degree, all joint M.S. students are required to complete 45 units within the parameters outlined below and must achieve at least a 'B' average (3.0 grade point average) for all letter-graded courses taken toward the M.S. degree.

Professional school letter-graded courses are not included in the E-IPER GPA calculation. The student must complete at least 23 units at the 200 level or above. Courses numbered 1 to 99 are not allowable. For application information, see the Admissions page on the E-IPER website.

1. Required Courses: An introductory core course and a capstone project seminar:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ENVRES 280</td>
<td>Topics in Environment and Resources</td>
<td>2</td>
</tr>
<tr>
<td>ENVRES 290</td>
<td>Capstone Project Seminar in Environment and Resources*</td>
<td>1-3</td>
</tr>
</tbody>
</table>

* The capstone project integrates the student's professional and M.S. degrees and may be completed in one quarter (3 units required) or across two quarters (for a total of either 3 or 4 units).

2. Track Courses: A minimum of four letter-graded courses from one M.S. course track. Track courses must be taken for a minimum of 3 units. Specific track courses are listed below in the “Joint M.S. and Dual M.S. Course Tracks” section.

   a. Cleantech
   b. Climate and Atmosphere
   c. Energy
   d. Freshwater
   e. Global, Community, and Environmental Health
   f. Land Use and Agriculture
   g. Oceans and Estuaries
   h. Sustainable Built Environment
   i. Sustainable Design

3. Elective Courses: At least four 3-5 unit letter-graded elective courses at the 100-level or higher. Elective courses may be taken from the student's selected course track, another course track, or elsewhere in the University, provided that they are relevant to the student's environment and resources course of study.

There are additional restrictions on course work used to fulfill the joint M.S. degree requirements:
A maximum of 5 units from courses that are identified as primarily consisting of guest lectures, such as the Energy Seminar, may be counted toward the Joint M.S. degree.

A maximum of 5 units of individual study courses, directed reading and/or independent research units (such as ENVRES 398 Directed Reading in Environment and Resources or ENVRES 399 Directed Research in Environment and Resources) may be counted toward the joint M.S. degree. One individual study course, if taken for 3-5 letter-graded units, may be counted as one of the four elective courses.

A maximum of 12 units from approved courses related to environmental and resource fields, from any professional school, may be counted toward the joint M.S. degree. One approved professional school course may be counted as one of the four electives.

### Dual Master’s Degree

Students in the School of Medicine or students pursuing a Ph.D. in another Stanford department may apply to the M.S. in Environment and Resources dual degree program. For the dual degree, students must meet the University’s minimum requirements for their M.D. or Ph.D. degree and also complete an additional 45 units for the M.S. in Environment and Resources. Completion of the M.S. typically requires at least three quarters of study in addition to the time required for the student’s other degree. For additional information, see the E-IPER web site.

Each student’s program of study focuses on a specific track (see "Joint M.S. and Dual M.S. Course Tracks" below) and is subject to the approval of the student’s faculty adviser and E-IPER staff. The two degrees are conferred when the requirements for both the E-IPER M.S. and the other degree program have been met. For application information, see the Admissions (https://earth.stanford.edu/eiper/joint-ms-admissions) page on the E-IPER website (https://earth.stanford.edu/eiper).

In addition to requirements for the M.D. or Ph.D. degree, students are required to complete 45 units within the parameters outlined below and must achieve at least a ‘B’ average (3.0 grade point average) for all letter-graded courses taken toward the M.S. degree. The student must complete at least 23 units at the 200-level or above. Courses numbered 1 to 99 are not allowable.

1. **Required Courses:** An introductory core course and a capstone project seminar:

<table>
<thead>
<tr>
<th>Course</th>
<th>Topics</th>
<th>Units</th>
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<tbody>
<tr>
<td>ENVRES 280</td>
<td>Topics in Environment and Resources</td>
<td>2</td>
</tr>
<tr>
<td>ENVRES 290</td>
<td>Capstone Project Seminar in Environment and Resources (see ‘2’ below)</td>
<td>1-3</td>
</tr>
</tbody>
</table>

2. The capstone project integrates the student’s professional and M.S. degrees and may be completed in one quarter (3 units required) or across two quarters (for a total of either 3 or 4 units).

