Environmental Studies

Environmental Studies offers one major and two minors. The Environmental Analysis major (https://enst.wustl.edu/academic-requirements/) creates a framework to integrate environmental courses and places a strong emphasis on critical thinking and general analytical and problem-solving skills. We offer an explicit focus on the application of those skills to analyze and design solutions to contemporary environmental challenges. The curriculum for this major is integrated and interdisciplinary, drawing from many disciplines across Arts & Sciences and the university as a whole. The major thus captures the strengths of the traditional academic departments and incorporates the interdisciplinary innovation necessary to explore fully the multiple issues and questions posed by the study of the environment. Our curriculum is sequenced and scaffolded so that students encounter concepts at increasing levels of depth, analysis, and real-world application. We offer opportunities for students with different disciplinary interests to repeatedly encounter one another and to engage in reflection with peers throughout, especially during our fourth-year reflection seminar.

The Interdisciplinary Environmental Analysis minor (https://enst.wustl.edu/academicrequirements/#anchor-group-9814) prepares students to tackle real-world environmental challenges by providing more robust opportunities for interdisciplinary knowledge and skill development. In particular, the minor is structured to provide students with opportunities to strengthen their critical analysis and problem-solving skills through participation in team-based learning experiences and, where possible, by engaging in real-world issues.

The Environmental Studies minor (https://enst.wustl.edu/academic-requirements/#anchor-group-9799) includes core course work in biology, earth science, and political science. Students may choose upper-level elective courses in a variety of natural and social science disciplines. Please visit the Environmental Studies website (http://enst.wustl.edu/) for more information.

Students can also choose from among three environmental majors in the following academic departments: Biology, Earth and Planetary Sciences, and Political Science. For more information about these related majors, please visit the following Bulletin pages:

- Environmental Biology (http://bulletin.wustl.edu/undergrad/artsci/biology/#majors)
- Environmental Earth Sciences (http://bulletin.wustl.edu/undergrad/artsci/earthplanetarysciences/#majors)
- Environmental Policy (http://bulletin.wustl.edu/undergrad/artsci/politicalscience/#majors)

Phone: 314-935-7047
Email: bowinston@wustl.edu
Website: http://enst.wustl.edu

Faculty

Director

David Fike (https://eps.wustl.edu/people/david-fike/)
Professor, Department of Earth & Planetary Sciences
Associate Director, International Center for Energy, Environment and Sustainability (InCEES)
Director, Environmental Studies Program
PhD, Massachusetts Institute of Technology
(Earth and Planetary Sciences)

Associate Director

Eleanor Pardini (https://biology.wustl.edu/people/eleanor-pardini/)
Senior Lecturer and Research Scientist
Associate Director, Environmental Studies Program
Contact for Environmental Biology
PhD, University of Georgia
(Biology)

Additional Faculty

Solny Adalsteinsson (https://tyson.wustl.edu/solny-adalsteinsson/)
Staff Scientist, Tyson Research Center
(Environnemental Studies)

Sharon Deem (https://www.researchgate.net/profile/Sharon_Deem/)
DVM, PhD, DACZM
(Environmental Studies; Saint Louis Zoo)

Karen DeMatteo (https://enst.wustl.edu/people/karen-dematteo/)
Senior Lecturer
PhD, Saint Louis University
(Environmental Studies; GIS)

Elizabeth Hubertz (http://law.wustl.edu/faculty_profiles/profiles.aspx?id=6728)
Lecturer in Law
Assistant Director, Interdisciplinary Environmental Clinic
JD, University of Virginia
(Law; Interdisciplinary Environmental Clinic)

Scott Krummenacher (https://polisci.wustl.edu/people/scott-krummenacher/)
Lecturer
PhD, Saint Louis University
(Political Science)
Majors

The Major in Environmental Analysis

The major in environmental analysis is a flexible program of study that focuses on developing the critical skills and competencies required for interdisciplinary environmental work. This program is ideal for students seeking a standalone major focused on the environment and sustainability or a complement to a primary major in the natural or social sciences or humanities.

Required Units: 49

Required Courses (28 units):

Required core disciplinary courses (9 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 2950</td>
<td>Introduction to Environmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 101</td>
<td>Earth's Future: Causes and Consequences of Global Climate Change (I60 course)</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 102</td>
<td>To Sustainability and Beyond: People, Planet, Prosperity</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 105</td>
<td>Sustainability in Business</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 111</td>
<td>Environmental Racism and the Health of Everyone</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 215</td>
<td>Introduction to Environmental Humanities</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 250</td>
<td>One Health: Linking the Health of Humans, Animals, and the Environment</td>
<td>3</td>
</tr>
<tr>
<td>EPSc 201</td>
<td>Earth and the Environment</td>
<td>4</td>
</tr>
<tr>
<td>EPSc 202</td>
<td>Introduction to Earth, Environmental, and Planetary Science</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: Students may count EnSt 101 or EnSt 102 — but not both — toward the major.

Required core courses in analysis and communication (12 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drama 214</td>
<td>Public Speaking: Embodied Communication</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 315</td>
<td>Fallout: Analyzing Texts and Narratives of the Nuclear Era</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 316</td>
<td>Beyond the Evidence</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 350W</td>
<td>Writing Skills for Environmental Professionals</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 357</td>
<td>Multiparty Environmental Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 364</td>
<td>Field Methods for Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 380</td>
<td>Applications in GIS</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 415W</td>
<td>Writing Home</td>
<td>3</td>
</tr>
<tr>
<td>Math 2200</td>
<td>Elementary Probability and Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Math 3200</td>
<td>Elementary to Intermediate Statistics and Data Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

Note: A fifth course from this section can count as a seventh elective; refer to the “Elective Courses” section of this page for more information.

