Washington University in St. Louis

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. Thus, the major captures the strengths of the traditional academic departments and incorporates the interdisciplinary innovation necessary to fully explore 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 their programs, especially during our fourth-year reflection seminar.

The Interdisciplinary Environmental Analysis minor (https://enst.wustl.edu/academic-requirements/#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.

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

Faculty

Director

Jeff Catalano (https://eps.wustl.edu/people/jeffrey-g-catalano/)
Professor
PhD, Standford University
(Earth, Environmental, and Planetary Sciences)

Associate Director

Eleanor Pardini (https://enst.wustl.edu/people/eleanor-pardini/)
Assistant Director and Director of Undergraduate Studies
Teaching Professor and Research Scientist
PhD, University of Georgia
(Biology)

Additional Faculty

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

David Fike (https://eps.wustl.edu/people/david-fike/)
Myron & Sonya Glassberg/Albert & Blanche Greensfelder Distinguished University Professor
Chair, Department of Earth, Environmental, and Planetary Sciences
PhD, Massachusetts Institute of Technology
(Earth, Environmental, and Planetary Sciences)

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)

Susan Kim
Lecturer
PhD, University of Illinois Urbana-Champaign
(McKelvey School of Engineering)

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

Doug Ladd (https://www.samfoxschool.wustl.edu/portfolios/doug_ladd/)
Lecturer
MS, Southern Illinois University

Suzanne Loui (https://enst.wustl.edu/people/suzanne-loui/)
Lecturer
PhD, Saint Louis University
(Biology; Environmental Studies)

Beth Martin (https://enst.wustl.edu/faculty-staff/beth-martin/)
Teaching Professor
MS, Washington University
(Environmental Studies)

John Parks (http://enst.wustl.edu/people/john-parks/)
Lecturer
PhD, Washington University
(Environmental Studies; School of Continuing & Professional Studies)

Froggi VanRiper (https://enst.wustl.edu/people/froggi-vanriper/)
Lecturer
PhD, Oregon State University
(Environmental Studies)

Bill Winston (https://library.wustl.edu/directory/bill-winston/)
Lecturer
MS, Washington University
(Environmental Studies; School of Continuing & Professional Studies)

Majors

The Major in Environmental Analysis

The environmental analysis major is a flexible, 49-credit program that focuses on developing critical skills and competencies in interdisciplinary environmental problem solving. It is ideal for students seeking interdisciplinary training focused on the environment and sustainability, and it is designed to stand alone or to complement another primary major.

Total units required: 49

Required courses (28 units):

- Choose three of the following (9 units):

Code	Title	Units
Biol 2950	Introduction to Environmental Biology	3
EEPS 201	Earth and the Environment **	4
EEPS 202	Introduction to Earth, Environmental, and Planetary Science **	3
EnSt 101	Earth's Future: Causes and Consequences of Global Climate Change (I60 course) *	3
EnSt 102	To Sustainability and Beyond: People, Planet, Prosperity *	3
EnSt 111	Environmental Racism and the Health of Everyone *	3
EnSt 215	Introduction to Environmental Humanities	3
EnSt 250	One Health: Linking the Health of Humans, Animals, and the Environment	3
EnSt 252	Sustainability in Business	3
Pol Sci 2010	Introduction to Environmental Policy	3

* Open to first-year students only. Per College rules for Beyond Boundaries courses, students are allowed to take one per semester; thus, students may count two toward the major.
** Students may count EEPS 201 or EEPS 202 toward the major.

- Required core courses in analysis and communication; choose four of the following (12 units):

Code	Title	Units
Anthro 428W	Original Research in Environmental Anthropology	3
Drama 214	Public Speaking: Embodied Communication	3
Drama 4081	Theater for Social Change	3
EnSt 315	Fallout: Analyzing Texts and Narratives of the Nuclear Era	3
EnSt 316	Beyond the Evidence	3
EnSt 350W	Writing Skills for Environmental Professionals	3
EnSt 357	Multiparty Environmental Decision Making	3
EnSt 364	Field Methods for Environmental Science	3
EnSt 380	Applications in GIS	3
EnSt 415W	Writing Home: Creating Cultural Guides for Environmental Site Workers	3
EnSt 481	Advanced GIS	3
IPH 3123	Introduction to Digital Humanities	3
Math 2200	Elementary Probability and Statistics	3
Math 3200	Elementary to Intermediate Statistics and Data Analysis	3

Note: Students may count a fifth analysis and communication course toward the depth electives.