3. **Track Courses:** A minimum of four letter-graded courses from one M.S. Course Track. Track courses must be taken for a minimum of 3 units. Specific track courses are listed below under Joint M.S. and Dual M.S. Course Tracks.

- **Cleantech**
  - Climate and Atmosphere
  - Energy
  - Freshwater
  - Global, Community, and Environmental Health
  - Land Use and Agriculture
  - Oceans and Estuaries
  - Sustainable Built Environment
  - Sustainable Design

4. **Elective Courses:** At least four additional 3-5 unit letter-graded elective courses at the 100 level or higher. Elective courses may be taken from the student’s selected course track, another course track, or elsewhere in the University, provided that they are relevant to the student’s environment and resources course of study.

There are additional restrictions on course work used to fulfill the dual M.S. degree requirements:

- A maximum of 5 units from courses that are identified as primarily consisting of guest lectures, such as the Energy Seminar may be counted toward the dual M.S. degree.
- A maximum of 5 units of individual study courses, directed reading, and independent research (such as ENVRES 398 Directed Reading in Environment and Resources or ENVRES 399 Directed Research in Environment and Resources) may be counted toward the Dual M.S. degree. One individual study course, if taken for 3-5 letter-graded units, may be counted as one of the four elective courses.
- A maximum of 12 units from approved courses related to the environmental and resource fields, from any professional school, may be counted toward the dual M.S. degree. One approved professional school course may be counted as one of the four electives.

### Joint M.S. and Dual M.S. Course Tracks

Students should consult the Stanford Bulletin’s ExploreCourses (http://explorecourses.stanford.edu) web site to view the course description, class schedule, location, eligibility, and prerequisites for all courses. Course track information and other recommended courses are also available on the E-IPER web site.

#### Cleantech

<table>
<thead>
<tr>
<th>Course</th>
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<td>APPPHYS 219</td>
<td>Solid State Physics Problems in Energy Technology</td>
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<tr>
<td>BIOE 355</td>
<td>Advanced Biochemical Engineering</td>
</tr>
<tr>
<td>CEE 176A</td>
<td>Energy Efficient Buildings</td>
</tr>
<tr>
<td>CEE 176B</td>
<td>100% Clean, Renewable Energy and Storage for Everything</td>
</tr>
<tr>
<td>CEE 207A</td>
<td>Understanding Energy</td>
</tr>
<tr>
<td>CEE 226</td>
<td>Life Cycle Assessment for Complex Systems</td>
</tr>
<tr>
<td>CEE 272R</td>
<td>Modern Power Systems Engineering</td>
</tr>
<tr>
<td>CEE 274A</td>
<td>Environmental Microbiology I</td>
</tr>
<tr>
<td>CEE 274B</td>
<td>Microbial Bioenergy Systems</td>
</tr>
<tr>
<td>CEE 277L</td>
<td>Smart Cities &amp; Communities</td>
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<tr>
<td>ECON 155</td>
<td>Environmental Economics and Policy</td>
</tr>
<tr>
<td>ENERGY 253</td>
<td>Carbon Capture and Sequestration</td>
</tr>
<tr>
<td>ENERGY 267</td>
<td>Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties</td>
</tr>
<tr>
<td>ENERGY 269</td>
<td>Geothermal Reservoir Engineering</td>
</tr>
<tr>
<td>ENERGY 293C</td>
<td>Energy from Wind and Water Currents</td>
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<tr>
<td>MATSCI 156</td>
<td>Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution</td>
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<tr>
<td>MATSCI 302</td>
<td>Solar Cells</td>
</tr>
<tr>
<td>MATSCI 303</td>
<td>Principles, Materials and Devices of Batteries</td>
</tr>
<tr>
<td>MATSCI 316</td>
<td>Nanoscale Science, Engineering, and Technology</td>
</tr>
<tr>
<td>ME 182</td>
<td>Electric Transportation</td>
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<td>ME 260</td>
<td>Fuel Cell Science and Technology</td>
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### Climate and Atmosphere