Required course in social identity and environment (3 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GeSt 232</td>
<td>Intergroup Dialogue: Race/Ethnicity</td>
<td>3</td>
</tr>
<tr>
<td>SOC 2010</td>
<td>The Roots of Ferguson: Understanding Racial Inequality in the Contemporary U.S.</td>
<td>3</td>
</tr>
<tr>
<td>SOC 2110</td>
<td>Social Inequality in America</td>
<td>3</td>
</tr>
<tr>
<td>SOC 3212</td>
<td>The Social Construction of Race</td>
<td>3</td>
</tr>
</tbody>
</table>

Required interdisciplinary environmental capstone course (3 units):
Choose one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnSt 405</td>
<td>Sustainability Exchange: Community and University Practicums</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 407</td>
<td>RESET - Renewable Energy Policy, Engineering and Business</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 452</td>
<td>International Climate Negotiation Seminar</td>
<td>var.; max 6</td>
</tr>
<tr>
<td>EnSt 539</td>
<td>Interdisciplinary Environmental Clinic</td>
<td>var.; max 6</td>
</tr>
<tr>
<td>EnSt 498</td>
<td>Senior Honors Research</td>
<td>3</td>
</tr>
</tbody>
</table>

**Fourth-year reflection seminar (1 unit):**

The purpose of this seminar is to create a written narrative portfolio that synthesizes, integrates, and reflects on the student’s learning across the courses and experiences of the major. Reflection will occur through personal writing and discussion with peers in the course.

**Elective Courses (21 units):**

Students will choose depth and breadth elective courses from three categories: social sciences, humanities and arts, and natural science. Students must choose seven elective courses, with at least four courses chosen from one category and at least one course chosen from each of the other two categories. This means that students can choose a five/one/one or four/two/one combination of courses from the three categories. If desired, a student may choose as their seventh elective a course from the “Required core courses in analysis and communication” section of the major.

**Social sciences electives:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMCS 299</td>
<td>The Study of Cities and Metropolitan America</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 3608</td>
<td>Caribbean Island Vulnerabilities: Puerto Rico</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 360</td>
<td>Placemaking St. Louis</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 361</td>
<td>Culture and Environment</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 3613</td>
<td>Follow the Thing: Global Commodities &amp; Environment</td>
<td>3</td>
</tr>
<tr>
<td>Econ 451</td>
<td>Environmental Policy</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 310</td>
<td>Ecological Economics</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 316</td>
<td>Beyond the Evidence</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 340</td>
<td>Energy Governance in Israel and the Middle East</td>
<td>3</td>
</tr>
</tbody>
</table>

**Environmental humanities electives:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFAS 3075</td>
<td>Recipes for Respect: Black Foodways in the United States</td>
<td>3</td>
</tr>
<tr>
<td>Drama 351</td>
<td>Intro to Playwriting</td>
<td>3</td>
</tr>
<tr>
<td>Comp Lit 4111</td>
<td>Pastoral Literature</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 315</td>
<td>Fallout: Analyzing Texts and Narratives of the Nuclear Era</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 415W</td>
<td>Writing Home</td>
<td>3</td>
</tr>
<tr>
<td>History 3194</td>
<td>Environment and Empire</td>
<td>3</td>
</tr>
<tr>
<td>Phil 235F</td>
<td>Introduction to Environmental Ethics</td>
<td>3</td>
</tr>
<tr>
<td>Writing 309</td>
<td>Writing the Natural World</td>
<td>3</td>
</tr>
<tr>
<td>IPH 431</td>
<td>Statistics for Humanities Scholars: Data Science for the Humanities</td>
<td>3</td>
</tr>
</tbody>
</table>

**Natural science electives:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnSt 341</td>
<td>International Energy Politics</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 346</td>
<td>Environmental Justice</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 347</td>
<td>Sustainable Cities</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 461</td>
<td>Intro to Environmental Law</td>
<td>3</td>
</tr>
<tr>
<td>MGT 401M</td>
<td>Sustainable Development and Conservation Through Entrepreneurial Collaboration: Madagascar</td>
<td>3</td>
</tr>
<tr>
<td>MGT 402</td>
<td>Ethical Issues in Managerial Decision Making</td>
<td>1.5</td>
</tr>
<tr>
<td>MGT 460L</td>
<td>Introduction to Social Entrepreneurship</td>
<td>3</td>
</tr>
<tr>
<td>MGT 460M</td>
<td>Business of Social Impact</td>
<td>1.5</td>
</tr>
<tr>
<td>MPH 5002</td>
<td>Epidemiology</td>
<td>3</td>
</tr>
<tr>
<td>MPH 5323</td>
<td>TPS: Climate Change and Public Health</td>
<td>3</td>
</tr>
<tr>
<td>Pol Sci 363</td>
<td>Quantitative Political Methodology</td>
<td>3</td>
</tr>
<tr>
<td>Pol Sci 389</td>
<td>Power, Justice and the City</td>
<td>3</td>
</tr>
<tr>
<td>Pol Sci 495</td>
<td>Research Design and Methods</td>
<td>3</td>
</tr>
<tr>
<td>SOC 3350</td>
<td>Poverty and the New American City</td>
<td>3</td>
</tr>
<tr>
<td>SOC 3510</td>
<td>Sick Society: Social Determinants of Health and Health Disparities in the United States</td>
<td>3</td>
</tr>
<tr>
<td>SOC 4810</td>
<td>Global Structures and Problems</td>
<td>3</td>
</tr>
</tbody>
</table>

* If classroom space allows after graduate student enrollment, permission for undergraduate enrollment may be granted at the discretion of the faculty instructor. Students will need to contact the faculty instructor for permission.
**Minors**

**The Minor in Interdisciplinary Environmental Analysis**

**Required Units: 18**

**Required courses (students choose three of the following; 9 units):**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnSt 315</td>
<td>Fallout: Analyzing Texts and Narratives of the Nuclear Era</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 316</td>
<td>Beyond the Evidence</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 350W</td>
<td>Writing Skills for Environmental Professionals</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 357</td>
<td>Multiparty Environmental Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 364</td>
<td>Field Methods for Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 380</td>
<td>Applications in GIS</td>
<td>3</td>
</tr>
</tbody>
</table>

**One interdisciplinary environmental capstone course (3 units):**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnSt 405</td>
<td>Sustainability Exchange: Community and University Practicums</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 407</td>
<td>RESET - Renewable Energy Policy, Engineering and Business</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 452</td>
<td>International Climate Negotiation Seminar</td>
<td>var.; max 6</td>
</tr>
<tr>
<td>EnSt 539</td>
<td>Interdisciplinary Environmental Clinic</td>
<td>var.; max 6</td>
</tr>
</tbody>
</table>