- Required course in social identity and environment; choose one of the following (3 units):

Code	Title	Units
AAS 2010	The Roots of Ferguson: Understanding Racial Inequality in the Contemporary U.S.	3
EnSt 111	Environmental Racism and the Health of Everyone	3
GeSt 232	Intergroup Dialogue: Race/Ethnicity	3
SOC 2010	The Roots of Ferguson: Understanding Racial Inequality in the Contemporary U.S.	3
SOC 2110	Social Inequality in America	3
SOC 3212	The Social Construction of Race	3
SOC 2520	Inequality By Design: Understanding Racial/Ethnic Health Disparities	3

- Required interdisciplinary environmental capstone course; choose one of the following (3 units):

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

Note: Due to the intensity of these project-based courses, students may only take one per semester. Students may count a second capstone course toward the depth electives.

- Fourth-year reflection seminar (1 unit):

Code	Title	Units
EnSt 492	Environmental Studies Fourth-Year Reflection Seminar	1

Note: 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 the three categories below: Social Sciences, Humanities and Arts, and Natural Science. Students must choose seven elective courses, with at least four courses from one category and at least one course in each of the other two categories. This requirement means that students can choose a 5/1/1 combination or a 4/2/1 combination from the elective categories.

The following flexibility is allowed regarding substitutions:

- Students may count a fifth analysis and communication course toward the depth electives.
- Students may count a second capstone course toward the depth electives.
- Students may request one course substitution outside of the electives listed below to take advantage of unique one-time or rarely offered courses.

Students must complete no fewer than 18 units of courses numbered 300 or above within the major with a grade of C- or better. There is no double counting of advanced (300- and 400-level) courses between two majors or between a major and a minor. This "no double-counting rule" also applies to students who are double majoring across schools.

- Social sciences electives:

Code	Title	Units
AMCS 299	The Study of Cities and Metropolitan America	3
Anthro 3215	Food, Culture, and Power	3
Anthro 3472	Global Energy and the American Dream	3
Anthro 3602	Environmental Inequality: Toxicity, Health, and Justice	3
Anthro 361	Culture and Environment	3
Anthro 3618	Urban Ecological Anthropology	3
Anthro 374	Social Landscapes in Global View	3
Anthro 379	Meltdown: The Archaeology of Climate Change	3
Econ 451	Environmental Policy	3
EnSt 251	Metropolitan Environment	3
EnSt 255	Systems Thinking	3
EnSt 310	Ecological Economics	3
EnSt 316	Beyond the Evidence	3
EnSt 346	Environmental Justice	3
EnSt 347	Sustainable Cities	3
EnSt 461	Intro to Environmental Law	3
EnSt 481	Advanced GIS	3
EnSt 482	Applications in Geospatial Intelligence	3
MGT 401M	Sustainable Development and Conservation Through Entrepreneurial Collaboration: Madagascar	3
MGT 402	Ethical Issues in Managerial Decision Making	1.5
MGT 460L	Introduction to Social Entrepreneurship	3
MGT 460M	Business of Social Impact	1.5
MPH 5002	Epidemiology *	3
MPH 5323	TPS: Climate Change and Public Health *	3
Pol Sci 363	Quantitative Political Methodology	3
Pol Sci 389A	Power, Justice and the City	3
Pol Sci 4043	Public Policy Analysis, Assessment and Practical Wisdom	3
Pol Sci 495	Research Design and Methods	3
SOC 3350	Poverty and the New American City	3
SOC 4810	Global Structures and Problems	3

* Students should request permission from the instructor to enroll in this course.

- Environmental humanities and arts electives:

Code	Title	Units
AFAS 288	Free the Land: Black Histories of Environmental Racism	3
AFAS 3075	Recipes for Respect: Black Foodways in the United States	3

AFAS 474	Black Geographies: Space, Place and Ecologies of Power *	3
ARCH 209	Design Process	3
ART 318P	Photography: Art Practice (Art, Environment, Culture & Image) *	3
Comp Lit 4111	Pastoral Literature	3
Drama 351	Intro to Playwriting	3
Drama 4081	Theater for Social Change	3
EnSt 315	Fallout: Analyzing Texts and Narratives of the Nuclear Era	3
EnSt 415W	Writing Home: Creating Cultural Guides for Environmental Site Workers	3
History 2561	Urban America	3
History 3194	Environment and Empire	3
IPH 312	Introduction to Digital Humanities	3
IPH 431	Statistics for Humanities Scholars: Data Science for the Humanities	3
Phil 235F	Introduction to Environmental Ethics	3
Writing 309	Writing the Natural World	3

* This course has a prerequisite.