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<td>BIO 117</td>
<td>Biology and Global Change</td>
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<tr>
<td>BIO 238</td>
<td>Ecosystem Services: Frontiers in the Science of Valuing Nature</td>
<td>3</td>
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<tr>
<td>CEE 172</td>
<td>Air Quality Management</td>
<td>3</td>
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<tr>
<td>CEE 226</td>
<td>Life Cycle Assessment for Complex Systems</td>
<td>3-4</td>
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<tr>
<td>CEE 263A</td>
<td>Air Pollution Modeling</td>
<td>3-4</td>
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<tr>
<td>CEE 263B</td>
<td>Numerical Weather Prediction</td>
<td>3-4</td>
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<tr>
<td>CEE 263C</td>
<td>Weather and Storms</td>
<td>3</td>
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<tr>
<td>CEE 263D</td>
<td>Air Pollution and Global Warming: History, Science, and Solutions</td>
<td>3</td>
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<td>CEE 278A</td>
<td>Air Pollution Fundamentals</td>
<td>3</td>
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<td>CEE 278C</td>
<td>Indoor Air Quality</td>
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<td>ECON 155</td>
<td>Environmental Economics and Policy</td>
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<tr>
<td>ENERGY 253</td>
<td>Carbon Capture and Sequestration</td>
<td>3-4</td>
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<tr>
<td>ESS 246A</td>
<td>Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation</td>
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<tr>
<td>ESS 246B</td>
<td>Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation</td>
<td>3</td>
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<tr>
<td>MS&amp;E 294</td>
<td>Systems Modeling for Climate Policy Analysis</td>
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### Energy

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<tr>
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<td>CEE 176B</td>
<td>100% Clean, Renewable Energy and Storage for Everything</td>
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<td>CEE 207A</td>
<td>Understanding Energy</td>
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<td>CEE 226</td>
<td>Life Cycle Assessment for Complex Systems</td>
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<tr>
<td>CEE 226E</td>
<td>Advanced Topics in Integrated, Energy-Efficient Building Design</td>
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<tr>
<td>CEE 255</td>
<td>Introduction to Sensing Networks for CEE</td>
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<td>CEE 256</td>
<td>Building Systems</td>
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<td>CEE 272R</td>
<td>Modern Power Systems Engineering</td>
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<tr>
<td>ECON 155</td>
<td>Environmental Economics and Policy</td>
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<td>ENERGY 101</td>
<td>Energy and the Environment</td>
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<tr>
<td>ENERGY 102</td>
<td>Fundamentals of Renewable Power</td>
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<tr>
<td>ENERGY 104</td>
<td>Sustainable Energy for 9 Billion</td>
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<td>ENERGY 120</td>
<td>Fundamentals of Petroleum Engineering</td>
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<tr>
<td>ENERGY 204</td>
<td>Achieving Universal Energy Access by 2030: Can it be done?</td>
<td>2-3</td>
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<td>ENERGY 226</td>
<td>Thermal Recovery Methods</td>
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<td>ENERGY 227</td>
<td>Enhanced Oil Recovery</td>
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<td>Geothermal Reservoir Engineering</td>
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<tr>
<td>ENERGY 271</td>
<td>Energy Infrastructure, Technology and Economics</td>
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<td>ENERGY 291</td>
<td>Optimization of Energy Systems</td>
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<td>ENERGY 293B</td>
<td>Fundamentals of Energy Processes</td>
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<td>ENERGY 293C</td>
<td>Energy from Wind and Water Currents</td>
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<td>GEOPHYS 208</td>
<td>Unconventional Reservoir Geomechanics</td>
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<tr>
<td>MATSCI 302</td>
<td>Solar Cells</td>
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<td>ME 260</td>
<td>Fuel Cell Science and Technology</td>
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<td>ME 370A</td>
<td>Energy Systems I: Thermodynamics</td>
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<tr>
<td>ME 370B</td>
<td>Energy Systems II: Modeling and Advanced Concepts</td>
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<td>ME 370C</td>
<td>Energy Systems III: Projects</td>
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<tr>
<td>MS&amp;E 243</td>
<td>Energy and Environmental Policy Analysis</td>
<td>3</td>
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<td>MS&amp;E 295</td>
<td>Energy Policy Analysis</td>
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### Freshwater