**One advanced elective in natural science (3 units)** (prerequisites: EnSt 481 [EnSt 300]; EPSc 454 [EPSc 201]):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>EnSt 364</td>
<td>Field Methods for Environmental Science</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 365</td>
<td>Applied Conservation Biology</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 481</td>
<td>Advanced GIS</td>
<td>3</td>
</tr>
<tr>
<td>Biol 3900</td>
<td>Science for Agriculture and Environmental Policy</td>
<td>3</td>
</tr>
<tr>
<td>EPSc 386</td>
<td>The Earth's Climate System</td>
<td>3</td>
</tr>
<tr>
<td>EPSc 454</td>
<td>Exploration and Environmental Geophysics</td>
<td>4</td>
</tr>
</tbody>
</table>

**One advanced elective in social science and humanities (3 units)** (prerequisite: Econ 451 [Econ 1011]):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND 551A</td>
<td>Landscape Ecology</td>
<td>3</td>
</tr>
</tbody>
</table>
The Minor in Environmental Studies
(For Students Starting Fall 2021 or After)

Required Units: 18

Required core introductory courses (students choose two of the following; 6 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biol 2950</td>
<td>Introduction to Environmental Biology</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 105</td>
<td>Sustainability in Business</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 110</td>
<td>Environmental Issues</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 215</td>
<td>Introduction to Environmental Humanities</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 250</td>
<td>One Health: Linking the Health of Humans, Animals, and the Environment</td>
<td>3</td>
</tr>
<tr>
<td>EPSc 201</td>
<td>Earth and the Environment</td>
<td>4</td>
</tr>
<tr>
<td>EPSc 219</td>
<td>Energy and the Environment</td>
<td>3</td>
</tr>
<tr>
<td>Pol Sci 2010</td>
<td>Introduction to Environmental Policy</td>
<td>3</td>
</tr>
</tbody>
</table>

One elective in analysis and communication (3 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthro 4803</td>
<td>Advanced GIS Modeling and Landscape Analysis</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 316</td>
<td>Beyond the Evidence</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 350W</td>
<td>Writing Skills for Environmental Professionals</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 357</td>
<td>Multiparty Environmental Decision Making</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 380</td>
<td>Applications in GIS</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 405</td>
<td>Sustainability Exchange: Community and University Practicums</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 407</td>
<td>RESET - Renewable Energy Policy, Engineering and Business</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 452</td>
<td>International Climate Negotiation Seminar</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 481</td>
<td>Advanced GIS</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 539</td>
<td>Interdisciplinary Environmental Clinic</td>
<td>var.; max. 6</td>
</tr>
</tbody>
</table>

One elective in environmental humanities (3 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFAS 3075</td>
<td>Recipes for Respect: Black Foodways in the United States</td>
<td>3</td>
</tr>
<tr>
<td>Comp Lit 4111</td>
<td>Pastoral Literature</td>
<td>3</td>
</tr>
<tr>
<td>Drama 351</td>
<td>Intro to Playwriting</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 315</td>
<td>Fallout: Analyzing Texts and Narratives of the Nuclear Era</td>
<td>3</td>
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<tr>
<td>History 3194</td>
<td>Environment and Empire</td>
<td>3</td>
</tr>
<tr>
<td>IPH 431</td>
<td>Statistics for Humanities Scholars: Data Science for the Humanities</td>
<td>3</td>
</tr>
<tr>
<td>Phil 235F</td>
<td>Introduction to Environmental Ethics</td>
<td>3</td>
</tr>
<tr>
<td>Writing 309</td>
<td>Writing the Natural World</td>
<td>3</td>
</tr>
</tbody>
</table>

One elective in social science (3 units):

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMCS 299</td>
<td>The Study of Cities and Metropolitan America</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 3472</td>
<td>Global Energy and the American Dream</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 360</td>
<td>Placemaking St. Louis</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 3608</td>
<td>Caribbean Island Vulnerabilities: Puerto Rico</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 361</td>
<td>Culture and Environment</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 3613</td>
<td>Follow the Thing: Global Commodities &amp; Environment</td>
<td>3</td>
</tr>
<tr>
<td>Anthro 4215</td>
<td>Anthropology of Food</td>
<td>3</td>
</tr>
<tr>
<td>Econ 451</td>
<td>Environmental Policy</td>
<td>3</td>
</tr>
<tr>
<td>EnSt 310</td>
<td>Ecological Economics</td>
<td>3</td>
</tr>
</tbody>
</table>
The Minor in Environmental Studies
(For Students Starting Before Fall 2021)

Required Units: 19
Visit online course listings to view semester offerings for L82 EnSt (https://courses.wustl.edu/CourseInfo.aspx?sch=L&dept=L82&crsLvl=1/4).
L82 EnSt 110 Environmental Issues
This course examines the science behind current environmental issues, with emphasis on ecology and conservation. Students will gain an understanding about the consequences of the way that humans currently interact with the natural environment and potential solutions that would allow long-term sustainability of the Earth. Topics will include: human population growth, ecosystem structure and diversity, types and origin of pollution, global climate change, energy resources and use, challenges to feeding the world, and the interaction between the environment and human health.
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 115 Introduction to Conservation Biology
This course is introductory level and appropriate for both non-science majors as well as potential science majors who may be investigating their interests. Conservation Biology will focus on biodiversity, its preservation and current threats, as well as obstacles to its preservation for the future. We will examine the different levels of biodiversity present in nature as well as highlighting its importance, and why it matters to the human population. In studying Conservation Biology, students will also learn key concepts from related fields such as evolution and ecology that are necessary to understand concepts and concerns. Course topics include species and ecosystem management, restoration, strategies to combat threats, and past successes and failures relating to biodiversity conservation.
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 121 Ampersand: Pathfinder — A Sense of Place: Discovering Missouri's Natural Heritage
This is the first course in the Pathfinder program, and it will introduce students to their new home for the next four years. This interdisciplinary course will cover Missouri geology, climate, archaeology, and native megafauna. We will explore many of the habitats found in Missouri (prairie, forest, glade, and stream) and the biology of our diverse plant and animal wildlife (arthropods, mollusks, fish, salamanders, lizards, birds, and mammals). This will provide a foundation that will inform the study of ecology, policy and management in other courses. In addition to weekly lectures and discussions, students in this course will visit sites across the state during three weekend camping trips and two one-day trips. Attendance on field trips is an essential component of the course. Course enrollment is open only to students admitted into the Pathfinder Fellowship program.
Same as L61 FYP 121
Credit 3 units. A&S: AMP A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 122 Ampersand: Pathfinder — A Sense of Place: Discovering the Environment of St. Louis
Students will go exploring in and around St Louis. They will learn about the St. Louis backyard and their “home” for the next four years. Through field trips, readings, and discussion, students will see firsthand what challenges face the environment and the people who live here. They will learn how to examine multiple perspectives, how to think critically, and how to approach problems from an interdisciplinary and holistic approach. They will also learn why it is important to know a community at the local level to affect change on any level: state, national, or international. In addition to weekly readings and discussions, this course includes several field trips.
Same as L61 FYP 122