- Natural science electives:

Code	Title	Units
Anthro 3053	Nomadic Strategies and Extreme Ecologies	3
Anthro 3660	Primate Ecology, Biology, and Behavior	3
Anthro 3662	Writing for Primate Conservation Biology	3
Anthro 4285	Environmental Archaeology	3
Anthro 4803	Advanced GIS Modeling and Landscape Analysis	3
Biol 3171	Biology for Climate Change Solutions	3
Biol 3220	Woody Plants of Missouri	3
Biol 3221	Research and Public Education in the Arboretum	3
Biol 349	Microbiology	4
Biol 373W	Laboratory on the Evolution of Animal Behavior (Writing Intensive)	3
Biol 381	Introduction to Ecology	3
Biol 3900	Science for Agriculture and Environmental Policy	3
Biol 419	Community Ecology	3
Biol 4193	Experimental Ecology Laboratory	4
Biol 4195	Disease Ecology	4
EEPS 219	Energy and the Environment	3
EEPS 323	Biogeochemistry	3
EEPS 340	Minerals, Rocks, Resources and the Environment	4
EEPS 342	Environmental Systems	3
EEPS 385	Earth History	3
EEPS 386	The Earth's Climate System	3
EEPS 387	Geospatial Science	4
EEPS 407	Remote Sensing	3
EEPS 413	Introduction To Soil Science	3
EEPS 428	Hydrology	3
EEPS 454	Exploration and Environmental Geophysics	4
EnSt 364	Field Methods for Environmental Science	3
EnSt 365	Applied Conservation Biology	3
EnSt 375	Urban Ecology	3
EnSt 481	Advanced GIS	3
EnSt 483	Introduction to Spatial Epidemiology	3
LAND 551A	Landscape Ecology	3

Minors

The Minor in Interdisciplinary Environmental Analysis

This minor was developed to prepare students to tackle real-world environmental challenges by providing more robust opportunities for interdisciplinary knowledge and skill development. The minor is structured to provide students with opportunities to strengthen their critical analysis and problem-solving skills through participation in team-based, experiential, often community-engaged learning around "wicked" real-world problems. Most courses do not have prerequisites. Courses that appear as options in multiple sections may only be taken for credit toward one section of the minor.

Total units required: 18

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

Code	Title	Units
EnSt 315	Fallout: Analyzing Texts and Narratives of the Nuclear Era	3
EnSt 316	Beyond the Evidence	3
EnSt 350W	Writing Skills for Environmental Professionals	3
EnSt 357	Multiparty Environmental Decision Making	3
EnSt 364	Field Methods for Environmental Science	3
EnSt 380	Applications in GIS	3
EnSt 415W	Writing Home: Creating Cultural Guides for Environmental Site Workers	3

One interdisciplinary environmental capstone course (3 units):

Code	Title	Units
EnSt 405	Sustainability Exchange: Community and University Practicums	3
EnSt 407	RESET - Renewable Energy Policy, Engineering and Business	3

EnSt 452	International Climate Negotiation Seminar	var.; max 6
EnSt 539	Interdisciplinary Environmental Clinic	var.; max 6

One advanced elective in natural science (3 units) (prerequisites: EnSt 481 [EnSt 380]; EEPS 454 [EEPS 201]):

Code	Title	Units
Biol 3900	Science for Agriculture and Environmental Policy	3
EEPS 386	The Earth's Climate System	3
EEPS 454	Exploration and Environmental Geophysics	4
EnSt 364	Field Methods for Environmental Science	3
EnSt 365	Applied Conservation Biology	3
EnSt 481	Advanced GIS	3

One advanced elective in social sciences and humanities (3 units) (prerequisites: Econ 451 [Econ 1011]); EnSt 481 [EnSt 380]):