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<tr>
<td>BIO 238</td>
<td>Ecosystem Services: Frontiers in the Science of Valuing Nature</td>
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<tr>
<td>CEE 101B</td>
<td>Mechanics of Fluids</td>
<td>4</td>
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<tr>
<td>CEE 174A</td>
<td>Providing Safe Water for the Developing and Developed World</td>
<td>3</td>
</tr>
<tr>
<td>CEE 174B</td>
<td>Wastewater Treatment: From Disposal to Resource Recovery</td>
<td>3</td>
</tr>
<tr>
<td>CEE 177</td>
<td>Aquatic Chemistry and Biology</td>
<td>4</td>
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<tr>
<td>CEE 226</td>
<td>Life Cycle Assessment for Complex Systems</td>
<td>3-4</td>
</tr>
<tr>
<td>CEE 260A</td>
<td>Physical Hydrogeology</td>
<td>4</td>
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<tr>
<td>CEE 260C</td>
<td>Contaminant Hydrogeology and Reactive Transport</td>
<td>3</td>
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<tr>
<td>CEE 262A</td>
<td>Hydrodynamics</td>
<td>3-4</td>
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<tr>
<td>CEE 262B</td>
<td>Transport and Mixing in Surface Water Flows</td>
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<td>CEE 265A</td>
<td>Sustainable Water Resources Development</td>
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<tr>
<td>CEE 265C</td>
<td>Water Resources Management</td>
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<tr>
<td>CEE 265D</td>
<td>Water and Sanitation in Developing Countries</td>
<td>1-3</td>
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<tr>
<td>CEE 266A</td>
<td>Watersheds and Wetlands</td>
<td>4</td>
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<tr>
<td>CEE 266B</td>
<td>Floods and Droughts, Dams and Aqueducts</td>
<td>4</td>
</tr>
<tr>
<td>CEE 270</td>
<td>Movement and Fate of Organic Contaminants in Waters</td>
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<tr>
<td>CEE 271A</td>
<td>Physical and Chemical Treatment Processes</td>
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<tr>
<td>CEE 271B</td>
<td>Environmental Biotechnology</td>
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<tr>
<td>CEE 273</td>
<td>Aquatic Chemistry</td>
<td>3</td>
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<tr>
<td>CEE 273A</td>
<td>Water Chemistry Laboratory</td>
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<tr>
<td>ECON 155</td>
<td>Environmental Economics and Policy</td>
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### Global, Community, and Environmental Health

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<tr>
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<th>Units</th>
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<tbody>
<tr>
<td>ANTHRO 262</td>
<td>Indigenous Peoples and Environmental Problems</td>
<td>3-5</td>
</tr>
<tr>
<td>ANTHRO 266</td>
<td>Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness</td>
<td>3-5</td>
</tr>
<tr>
<td>ANTHRO 277</td>
<td>Environmental Change and Emerging Infectious Diseases</td>
<td>4-5</td>
</tr>
<tr>
<td>ANTHRO 282</td>
<td>Medical Anthropology</td>
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<td>Life Cycle Assessment for Complex Systems</td>
<td>3-4</td>
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<tr>
<td>CEE 260C</td>
<td>Contaminant Hydrogeology and Reactive Transport</td>
<td>3</td>
</tr>
<tr>
<td>CEE 263A</td>
<td>Air Pollution Modeling</td>
<td>3-4</td>
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<tr>
<td>CEE 263D</td>
<td>Air Pollution and Global Warming: History, Science, and Solutions</td>
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<tr>
<td>CEE 265A</td>
<td>Sustainable Water Resources Development</td>
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</tr>
<tr>
<td>CEE 265C</td>
<td>Water Resources Management</td>
<td>3</td>
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<tr>
<td>CEE 265D</td>
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<tr>
<td>CEE 270</td>
<td>Movement and Fate of Organic Contaminants in Waters</td>
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<td>CEE 272</td>
<td>Coastal Contaminants</td>
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<tr>
<td>CEE 274D</td>
<td>Pathogens and Disinfection</td>
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<tr>
<td>CEE 276</td>
<td>Introduction to Human Exposure Analysis</td>
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<tr>
<td>CEE 277S</td>
<td>Design for a Sustainable World</td>
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<tr>
<td>CEE 278A</td>
<td>Air Pollution Fundamentals</td>
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<tr>
<td>CEE 278C</td>
<td>Indoor Air Quality</td>
<td>2-3</td>
</tr>
<tr>
<td>ECON 155</td>
<td>Environmental Economics and Policy</td>
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<tr>
<td>HUMBIO 153</td>
<td>Parasites and Pestilence: Infectious Public Health Challenges</td>
<td>4</td>
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<tr>
<td>HUMBIO 166</td>
<td>Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context</td>
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### Oceans and Estuaries