L82 EnSt 181 Ampersand: Pathfinder — Environmental Seminar
This course is a survey of pressing environmental issues (both local and global) as well as an introduction to the breadth of environmental work occurring on campus. Credit/no credit only. Same as L61 FYP 181P
Credit 1 unit. A&S: AMP

L82 EnSt 201 Earth and the Environment
Introduction to the study of the Earth as a dynamic, evolving planet. Emphasis on how internal and surface processes combine to shape the environment. Themes: Earth’s interior as revealed by seismic waves; Earth history and global tectonics shown by changes to ocean floors, mountain-building, formation of continents, earthquakes and volcanism; climate history and global biogeochemical cycles, influenced by circulation of atmosphere and oceans, ice ages and human activity. Composition and structure of rocks and minerals. Part of the introductory sequence of courses for all Earth and planetary sciences and environmental studies majors. Three class hours and one two-hour lab a week.
Same as L19 EPSc 201
Credit 4 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 210 Undergraduate Teaching Assistant
Credit 3 units.

L82 EnSt 215 Introduction to Environmental Humanities
In this environmental humanities seminar, we will consider texts illustrating how American citizens evolved in their perception, use, and expectations of the natural world during the 19th and early 20th centuries, especially with regard to (but not limited to) the practice of agriculture. How did the mandatory short-term goals of health and economic security sought so eagerly by citizens and supported by evolving technologies foreshadow the unintended consequences of long-term environmental damage that would contribute to climate change, and how can we understand this using a critical and hopeful lens? Considering contemporary writings on our perception of "environmentalism" will help us notice our analysis. Topics will include agrarian democracy; settlement of the Great Plains by immigrant farmers; the Dust Bowl; and fragmentation of the Sioux ecosystem. This cultural research will frame our visits to the Tyson Research Center, Washington University’s field laboratory in west St. Louis County. The Tyson Research Center’s mission is to provide a living landscape for environmental research and education as a component of Washington University’s International Center for Energy, Environment and Sustainability (InCEES). As a class, we will meet with faculty researchers from both science and the humanities and hear about their work on ecosystem sustainability (i.e., thinking long-term for human and environmental health). We will use texts such as government reports, history, literature, environmental policy, and autobiography. This course is for first-year and sophomore students only.
L82 EnSt 222 Topics in Japanese Literature and Culture: Environmental Consciousness in Modern Japanese Literature
A topics course on Japanese literature and culture. Subject matter varies by semester; consult current semester listings for topic. Same as L05 Japan 221 Credit 3 units. A&S IQ: HUM, LCD BU: IS EN: H

L82 EnSt 250 One Health: Linking the Health of Humans, Animals, and the Environment
This course provides an introduction to One Health, a collaborative effort of multiple disciplines — working locally, nationally, and globally — to attain optimal health for people, animals, and the environment. The student will learn about the challenges threatening environmental, animal, and human health. More importantly, they will learn about the transdisciplinary/holistic/One Health approach, which is necessary if we are to develop the solutions to these challenges. To address the loss of biodiversity, climate change, and environmental pollutants, students will participate in project-based learning modules to understand the how and why of these challenges as well as the mechanisms available to study current threats to conservation and public health. Class lessons will consist of lectures, clicker-based discussions, and case-study discussions. Assignments will include regular readings, quizzes, three exams, the creation of one infographic to convey a concept to a lay audience, and one short final reflection essay. This course will be limited to first- and second-year students. Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 290 Sophomore Seminar in Sustainability and the Environment
This course will provide an opportunity for students to evaluate and explore potential paths in environmental studies, and learn presentation skills to carry forward in their careers. Students will also get the opportunity to get out of the classroom and participate in environmental field trips and activities. Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 2950 Introduction to Environmental Biology
Introduction to Environmental Biology is designed to teach important principles of environmental biology and general science literacy skills. We cover the foundational biological principles and contemporary issues within four main topics: human population growth, transfer of energy and carbon in the ecosystem, biodiversity, and food production. We focus on the biological principles involved as we examine these topics in the context of some contentious and confusing issues related to environmental biology in everyday life. The science literacy skills that you master in this course will help you address the issues you face in your everyday life regarding scientific and pseudoscientific claims about the environment and society and will form the foundation for your development as a critical consumer of science information in the media. This course is required for all environmental biology majors and environmental studies minors. We recommend you take this course in your first- or second-year if possible. If your interests align and your schedule allows, we recommend co-enrolling in ENST 215: Introduction to Environmental Humanities. Same as L41 Biol 2950 Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 299 Directed Internship
Internship with an environmental organization (commercial, not-for-profit, governmental, etc.) where the primary objective is to obtain professional experience outside of the classroom. Student must have a faculty sponsor and must file a Learning Agreement with the Career Center, the faculty sponsor and the site supervisor. A final written project is agreed upon between the student and faculty sponsor before work begins, and is evaluated by the faculty sponsor at the end of the internship. Detailed supervision of the intern is the responsibility of the site supervisor. Credit variable, maximum 3 units.