Code	Title	Units
Econ 451	Environmental Policy	3
EnSt 310	Ecological Economics	3
EnSt 315	Fallout: Analyzing Texts and Narratives of the Nuclear Era	3
EnSt 316	Beyond the Evidence	3
EnSt 346	Environmental Justice	3
EnSt 347	Sustainable Cities	3
EnSt 415W	Writing Home: Creating Cultural Guides for Environmental Site Workers	3
EnSt 461	Intro to Environmental Law	3
EnSt 481	Advanced GIS	3
History 3194	Environment and Empire	3
Approved for students who entered Spring 2020 or before:		
Pol Sci 340	Topics	3
Pol Sci 3752	Topics in American Politics	3
Pol Sci 4043	Public Policy Analysis, Assessment and Practical Wisdom	3

The Minor in Environmental Studies

This minor is a good fit for students for many reasons:

- **Exposure:** Includes introductory-level courses
- **Accessibility:** Includes introductory courses
- **Flexibility:** Wide degree of choice in elective categories
- Pairs easily with many majors to provide interdisciplinary exposure

Students must have at least 9 units of course work at the 300 level or higher that are unique to this minor.

Total units required: 18

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

Code	Title	Units
Biol 2950	Introduction to Environmental Biology	3
EEPS 201	Earth and the Environment *	4
EEPS 202	Introduction to Earth, Environmental, and Planetary Science *	3
EEPS 219	Energy and the Environment *	3
EnSt 101	Earth's Future: Causes and Consequences of Global Climate Change	3
EnSt 102	To Sustainability and Beyond: People, Planet, Prosperity	3
EnSt 110	Environmental Issues	3
EnSt 111	Environmental Racism and the Health of Everyone	3
EnSt 215	Introduction to Environmental Humanities	3
EnSt 250	One Health: Linking the Health of Humans, Animals, and the Environment	3
EnSt 252	Sustainability in Business	3
Pol Sci 2010	Introduction to Environmental Policy	3

* Students can take only one of the following: EEPS 201 Earth and the Environment, EEPS 202 Introduction to Earth, Environmental, and Planetary Science, or EEPS 219 Energy and the Environment.

One elective in analysis and communication (3 units):

Code	Title	Units
EnSt 315	Fallout: Analyzing Texts and Narratives of the Nuclear Era	3
EnSt 316	Beyond the Evidence	3
EnSt 350W	Writing Skills for Environmental Professionals	3
EnSt 357	Multiparty Environmental Decision Making	3
EnSt 364	Field Methods for Environmental Science	3
EnSt 380	Applications in GIS	3
EnSt 405	Sustainability Exchange: Community and University Practicums	3
EnSt 407	RESET - Renewable Energy Policy, Engineering and Business	3
EnSt 415W	Writing Home: Creating Cultural Guides for Environmental Site Workers	3
EnSt 452	International Climate Negotiation Seminar	var.; max 6
EnSt 481	Advanced GIS	3
EnSt 539	Interdisciplinary Environmental Clinic	var.; max 6

One elective in environmental humanities and arts (3 units):

Code	Title	Units
AFAS 288	Free the Land: Black Histories of Environmental Racism	3
AFAS 3075	Recipes for Respect: Black Foodways in the US	3
AFAS 474	Black Geographies: Space, Place and Ecologies of Power	3
ARCH 209	Design Process	3
ART 318P	Photography: Art Practice (Art, Environment, Culture & Image)	3
Comp Lit 4111	Pastoral Literature	3
Drama 351	Intro to Playwriting	3
Drama 4081	Theater for Social Change	3
EnSt 315	Fallout: Analyzing Texts and Narratives of the Nuclear Era	3
EnSt 415W	Writing Home: Creating Cultural Guides for Environmental Site Workers	3
History 2561	Urban America	3
History 3194	Environment and Empire	3
IPH 312	Introduction to Digital Humanities	3
IPH 431	Statistics for Humanities Scholars: Data Science for the Humanities	3
Phil 235F	Introduction to Environmental Ethics	3
Writing 309	Writing the Natural World	3

One elective in social sciences (3 units):