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>BIO 238</td>
<td>Ecosystem Services: Frontiers in the Science of Valuing Nature</td>
<td>3</td>
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<tr>
<td>BIOHOPK 263H</td>
<td>Oceanic Biology</td>
<td>4</td>
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<tr>
<td>BIOHOPK 272H</td>
<td>Marine Ecology: From Organisms to Ecosystems</td>
<td>5</td>
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<tr>
<td>BIOHOPK 273H</td>
<td>Marine Conservation Biology</td>
<td>4</td>
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<tr>
<td>BIOHOPK 274</td>
<td>Hopkins Microbiology Course</td>
<td>3-12</td>
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<tr>
<td>BIOHOPK 285H</td>
<td>Ecology and Conservation of Kelp Forest Communities</td>
<td>5</td>
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<td>CEE 226</td>
<td>Life Cycle Assessment for Complex Systems</td>
<td>3-4</td>
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<tr>
<td>CEE 262D</td>
<td>Introduction to Physical Oceanography</td>
<td>4</td>
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<td>CEE 272</td>
<td>Coastal Contaminants</td>
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</tr>
<tr>
<td>CEE 274S</td>
<td>Hopkins Microbiology Course</td>
<td>3-12</td>
</tr>
<tr>
<td>CEE 275A</td>
<td>California Coast: Science, Policy, and Law</td>
<td>3-4</td>
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<td>ECON 155</td>
<td>Environmental Economics and Policy</td>
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<td>ESS 241</td>
<td>Remote Sensing of the Oceans</td>
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<td>ESS 244</td>
<td>Marine Ecosystem Modeling</td>
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<tr>
<td>ESS 246A</td>
<td>Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation</td>
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<tr>
<td>ESS 246B</td>
<td>Atmosphere, Ocean, and Climate Dynamics: the Ocean Circulation</td>
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<tr>
<td>ESS 251</td>
<td>Biological Oceanography</td>
<td>3-4</td>
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<td>ESS 252</td>
<td>Marine Chemistry</td>
<td>3-4</td>
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<td>ESS 258</td>
<td>Geomicrobiology</td>
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### Sustainable Built Environment

<table>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>CEE 100</td>
<td>Managing Sustainable Building Projects</td>
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</tr>
<tr>
<td>CEE 174A</td>
<td>Providing Safe Water for the Developing and Developed World</td>
<td>3</td>
</tr>
<tr>
<td>CEE 174B</td>
<td>Wastewater Treatment: From Disposal to Resource Recovery</td>
<td>3</td>
</tr>
<tr>
<td>CEE 176A</td>
<td>Energy Efficient Buildings</td>
<td>3-4</td>
</tr>
<tr>
<td>CEE 176B</td>
<td>100% Clean, Renewable Energy and Storage for Everything</td>
<td>3-4</td>
</tr>
<tr>
<td>CEE 224X</td>
<td>Sustainable Urban Systems Fundamentals</td>
<td>3-5</td>
</tr>
<tr>
<td>CEE 224Y</td>
<td>Sustainable Urban Systems Project</td>
<td>1-5</td>
</tr>
<tr>
<td>CEE 224Z</td>
<td>Sustainable Urban Systems Project</td>
<td>1-5</td>
</tr>
</tbody>
</table>
In exceptional circumstances, students in E-IPER’s Ph.D. program may opt to complete their training with a Master of Science degree. There is no direct admission to the M.S. degree program. Requirements for the M.S. include:

1. Completion of a minimum of 45 units at or above the 100-level, of which 23 units must be at or above the 200-level. Courses numbered 1 to 99 are not allowable.
2. Completion of the E-IPER Ph.D. core curriculum, with a letter grade of 'B' or higher in each course:

   - Environ 215: Environmental Decision-Making and Risk Perception
   - Environ 216: Design for Extreme Affordability
   - Environ 218: Advanced Product Design: Needfinding
   - Environ 219: Design Impact Master’s Project II
   - Environ 227: Design Thinking Studio
   - Environ 230: Pursuing Sustainability: Managing Complex Social Environmental Systems

Additional courses may be chosen in consultation with the student’s lead advisers. Students must maintain at least a ‘B’ (3.0) grade point average in all courses taken for the M.S. degree. The M.S. degree does not have an M.S. with thesis option. Students may write a M.S. thesis, but it is not formally recognized by the University.

**Doctor of Philosophy in Environment and Resources**

For information on the University’s basic requirements for the Ph.D. degree, see the “Graduate Degrees” section of this bulletin. E-IPER updates the Ph.D. requirements annually, laying out the structure of advising meetings, core courses, program activities, and milestones that guide students’ progress. Each student works with a faculty advising team from different research areas to design a course of study that allows the student to develop and exhibit:

1. understanding of analytical tools and research approaches for interdisciplinary problem solving, and a mastery of those tools and approaches central to the student’s thesis work
2. depth of knowledge in at least two distinct fields of inquiry; and
3. interdisciplinary breadth as determined by faculty, advising team, and student.

Program-specific Ph.D. requirements, including a timeline to achieve milestones, are outlined in detail in the current year requirements and are summarized below:

1. In the first year, completion of the Ph.D. core course sequence:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Environ 300</td>
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<td>Environ 315</td>
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<td>Environ 320</td>
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<tr>
<td>Environ 330</td>
<td>3</td>
</tr>
<tr>
<td>Environ 398</td>
<td>1-10</td>
</tr>
</tbody>
</table>

2. **Fields of Inquiry:** Fulfillment of depth of knowledge in the student’s two chosen fields of inquiry through courses, research, and/or independent studies as determined by the student and their two lead advisers and committee members. Fields of inquiry are central to the student’s dissertation research. Students have the freedom to define and choose the two fields of inquiry in which they develop depth of understanding throughout their Ph.D. program; the fields must be distinct from one another to ensure that the student’s research is interdisciplinary. Each field of inquiry is associated with a specific lead adviser.

As part of the qualifying exam, each student is required to submit a detailed essay describing:

- the two fields of inquiry, explaining the development of these fields, and their relationship to the larger disciplines from which they are drawn;
- how rigor is understood and achieved in these fields;
- the importance and applicability of these fields to the student’s research questions; and

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**Sustainable Design**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEE 226</td>
<td>3-4</td>
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<tr>
<td>CEE 277S</td>
<td>1-5</td>
</tr>
<tr>
<td>Earthsys 187</td>
<td>2-3</td>
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<td>Earthsys 289A</td>
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<td>Econ 155</td>
<td>5</td>
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<tr>
<td>Environ 240</td>
<td>1-3</td>
</tr>
<tr>
<td>Environ 380</td>
<td>3-4</td>
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<tr>
<td>Me 206A</td>
<td>4</td>
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<tr>
<td>Me 206B</td>
<td>4</td>
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<td>Me 216A</td>
<td>3-4</td>
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<td>Me 316B</td>
<td>2-6</td>
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<td>Me 377</td>
<td>4</td>
</tr>
<tr>
<td>Sust 210</td>
<td>3</td>
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</table>

**Master of Science**

In exceptional circumstances, students in E-IPER’s Ph.D. program may opt to complete their training with a Master of Science degree. There is no direct admission to the M.S. degree program. Requirements for the M.S. include:

1. Completion of a minimum of 45 units at or above the 100-level, of which 23 units must be at or above the 200-level. Courses numbered 1 to 99 are not allowable.
2. Completion of the E-IPER Ph.D. core curriculum, with a letter grade of 'B' or higher in each course:

   - Environ 315: Environmental Research Design Seminar
   - Environ 320: Designing Environmental Research
   - Environ 330: Research Approaches for Environmental Problem Solving
   - Environ 398: Directed Reading in Environment and Resources
how the student’s work will combine these two fields of inquiry to produce an interdisciplinary research project that demonstrates scholarly rigor.

1. Demonstration of an interdisciplinary breadth of knowledge that is more broadly related to environment and resources; this may be in the form of courses, independent study, and/or evidence of proficiency through prior course work or other experience. Fulfillment of the interdisciplinary breadth requirement must be certified by the student’s lead faculty advisers and committee members.

2. Completion of quarterly meetings with advisers during the first year, and at minimum, annual meetings thereafter.

3. Submission of a candidacy plan for review at the second-year committee meeting and subject to the approval of that plan by the student’s committee and E-IPER’s faculty director. The candidacy plan documents how the student has fulfilled the program requirements to date and includes a summary of research ideas and a list of faculty who might serve as qualifying exam committee members.

4. Completion of the oral qualifying examination and completion of the requirements for candidacy, including at least 25 letter-graded graduate course units (200 level and above) with at least a ‘B’ (3.0) average. The qualifying exam committee must include the student’s two lead advisers and two to three other faculty members with expertise in the student’s research area. The majority of the qualifying exam committee should be members of the Stanford Academic Council; the chair of the committee must be a Stanford Academic Council member and may not be one of the student’s two lead advisers. In exceptional cases, the committee may include a member-at-large who is not a Stanford faculty member as a fourth or fifth member.

5. Completion of a written dissertation, approved by the student’s dissertation reading committee consisting of the student’s lead advisers and at least one other member and passage of the University oral examination in defense of the dissertation following the guidelines outlined in the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees/#advisingandcredentialstext)" section of this bulletin. The University oral examination committee comprises the student’s two lead advisers, at least two additional members, and a chair whose academic appointment is in a department outside that of the lead advisers. Normally, all committee members are Academic Council members; appointment of a non-Academic Council member must be petitioned and approved by the faculty director.

In addition to the requirements listed above, all Ph.D. students must:

1. Serve as a teaching assistant (TA) for at least one quarter, as a discussion section leader or with an opportunity to lecture in at least two class sessions, in any department or program, including but not limited to ENVRES 320 Designing Environmental Research or ENVRES 330 Research Approaches for Environmental Problem Solving. Seminars, including Introductory Seminars, may not be used to fulfill this requirement. Students should fulfill the teaching requirement by the end of the third year unless they obtain a firm commitment from a faculty member to TA a future course.

2. On an ongoing basis, submit grant proposals for external funding, defined as fellowship and/or research funds provided by a government agency, a private foundation, or a University entity other than E-IPER or the School of Earth, Energy and Environmental Sciences.

3. Participate each year in a Spring Quarter Annual Review in which the student and lead advisers submit progress reports for review by the E-IPER Academic Guidance Committee.

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**Graduate Advising Expectations**

The Program in Environment and Resources is committed to providing academic advising in support of graduate student scholarly and professional development. When most effective, this advising relationship entails collaborative and sustained engagement by both the adviser and the advisee. As a best practice, advising expectations should be periodically discussed and reviewed to ensure mutual understanding. Both the adviser and the advisee are expected to maintain professionalism and integrity.

Faculty advisers guide students in key areas such as selecting courses, designing and conducting research, developing of teaching pedagogy, navigating policies and degree requirements, and exploring academic opportunities and professional pathways.

Graduate students are active contributors to the advising relationship, proactively seeking academic and professional guidance and taking responsibility for informing themselves of policies and degree requirements for their graduate program.