L82 EnSt 306B Africa: Peoples and Cultures
An anthropological survey of Africa from the classic ethnographies to contemporary studies of development. Emphasis on the numerous social and economic changes African peoples have experienced from precolonial times to the present. Same as L48 Anthro 306B Credit 3 units. A&S IQ: LCD, SSC Arch: SSC Art: SSC BU: HUM, IS

L82 EnSt 310 Ecological Economics
Our planet is finite but our economic theories and practices assume that our economy can grow forever. The paradoxical pursuit of infinite growth on a finite planet has real-world consequences: from climate change to increasing income inequality to stagnant and declining quality of life for most of us to the ongoing mass extinction of species that are not economically useful to us, but whose loss simplifies ecosystems to the point of collapse. If these trends continue we will face some very difficult times ecologically and socio-politically. One alternative to infinite-planet economic theory is Ecological Economics, which can be described as economics as if the laws of thermodynamics are true and apply to us. Alone among disciplines with any aspiration to analytic rigor, the field of economics has remained unaffected by the thermodynamic revolution that transformed such fields as biology, chemistry, physics, even history in the late 19th and early 20th centuries. This failure to take physical law into account is one great source of our society’s environmental (and social and political) problems. Ecological economics thus represents the continuation of the thermodynamic revolution begun in the 1880s. This course is designed to give you an appropriate grounding in the fundamental assumptions, the conceptual novelties, and the distinctive tools of analysis that comprise this emergent school of economic theory, while placing this theorizing in historical (and ecological) context. We’ll pay particular attention to how the precepts and practice of Ecological Economics illuminate the largest challenge facing humans today, the necessity of developing an ecologically sustainable society, one that is sized to the limits of our finite planet. Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 315 Fallout: Analyzing Texts and Narratives of the Nuclear Era
In this environmental humanities course we will compare and integrate diverse texts and narratives through which Americans have developed a complex relationship to nuclear technology. Nuclear technology has long been developed, used and debated. Capable of both healing and harm, it challenges our notions of risk verses benefit at every level. It is also poised to potentially play a significant environmental
L82 EnSt 316 Beyond the Evidence
Why, when all evidence points to the growing threats of climate change, is it so difficult to create movement toward addressing this issue? Why, when we have so much evidence that vaccines reduce illness and death and are extremely safe, do individuals still choose not to vaccinate their children? What if I told you that the scientific evidence does not matter? Over the last few decades, neither better education, nor guilt, nor fear has worked to produce change on important environmental and public health issues. In this course, we will explore the different factors that contribute to the reasons why scientific evidence does not matter for the individual choices we make or policies we support. We will especially consider how values, beliefs, emotions, and identity shape how we process information and make decisions. We will examine how we might talk to one another in a way that might shift thinking or behavior as well as how we can create evidence-based policy. We will explore themes of worldview, cognitive linguistics and framing, cognitive dissonance, risk perception, empathy, habit changes, bungles in messaging, and difficult dialoguing through the examples of climate change and vaccination. Course activities will consist of regular reading, some online research, reflective journaling at home, and engaging in conversation during class. This course is designed to target upper-level students in environmental majors and pre-health studies.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 3194 Environment and Empire
In this course we study British imperialism from the ground up. At bottom, the British empire was about extracting the wealth contained in the labour and the natural resources of the colonized. How did imperial efforts to maximize productivity and profits impact the ecological balance of forests, pastures, and farm lands, rivers and rainfall, animals and humans? We'll ask, with environmental historians of the U.S., how colonialism marked a watershed of radical ecological change.
The course will cover examples from Asia to Africa, with a focus on the "jewel in the crown" of the British empire: the Indian subcontinent. We'll learn how the colonized contributed to the science of environmentalism, and how they forged a distinctive politics of environmentalism built upon local resistance and global vision, inspired by religious traditions and formative thinkers, not least Mahatma Gandhi.
Same as L22 History 3194
Credit 3 units. A&S IQ: HUM, LCD BU: HUM, IS EN: H

L82 EnSt 320 Pathfinder: Environmental Modernism
Credit 3 units. A&S IQ: HUM Arch: HUM Art: HUM BU: HUM EN: H

L82 EnSt 323 Biogeochemistry
This course covers basic concepts of how elements cycle among the Earth's crust, the oceans, and the atmosphere, including perturbations due to human activities. Carbon, nitrogen, phosphorus, sulfur, and water cycles; isotopic tracers. Feedbacks, forcings, and residence times. Redox cycling and thermodynamics. Biogeochemical box models and changes in biogeochemical cycles over Earth's history. Biogeochemistry of greenhouse gases; biogeochemical feedbacks in the climate system. This course is appropriate for EPS students, engineering students, environmental science majors, and other students with interest in the environmental or geological sciences.
Same as L19 EPSc 323
Credit 3 units. A&S IQ: NISM Art: NISM BU: SCI

L82 EnSt 340 Energy Governance in Israel and the Middle East
This course focuses on the energy policy concerns of Israel and its surrounding region. Students gain a deep understanding of the complexities involved in energy policy formulation and its profound impact on the security, economy and foreign policy of the Middle East. The course examines such issues as securing energy markets and suppliers, managing oil revenue, deciding on the country's energy mix for electricity, balancing environmental concerns, using energy resources as a "weapon" in foreign policy, subsidizing renewable energy, dealing with water scarcity, promoting nuclear energy, and the role of energy in armed conflicts. Each lesson focuses on one policy concern or dilemma, reviews the main theories and approaches to it, and uses Israel and its surrounding region as case studies for analysis. Although the course focuses on Israel and the East Mediterranean area, it is widely relevant to students interested in energy policy formulation in the United States, Europe, or elsewhere.
Credit 3 units. A&S IQ: LCD, SSC Arch: SSC Art: SSC BU: BA, IS EN: S

L82 EnSt 341 International Energy Politics
What determines the global price of oil? What is the relationship between oil, democracy, poverty, and war? Can renewable energy ever fully replace fossil fuels? In this course, we will analyze long-term trends in the international energy markets while focusing on the political, economic, and security considerations that influence them. We first review the effects of fossil fuels (oil, natural gas, coal) on peace and conflict in the international system and on the stability and well-being of regimes that are rich with such resources. We discuss the major role that energy plays in regional and interstate politics by examining the energy policy of various actors in the international system, including the United States, the European Union, Saudi Arabia, China, Russia, Nigeria, Venezuela, and Iran. The course will also deal with various issues in global environmental politics as well as global trends in the use of renewable and nuclear energy. Grades are based on a short research paper, a class presentation, and a midterm exam.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: IS EN: S

L82 EnSt 346 Environmental Justice
Environmental quality varies widely across race, class, gender and other forms of social difference. This course explores how and why these differences exist. It provides an overview of the history and foundations of the environmental justice movement in the United States while covering classic environmental justice issues, such as toxic waste and pollution, along with more recent
issues, such as food access, urban green space, transportation
and climate change. Educational justice concerns in St. Louis
are featured as part of the course. Class time will be devoted to
lectures, case studies, group activities and discussions. Student
learning will be assessed through exams, reflection, online
assignments, a policy brief on an environmental justice issue and
a group presentation.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: CPSC, SSC BU: BA
EN: S