Code	Title	Units
AMCS 299	The Study of Cities and Metropolitan America	3
Anthro 3472	Global Energy and the American Dream	3
Anthro 3602	Environmental Inequality: Toxicity, Health, and Justice	3
Anthro 361	Culture and Environment	3
Anthro 3618	Urban Ecological Anthropology	3
Anthro 428W	Original Research in Environmental Anthropology	3
Econ 451	Environmental Policy	3
EnSt 251	Metropolitan Environment	3
EnSt 255	Systems Thinking	3
EnSt 310	Ecological Economics	3
EnSt 316	Beyond the Evidence	3
EnSt 346	Environmental Justice	3
EnSt 347	Sustainable Cities	3
EnSt 461	Intro to Environmental Law	3
EnSt 481	Advanced GIS	3
EnSt 482	Applications in Geospatial Intelligence	3
MGT 401M	Sustainable Development and Conservation Through Entrepreneurial Collaboration: Madagascar	3
MGT 402	Ethical Issues in Managerial Decision Making	1.5
MGT 460L	Introduction to Social Entrepreneurship	3
MGT 460M	Business of Social Impact	1.5
MPH 5002	Epidemiology	3
MPH 5323	TPS: Climate Change and Public Health	3
Pol Sci 363	Quantitative Political Methodology	3
Pol Sci 389A	Power, Justice and the City	3
Pol Sci 4043	Public Policy Analysis, Assessment and Practical Wisdom	3
Pol Sci 495	Research Design and Methods	3
SOC 3350	Poverty and the New American City	3
SOC 4810	Global Structures and Problems	3

One elective in natural science (3 units):

Code	Title	Units
Anthro 3053	Nomadic Strategies and Extreme Ecologies	3
Anthro 3660	Primate Ecology, Biology, and Behavior	3
Anthro 3662	Writing for Primate Conservation Biology	3
Anthro 4285	Environmental Archaeology	3
Anthro 4803	Advanced GIS Modeling and Landscape Analysis	3
Biol 3220	Woody Plants of Missouri	3
Biol 349	Microbiology	4
Biol 370	Animal Behavior	3
Biol 373W	Laboratory on the Evolution of Animal Behavior (Writing Intensive)	3
Biol 381	Introduction to Ecology	3
Biol 3900	Science for Agriculture and Environmental Policy	3
Biol 419	Community Ecology	3
Biol 4193	Experimental Ecology Laboratory	4
Biol 4195	Disease Ecology	4
EEPS 219	Energy and the Environment	3
EEPS 323	Biogeochemistry	3
EEPS 340	Minerals, Rocks, Resources and the Environment	4
EEPS 385	Earth History	3
EEPS 386	The Earth's Climate System	3
EEPS 387	Geospatial Science	4
EEPS 407	Remote Sensing	3
EEPS 413	Introduction To Soil Science	3
EEPS 428	Hydrology	3
EEPS 454	Exploration and Environmental Geophysics	4
EnSt 364	Field Methods for Environmental Science	3
EnSt 365	Applied Conservation Biology	3

EnSt 375	Urban Ecology	3
EnSt 481	Advanced GIS	3
EnSt 483	Introduction to Spatial Epidemiology	3
LAND 551A	Landscape Ecology	3

Courses

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 101 Earth's Future: Causes and Consequences of Global Climate Change

Earth's Future: Causes and Consequences of Global Climate Change examines the following: 1) the physical basis for climate change; 2) how climates are changing and how we know and assess that climates are changing; and 3) the effects of climate change on natural and human systems. The course is team-taught and will involve participation by scholars across the university with expertise in specific subjects. This is a broad introductory course for first-year students, and it presumes no special subject matter knowledge on the part of the student. This course is for first-year (non-transfer) students only.
Same as I60 BEYOND 101
Credit 3 units. A&S: FYBB A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 102 To Sustainability and Beyond: People, Planet, Prosperity

This class examines the subject of sustainability from multiple perspectives to gain an appreciation for its interconnected environmental, social, and economic dimensions. We explore foundational concepts and principles through a variety of activities and assignments, including readings, discussions, group work, case studies, presentations, and projects. The goal is to integrate knowledge and methods from different disciplines to achieve a holistic understanding of sustainability problems and solutions. This course is for first-year (non-transfer) students only.
Same as I60 BEYOND 140
Credit 3 units. A&S: FYS A&S IQ: SSC Arch: SSC Art: SSC EN: S

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 111 Environmental Racism and the Health of Everyone