For a statement of University policy on graduate advising, see the "Graduate Advising (http://exploredegrees.stanford.edu/graduatedegrees/#advisingandcredentialstext)" section of this bulletin.

**Faculty Director:** Peter Vitousek

**Acting Faculty Director (Autumn 2018)** Nicole Ardoin

**Associate Director:** Susannah Barsom

**Anthropology:** Lisa Curran, William H. Durham, Anne Ehrlich, James Ferguson, Lynn Messkel, Krish Seetah, Michael Wilcox

**Biology:** Barbara Block, Larry B. Crowder, Gretchen C. Daily, Giulio De Leo, Rodolfo Dirzo, Paul Ehrlich, Christopher Field, Tadashi Fukami, Elizabeth Hadly, Donald Kennedy, Harold Mooney, Erin Mordecai, Stephen Palumbi, Kabir Peay, Robert Sapsil, Shripad Tuljapurkar, Peter Vitousek

**Business:** William Barnett, David Broockman, Dan Iancu, Hau Lee, Dale T. Miller, Erica Plambeck, Hayagreeta Rao, Stefan J. Reichelstein, Dan Reicher, Baba Shiv, Sarah A. Soule

**Carnegie Institution:** Gregory Asner, Ken Caldeira, Anna Michalak

**Civil and Environmental Engineering:** Sarah L. Billington, Alexandra Boehm, Craig S. Criddle, Jennifer Davis, Martin Fischer, David Freyberg, Olivier Fringer, Mark Jacobson, Jeffrey Koseff, Michael Lepech, Raymond Levitt, Richard Luthy, Gilbert M. Masters (emeritus), Stephen Monismith, Leonard Ortolano, Ram Rajagopal

**Communications:** Jon A. Krosnick

**Earth System Science:** Kevin Arrigo, Marshall Burke, Karen Casciotti, Page Chamberlain, Noah Diffenbaugh, Robert B. Dunbar, Scott Fendorf, Steven Gorelick, James Holland Jones, Julie Kennedy, Eric Lambin, David Lobell, Katharine Mach, Pamela Matson, Rosamond Naylor, Leif Thomas

**Earth Systems Program:** Patrick Archie, Richard Neve

**Economics:** Kenneth J. Arrow (emeritus), Lawrence Goulder, Charles Kolstad

**Education:** Nicole Ardoin, Daniel McFarland, Walter W. Powell

**Energy Resources Engineering:** Sally M. Benson, Adam Brandt, Jef Caers, Margot Gerritsen, Anthony Kovscek

**English:** Mark Algee-Hewitt
Freeman Spogli Institute for International Studies: Walter Falcon (emeritus), Stephen Stedman

Geological Sciences: Gary Ernst (emeritus)

Geophysics: Jenny Suckale, Mark Zoback

Global Climate and Energy Program: Sally M. Benson

Global Ecology: Gregory Asner, Ken Caldeira, Anna Michalak

History: Zephyr Frank, David Kennedy, Richard White, Mikael Wolfe

Law: Michelle Anderson, Janet Martinez, Deborah Sivas, Barton Thompson, Michael Wara

Management Science and Engineering: Dariush Rafinejad, James Sweeney, John Weyant

Materials Science and Engineering: Michael D. McGehee

Medicine: Michele Barry, Eran Bendavid, Mark Cullen, Christopher Gardner, Jeremy Goldhaber-Fiebert, Desiree LaBeaud, Stephen P. Luby, Grant Miller, Thomas N. Robinson, Gary Schoolnik, Gary Shaw

Packard Foundation: Margaret Caldwell

Philosophy: Debra Satz

Political Science: Bruce E Cain, Terry Karl, Clayton Nall, Kenneth Schultz, Jeremy Weinstein

Precourt Energy Efficiency Center: James Sweeney, John Weyant

Precourt Institute for Energy: Charles D. Kolstad

Program in Writing and Rhetoric: Emily Polk

Psychology: Brian Knutson

Sociology: Mark Granovetter, Douglas McAdam, Richard Scott, Robb Willer

Stanford Educational Farm: Patrick Archie

Stanford Institute for Economic Policy Research: Charles D. Kolstad