L82 EnSt 347 Sustainable Cities
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 350W Writing Skills for Environmental Professionals
This course is for students interested in climate change,
sustainability, and the environment. Who are you writing for?
Why are you writing? What format makes sense? These are key
questions we will ask in this course as we discuss intentionally
building effective written communications. Students will explore
building blocks of written communication -- such as audience,
purpose, format, and angle of vision -- as they examine current
relevant publications, such as the National Climate Assessment
or an IPCC report. Readings are intended to highlight these
building blocks, and students will engage with them through
workshops and reflective writing. Major assignments include
a proposal letter of intent and a proposal. For the proposal,
students will select a climate-related topic of interest and, using
their building blocks, create an effectively constructed proposal
to persuade an imaginary foundation to support their idea.
Preference given to majors in Environmental Analysis.
Credit 3 units. A&S IQ: NSM, WI BU: SCI

L82 EnSt 357 Multiparty Environmental Decision Making
This course aims to provide students with the opportunity
to develop and apply problem-solving skills in the context of
environmental challenges. Students will learn basic frameworks
decision-making through readings and role-play. Through
the role-play, students will grapple with the perspectives of
multiple stakeholders, the interplay of science and policy, and
the ambiguity and uncertainty inherent in decision-making
processes.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 361 Culture and Environment
An introduction to the ecology of human culture, especially
how “traditional” cultural ecosystems are organized and how
they change with population density. Topics include foragers,
extensive and intensive farming, industrial agriculture, the
ecology of conflict, and problems in sustainability.
Same as L48 Anthro 361
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: ETH EN: S

L82 EnSt 365 Applied Conservation Biology
This course provides a broad survey of practical and applied
methods for environmental field work for site assessments,
ecological studies, conservation land management, habitat
monitoring, and ecological restoration. A primary focus will be
sources and techniques for obtaining and interpreting field data
across a range of abiotic, organismal and system/community
parameters, with emphasis on hands-on field experience
providing students with direct knowledge highlighting the
advantages and limitations of various methods. In the process,
students will learn about multiple taxonomic and organismal
and natural community types, and the relationships
among these and the physical environment in functional natural
systems. Course topics include theory and practice of methods
for sampling biotic and abiotic resources, including vegetation,
fauna, aquatic systems, stream geomorphology, and soils, as
well as using these data for assessments, habitat monitoring,
land management decisions, and developing ecological
restorations. Students will gain familiarity with responding to
issues driving applied environmental science and related fields
today, including data quality, sampling design, field techniques,
viability and threat analyses, and incorporating field data into
multi-scale conservation planning and design work. The course
consists of instructor presentations, guest lectures, readings and
written response papers, student projects and presentations,
classroom discussions, and extensive field exercises and hands-
on training. Class logistics: one lecture (1.5 hours) and one lab
(5 hours) per week, plus 2-3 all day Saturday field trips (see
policy on absences for back-up plan regarding field trips).
Credit 3 units. A&S IQ: NSM BU: SCI

L82 EnSt 364 Field Methods for Environmental Science
This course provides a broad survey of practical and applied
methods for environmental field work for site assessments,
ecological studies, conservation land management, habitat
monitoring, and ecological restoration. A primary focus will be
sources and techniques for obtaining and interpreting field data
across a range of abiotic, organismal and system/community
parameters, with emphasis on hands-on field experience
providing students with direct knowledge highlighting the
advantages and limitations of various methods. In the process,
students will learn about multiple taxonomic and organismal
and natural community types, and the relationships
among these and the physical environment in functional natural
systems. Course topics include theory and practice of methods
for sampling biotic and abiotic resources, including vegetation,
fauna, aquatic systems, stream geomorphology, and soils, as
well as using these data for assessments, habitat monitoring,
land management decisions, and developing ecological
restorations. Students will gain familiarity with responding to
issues driving applied environmental science and related fields
today, including data quality, sampling design, field techniques,
viability and threat analyses, and incorporating field data into
multi-scale conservation planning and design work. The course
consists of instructor presentations, guest lectures, readings and
written response papers, student projects and presentations,
classroom discussions, and extensive field exercises and hands-
on training. Class logistics: one lecture (1.5 hours) and one lab
(5 hours) per week, plus 2-3 all day Saturday field trips (see
policy on absences for back-up plan regarding field trips).
Credit 3 units. A&S IQ: NSM BU: SCI

L82 EnSt 367 Social Landscapes in Global View
From the beginning of the human campaign, societies have
socialized the spaces and places where they live. This
socialization comes in many forms, including the generation
of sacred natural places (e.g., Mt. Fuji) to the construction
of planned urban settings where culture is writ large in
overt and subtle contexts. Over the past two decades or
so, anthropologists, archaeologists and geographers have
developed a wide body of research concerning these socially
constructed and perceived settings — commonly known as
“landscapes.” This course takes a tour through time and across
the globe to trace the formation of diverse social landscapes,
starting in prehistoric times and ending in modern times. We
cover various urban landscapes, rural landscapes, nomadic
landscapes (and others) and the intersection of the natural
environment, the built environments and the symbolism that
weaves them together. Chronologically, we range from 3000
BCE to 2009 CE and we cover all the continents. This course
also traces the intellectual history of the study of landscape as a
L82 EnSt 375 Urban Ecology
Urban Ecology is a field of study within ecology that focuses on the urban environment as an ecosystem and attempts to understand how humans and nature can better coexist in these highly modified environments. The ultimate goal is to aid efforts for more sustainable cities through better urban planning and practices. It is a multidisciplinary study including topics from ecology, evolution and conservation biology, as well as architecture, economics and business. The class format will include both lectures and discussions.
Credit 3 units. A&S IQ: LCD, SSC Arch: SSC Art: SSC BU: BA, IS EN: S UColl: CD