Environmental inequalities threaten the health and well-being of low-income communities and communities of color who are increasingly on the frontlines in the fight against climate change, air and water pollution, food security, and many other urgent environmental problems. Like many urban areas, the St. Louis region faces egregious social, environmental and health disparities. In this course, we critically examine the role of racism and other structural policy inequalities that produce unequal environments and how those unequal environments contribute to public health disparities in St. Louis and beyond. We explore the use of public health data, policy options, and case studies that allow for evidence-based solutions to environmental racism and improved population health. This course that combines small group sessions, case studies and speakers working on environmental justice in the St. Louis region. We provide students with interdisciplinary perspectives and methods, challenging them to address racism and environmental policy through a population health lens. Student learning will be assessed through case studies, reflections, online assignments, and exams. This course is for first-year (non-transfer) students only. Students who are not first year students will be unenrolled from this course.
Same as I60 BEYOND 115
Credit 3 units. A&S IQ: SSC EN: S

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

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 A&S IQ: NSM Art: NSM

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 EEPS 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 perceptions, use, and expectations of the natural world during the nineteenth and early twentieth centuries, especially but not limited to the practice of agriculture. We will also consider how practices of agriculture were inextricably tied to oppression and misuse not only of land but of people. 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 historic trauma that marginalized communities still live with today? How can we understand this using a critical and hopeful lens? Considering contemporary writings on our perception of "environmentalism" will help us nuance our analysis. Topics will include: agrarian democracy; settlement of the Great Plains by immigrant farmers; the Dust Bowl; fragementation of the Sioux ecosystem. If COVID guidelines permit, students will have the opportunity to visit the Tyson Research Center, Washington University's field laboratory in west St. Louis County. Tyson'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, that is, thinking long-term for human and environmental health. Throughout the course we will use texts such as: government reports, history, literature, environmental policy and autobiography. This course is for first-year students and sophomore students only.
Credit 3 units. A&S: FYS A&S IQ: HUM Arch: HUM Art: HUM BU: HUM EN: H

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 251 Metropolitan Environment
Understanding the forces shaping urban growth and change is increasingly important for addressing environmental issues. The United Nations projects up to 3/4ths of the world's population will live in urban areas by the end of the century. Urbanization rates now outpace population growth rates in many parts of the world. Changes within the metropolitan environment will have profound impacts on people and planet. This course provides an interdisciplinary overview of the metropolitan growth and change, paying particular attention to the role of planning, politics, and policy. Class time will be devoted to lectures, case studies, group activities and discussion. Student learning will be assessed through exams, online assignments, and a research paper on an environmental issues in a city of student's choice. This course is targeted toward first and second year students looking for foundational understand of urban environmentalism.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L82 EnSt 252 Sustainability in Business
In today's complex business environment, organizations are constantly challenged to develop innovative policies and processes that ensure profitability. Some leaders believe that the sole purpose of business is to maximize shareholder wealth and that fiscal sustainability is not compatible with environmental responsibility. In reality, ecological and economic performance need not--and should not--be mutually exclusive. Fortunately, the outmoded mindset of "profit-at-any-cost" is beginning to shift as organizations recognize the importance of adopting balanced business practices that promote social equity and environmental prosperity without sacrificing financial stability. Organizations that embed sustainability into their corporate strategies increase operational efficiency by using resources more responsibly and minimizing waste. In an increasingly crowded and competitive marketplace, sustainability has become a source of competitive advantage through which an organization can have a positive impact not only on the financial "bottom line" but also on the environment and society. In this course, we explore key concepts and issues driving sustainability in business. We also examine core sustainability principles, frameworks, and tools that companies can use to better understand and work within the natural systems that enable their existence and sustain their operations.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC EN: S

L82 EnSt 255 Systems Thinking
Our complex world is bound together by multiple overlapping systems. Social systems interact with physical and biological systems. Societies and individuals, ecosystems and species, interact in ways that influence each other. Systems thinking is the ability to see the relationships and patterns within and across systems, as well as the underlying structures which shape those relationships and patterns. This course provides an introduction into systems thinking for sustainability. We will explore the key features of systems and students will learn the basics of the systems thinking lens which they will be able to use for addressing sustainability in an ever-changing world. Class time will be devoted to lectures, case studies, group activities and discussions.

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 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, improved and debated. Capable of both healing and harm, it challenges our notions of rish verses benefit at every level. It is also poised to potentially play a significant environmental role in climate change mitigation by delivering large amounts of nearly carbon-free energy. Through an environmental humanities lens, using texts such as literary non-fiction, history, environmental anthropology, natural history and public health, we will explore aspects of the Manhattan Project, the Chernobyl Nuclear Reactor accident, the presence of fear in the public perception of nuclear technology, and debates regarding the current and future use of nuclear energy. Two field site visits will be included, one to Weldon Springs Interpetive Center. Note: While we will talk abut nuclear reactors in general, this course will not explore them from a detailed engineering perspective. In addition, the course is designed as an upper-level elective for third and fourth year students. There are no pre-requisites, but having taken or taking concurrently "Beyond the Evidence" will be helpful.

Credit 3 units. A&S IQ: HUM Arch: HUM Art: HUM BU: HUM EN: H

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 it? 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, not better education, nor guilt, nor fear has worked to produce change on important environmental and public health issues. In this class, we will explore how values, beliefs, emotions and identity shape how we process information and make decisions. We will explore themes of moral world view, cognitive linguistics and framing, cognitive dissonance, risk perception, empathy, habit changes, and difficult dialoguing through the case studies 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. There are no prerequistes, but the class is designed for fourth-year 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 3171 Biology for Climate Solutions

Human-induced climate change poses a pressing and pervasive threat to both human populations and to the biological world. The challenges of climate change are manifest and well known, increasing temperatures, greater variability of weather, sea level rise, leading to a host of consequences. Adapting to and mitigating climate change are essential activities for confronting the threats of climate change. The biological sciences offer great potential for addressing these threats. This course focus on efforts in biological research to adapt and to mitigate climate change. Topics will range across the biological sciences from microbial engineering and biotechnology to zoonotic diseases and one health, to ecosystem function and conservation of biodiversity. The course consists of lectures, discussion of assigned readings, and class projects. Class projects focus on science topics that addresses new approaches to climate adaptation and mitigation and constitute both of a written paper and class presentation. The goals of this class are: (1) to develop an understanding of basic climate science

and the biological aspects of climate change, (2) to develop knowledge of the biological efforts towards adaption and mitigation for climate solutions. The class is open to both non-science and science majors. The course does not count for the biology major. 3 units credit. Class cannot be taken pass fail. Small class. Not for biology major credit
Same as L41 Biol 3171
Credit 3 units. A&S IQ: NSM

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
As committed environmentalists, one of our greatest fears is that not enough people take climate change seriously. To ward off that fear, we assess the state of the world in the most dramatically pessimistic ways to indicate the seriousness of our situation and our personal commitment to "environmentalism." Highlighting (much less admiring) human progress in areas where solid evidence of its flourishing exists, seems blasphemous, dismissive of evident, copious human suffering and natural systems abuse. However, the absence of acknowledging human progress reinforces social fear and a sense of danger. The resulting panic leads to a preferencing of solutions which appear "in harmony with nature," limiting our understanding and trust of viable alternative solutions using our best social, economic and technological powers. As antidote to this cycle, in this course we will explore the precepts of environmental modernism, the reconciliation of environmental preservation with human development.
Credit 3 units. A&S IQ: HUM Arch: HUM Art: HUM BU: HUM EN: H

L82 EnSt 323 Biogeochemistry
Basic concepts of how elements cycle among Earth's crust, oceans, and 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 history. Biogeochemistry of greenhouse gases, biogeochemical feedbacks in the climate system. This course is appropriate for EEPS students, engineering students, environmental science majors, and other students with interest in the environmental or geological sciences. Prerequisite: EEPS 202 or EECE 101.
Same as L19 EEPS 323
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

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. Environmental justice concerns in St. Louis are featured as part of the course. Class time will be devoted to lectures, case studies, group activities and discussion. Student learning will be assessed through exams, reflection, online assignments, a policy brief on an environmental justice issue and a group presentation. This is an advanced elective targeted toward third and fourth year students.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: CPSC, SSC BU: BA EN: S