L82 EnSt 380 Applications in GIS
This introductory course in Geographic Information Systems (GIS) is designed to provide you with the knowledge, skills, and confidence to be an independent user of GIS. The course will use the latest version of ESRI ArcGIS. The course is taught using a combination of lectures, demonstrations, and hands-on, interactive tutorials in the classroom. You will also explore the scientific literature to understand how GIS is being used by various disciplines to address spatial questions. The course takes a multidisciplinary approach that is focused on learning the tools of GIS versus working with data from a particular field. The goal is to establish a solid foundation you can use to address spatial questions that interest you, your mentor, or your employee. The first weeks of the course will provide a broad view of how you can display and query spatial data and produce map products. The remainder of the course will explore the power of GIS with a focus on applying spatial analytical tools to address questions and solve problems. As the semester develops, more tools will be added to your GIS toolbox so that you can complete a final independent project that integrates materials learned during the course with those spatial analyses that interest you the most. Students will have the choice of using a prepared final project, a provided data set, or designing an individualized final project using their own or other available data.
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 381 Introduction to Ecology
This course explores the central theories and principles in ecology and evolution and the use of these principles to study and predict human-induced environmental changes. It emphasizes understanding species interactions and population dynamics in biological communities as well as the relationships between communities and their environment. It regularly touches on applications of these principles, such as ecological responses to global climate change, consequences of habitat fragmentation, disease ecology, and conservation medicine. Principles of experimental design, quantitative data analysis and interpretation, and mathematical models are critical to the field of ecology, and these are also emphasized throughout the course. Class meetings will include lectures, class activities, computer simulation labs, and smaller group discussions to familiarize students with peer-reviewed journals, scientific writing, and current issues in ecology. Assignments include regular homework reading, occasional problem sets, participation in tutorials/discussions, and a small term paper. Prerequisite: Biol 2970 or Biol 2950, or permission of instructor.
Same as L41 Biol 381
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI
L82 EnSt 406 Urban Ecosystem Principles Integration

In today's world, your discipline has grand challenges whose solutions often lay in other realms. How will you train yourself to leverage the interdisciplinary partnerships required to innovatively solve and evolve in a rapidly changing world? The mission of the interdisciplinary course L82 EnSt 406 Urban Ecosystem Principles Integration is to "Advance the interrelationships of ecological and human systems toward creating a healthy, resilient, and biodiverse urban environment," and bring together experts and students in ecology, urban design, architecture/landscape architecture, economics, social work and engineering, drawing from inside and outside the Washington University community. Building from our knowledge of ecosystem principles and function, a diverse group of leaders in their fields provides lectures, readings and student project leadership to understand and test Healthy Urban Ecosystems Principles among human and ecological (nonhuman) systems and the range of sociopolitical processes entailed with their implementation. Class content is developed by Washington University leaders in their disciplines as well as external organizations such as the Missouri Botanical Garden, the Field Museum in Chicago and others. This course builds upon a 1-unit fall seminar (not a prerequisite) that introduces challenges and solutions to achieving healthy urban ecosystems, and provides students an opportunity to more deeply engage and manipulate the interrelationships of symbiotic urban systems, and apply those concepts in multidisciplinary project applications. Projects leverage student-defined challenges in the evolving laboratory of urban St. Louis using Healthy Urban Ecosystems Principles to develop multidisciplinary integrated solutions to challenges encountered in urban areas such as climate change and resilience, security of ecosystem services, social inequity, economic strife, and community vitality. Students present their work in a public forum at semester's end. CET (https://gephardtinstitute.wustl.edu/or-faculty-and-staff/community-engaged-teaching/) course.

Same as I50 INTER D 406
Credit 3 units. A&S IQ: SSC Arch: SSC Art: CPSC, SSC EN: S

L82 EnSt 407 RESET - Renewable Energy Policy, Engineering and Business

RESET will provide students with an in-depth understanding of the policy, engineering, and business factors that are shaping the growing renewable energy industry as well as the opportunities and challenges in the decades ahead for decarbonizing the electric grid. From 2015 to 2017, the number of U.S. states producing grid electricity from 20% or more renewable energy sources (excluding hydropower) increased from seven to eleven. The IPCC's Fall 2018 Special Report on 1.5 degrees of warming concluded that approximately 45% reductions in global emissions will be required by 2030 to limit warming to 1.5 degrees Celsius. With this new science-based target in mind, how quickly can the United States and the world accelerate the transition to renewable energy?

What technical problems will need to be addressed? What is the current and future role of policy? What are the economic implications? RESET is an interdisciplinary course comprised of classroom lectures from faculty and industry professionals; group discussions; field trips to solar, wind, and fossil fuel power plants; and a final applied team-based project to propose a new major solar photovoltaic project. RESET is structured to provide students with an understanding of the large-scale issues influencing renewable energy deployment as well as the real-world factors that are necessary for designing, financing, and building new wind and solar projects.

Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 408 Earth's Atmosphere & Global Climate

Topics include the structure and dynamics of Earth's atmosphere, basic factors controlling the global climate of Earth, quantitative aspects of remote sensing of the atmosphere, and remote sensing instrumentation. Prerequisites: Math 233 and Phys 191, or permission of instructor.

Same as L19 EPSc 408
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 413 Introduction to Soil Science

Topics include physical, chemical, and biological processes that occur within soil systems; types of soils and their formation; major components of soil, including soil water, minerals, organic matter, and organisms; soils in wetlands and arid regions; mapping of soils and their spatial variability; cycling of nutrients and contaminants in soils; and sustainable use of soils and their role in climate change. Prerequisites: EPS 201, EPS 323 or Chem 106 (or AP Chem score of 4); or permission of instructor.

Same as L19 EPSc 413
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 419 Community Ecology

Community ecology is an interdisciplinary field that bridges concepts in biodiversity science, biogeography, evolution and conservation. This course provides an introduction to the study of pattern and process in ecological communities, with an emphasis on theoretical, statistical and experimental approaches. Topics include ecological and evolutionary processes that create and maintain patterns of biodiversity; biodiversity and ecosystem function; island biogeography, metacommunity dynamics, niche and neutral theory; species interactions (competition, predation, food webs); species coexistence; and environmental change. The class format
includes lectures, discussions, and computer labs focused on the analysis, modeling, and presentation of ecological data using the statistical program R. Prerequisite: Bio 2970, Bio 381 (recommended), or permission of instructor.

Same as L41 Biol 419
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 4193 Experimental Ecology Laboratory
The goal of this course is to provide skills in the design, interpretation, and written presentation of ecological and evolutionary experiments, with emphasis on sampling methodology, hypothesis testing, and data analysis. A key objective of this course is to familiarize students with the importance of statistics and experimental design as unified tools, rather than two separate processes. We will practice how to abstract theories, hypotheses, and predictions, mathematically; how to contrast them with data; and how to interpret the results. The course does not seek to be exhaustive of all experimental designs or statistical techniques, nor intensive in any given one. Rather, its focus is on providing the tools and concepts for the critical evaluation, choice, interpretation, and further independent learning of the experimental and statistical tools needed for research. Practical analysis of data will be taught in program R, but no prior knowledge is required. During the course, students will plan and execute their own ecological studies, within the limitations of the current pandemic. This is a writing-intensive course, and grades are based on written assignments, including final projects and in-class participation. This course fulfills the upper-level laboratory requirement for the biology major.

Prerequisites: Permission of instructor and at least one of the following: Biol 3501, Biol 372, Biol 381, Biol 419, or Biol 472. Enrollment is limited to 10 students.

Same as L41 Biol 4193
Credit 4 units. A&S IQ: NSM, WI Arch: NSM Art: NSM

L82 EnSt 426 Topics in American Politics
This course is intended primarily for sophomores and juniors. The topic of this course varies by semester, dependent on faculty and student interests. Prerequisite: L32 101B.

Same as L32 Pol Sci 426
Credit 3 units. A&S IQ: SSC, SD Art: SSC EN: S

L82 EnSt 428 Hydrology
Survey of principles that govern the flow of water in river and groundwater systems in deep geologic environments. Basic equations of fluid flow, dynamics, and the characteristics of drainage basins, rivers, floods, and important aquifers. Exploitation of ground water systems. Prerequisite: EPSc 353; or permission of instructor.

Same as L19 EPSc 428
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 432 Environmental Mineralogy
Topics connected with environmental mineralogy, some selected by students. Topics may include: mineral dust such as asbestos; containment materials for nuclear waste disposal; environmental ramifications of the processing and use of phosphate fertilizers, lead in the environment, acid mine drainage, microbial mediation of sulfide oxidation, minerals in the human body, weathering of building materials, materials engineering, and engineering of materials for more effective recycling. Three class hours and one two-hour laboratory a week. Participation in discussions, term paper, two field trips required. Most readings from primary sources. Prerequisite: EPSc 352 or permission of instructor.

Same as L19 EPSc 430
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 444 Environmental Geochemistry
This course is an introduction to the geochemistry of natural waters and the processes that alter their composition. Topics include key principles of aqueous geochemistry and their application to describe the main controls on the chemistry of pristine and polluted soil, surface, and ground water environments; acids and bases; mineral solubility; carbonate chemistry; chemical speciation; redox reactions; adsorption and ion exchange; and the speciation, mobility, and toxicity of metals. Prerequisites: EPSc 201 and Chem 108 (or AP Chem score of 4), or permission of instructor.

Same as L19 EPSc 444
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 451 Environmental Policy
This course examines the relationship between environmental economics and environmental policy. The course focuses on air pollution, water pollution, and hazardous wastes, with some attention given to biodiversity and global climate change. This course examines critically two prescriptions that economics usually endorses: (1) “balancing” of benefits against costs (e.g., benefit-cost analysis) and the use of risk analysis in evaluating policy alternatives; (2) use of market incentives (e.g., prices, taxes or charges) or “property rights” instead of traditional command-and-control regulations to implement environmental policy. Prerequisite: Econ 1011.

Same as L11 Econ 451
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA, ETH EN: S

L82 EnSt 452 International Climate Negotiation Seminar
This variable-credit course (students will register for 3 credits) is designed to prepare students to attend and observe annual meetings associated with the United Nations Framework Convention on Climate Change (UNFCCC) as delegates of Washington University. The course and its meetings provide student delegates with a unique educational experience to observe the development of international climate policy through interdisciplinary negotiations and interactions inside the negotiating space. Students see the interactions among climate policy, science, and technology as they identify and analyze policy decisions from across the international climate regime. The number of students who can attend meetings is limited by the United Nations. We will do our best to have course participants attend either the COP or Subsidiary Body meetings. Students will attend one week of these meetings. The COP 25 meeting was held in Santiago, Chile, from December 2 to December 13, 2019, and the Subsidiary Body meetings were in Bonn, Germany, in June 2020. Enrollment is limited. Students should indicate their interest by placing themselves on the waitlist and completing an application. All students will be placed on the waitlist upon registration, and students will be selected to enroll from the waitlist after all the applications are reviewed. Application will begin in March and will be available on the course website (https://sites.wustl.edu/wustlcop/) and on the Climate Change Program website (climatechange.wustl.edu). Application review and interviews will take place in April, and enrollment decisions will be made by shortly after. Participation in the course is possible without traveling to the meetings. Contact the instructor with questions at martin@wustl.edu.
Credit variable, maximum 6 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L82 EnSt 461 Intro to Environmental Law
Survey of the most prominent federal laws designed to control pollution and protect human health and the environment. Examines laws applicable to environmental impact statements, biodiversity, air pollution, water pollution, and hazardous waste. Discusses the role of state law and cooperative federalism, as well as the roles of the courts, the legislature, and the administrative state in protecting the environment.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 481 Advanced GIS
This course is designed to move beyond tools and skills learned in Applications in GIS (EnSt 380/580). Classes will feature hands-on exercises selected to help students master advanced GIS analysis tools and techniques, while providing experience in the planning and execution of real-world projects. Primary emphasis will be on applying fundamental GIS concepts, performing spatial analysis, developing proficiency with core ArcGIS software (e.g., Network Analyst extension), resolution of problems, and efficient delivery of results. Readings from books and scientific literature will introduce key concepts and provide real-world examples that will be reinforced in the hands-on exercises, assignments and projects. As the semester develops, students will gain a variety of new tools and techniques that will allow them to complete a final independent project that integrates the material learned during the course.
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 498 Senior Honors Research
Independent research for undergraduate honors, to be supervised by a faculty member. Prerequisites: senior standing, eligibility for honors, and permission of instructor.
Credit 3 units.

L82 EnSt 4980 Undergraduate Research Seminar
Provides an opportunity for advanced undergraduates to synthesize many of the diverse subdisciplines of Earth and Planetary Sciences while focusing on a research topic. Subject changes each offering. Each subject is unique and timely, but broad enough to encompass wide-ranging interests among students. Students conduct original research, make written reports of the results, and make oral presentations of their projects in class. Prerequisite: senior standing or permission of instructor.
Same as L19 EPSc 498
Credit 3 units. A&S IQ: NSM, WI Art: NSM

L82 EnSt 499 Senior Honors
Independent work for undergraduate Honors, to be supervised by a faculty member. Prerequisites, senior standing, eligibility for Honors, and permission of instructor.
Credit 3 units.