L82 EnSt 347 Sustainable Cities
Urbanization is one of the most significant forces shaping today's environment. More than half of the world's population now lives in urban, rather than rural, areas. This migration has profound consequences for people and the planet, connecting a sustainable future to the developments in cities around the world. Many cities are already advancing sustainable policies and practices in all areas of urban systems and services - green infrastructure, renewable energy, waste management and climate mitigation. This course explores the impact of the rise of cities in an interconnected world and the efforts to sustainably address environmental issues in urban settings. This course pays particular attention to the role of planning, politics and policy. Class time will be devoted to lectures, case studies, group activities and discussion. Student learning will be assessed through exams, online assignments, and a research paper on an environmental issue in a city of the student's choice.
Credit 3 units. A&S IQ: SSC Arch: SSC Art: SSC BU: BA EN: S

L82 EnSt 350W Writing Skills for Environmental Professionals
For students interested in climate change, sustainability and the environment. Consider writing as a tool. Who will read it? Why are you writing it? What do you want the reader to know or do? What structure or format effectively makes your case? We will consider these questions while building effective written communications with a focus on climate change. Students will explore audience awareness, purpose, and format as they analyze document types and create their own. Activities will include writing, reading, discussion, and peer workshops. Major assignments include a letter of inquiry and a grant proposal. Students will write a grant proposal to an imaginary climate change foundation. Preference given to upper-level 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 of negotiation and 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. This course is designed as an upper-level elective for third- and fourth-year students.
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: LCD, SSC Arch: SSC Art: SSC BU: ETH EN: S

L82 EnSt 3615 Environmental Anthropology
This course will provide students with a working knowledge of how the study of humans across space and time has fundamentally impacted the way we understand the idea of nature, the environment and what it means to be human. The course will ground students in both historical and cutting-edge anthropological theories with units on subsistence, transformative nature, imagining wilds in the Anthropocene and pluralizing environmentalisms.
Same as L48 Anthro 3615
Credit 3 units. A&S IQ: SSC Arch: SSC Art: CPSC, SSC BU: BA EN: S

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 groups 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 Art: NSM BU: SCI

L82 EnSt 365 Applied Conservation Biology
A hands-on introduction to the concepts of conservation biology and applied conservation practice, including designing and implementing conservation projects. Readings, lectures, classroom activities and discussions, student presentations, and field exercises will immerse students in all aspects of conservation in the contemporary landscape, and provide the tools and techniques needed for successful and sustainable conservation outcomes. Two Saturday field trips required. Prerequisities: a biology/ecology class or permission of instructor.
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 374 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 social phenomenon and investigates the current methods used to recover and describe social landscapes around the world and through time. Join in situating your own social map alongside the most famous and the most obscure landscapes of the world and trace the global currents of your social landscape!
Same as L48 Anthro 374
Credit 3 units. A&S IQ: LCD, SSC Arch: SSC Art: SSC BU: BA, IS EN: S
UColl: CD

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: NSM Arch: NSM Art: NSM BU: SCI

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

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 390 Independent Study
Independent study for undergraduates, supervised by a faculty member. Prerequisite: permission of instructor.
Credit variable, maximum 6 units.

L82 EnSt 3900 Science for Agriculture and Environmental Policy
Government policies at the local, state, and national levels determine and regulate activities that range from local farmers markets to U.S. membership in the Paris Climate Agreement. Science can and should play a critical role in developing policy. This course focuses on the biological science behind policies for climate change and agricultural practice as well as the role of various organizations in providing science for policy. Now is a particularly interesting time for science-based policy with the election of a new U.S. President and the elevation of the President's science advisor to Cabinet level. This course is divided into three parts. First, we review how policy is developed and how various agencies and actors affect policy. The next section looks at biological topics that have policy implications. These case studies are presented by expert speakers who have had experience in various science-related roles in the federal government, foundations, professional associations, advisory organizations, and scientific publications. Finally, students conduct individual research projects on a science topic that affects current legislative efforts, either state or national. Students investigate the basic science of their chosen topic and how this could affect proposed legislation. As part of the research project, students give a class presentation, lead a class discussion, and write a term paper on the foundational biological science. The goals of this course are as follows: (1) to develop an understanding of how science is used to develop policy by examining case studies presented by experts; and (2) to critique a proposed science-based policy either at the state or federal level.
Same as L41 Biol 3900
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 391 Directed Research in Environmental Studies
Research activities or project in environmental studies done under the direction of an instructor in the program. Permission of an instructor and the chair of the program is required.
Credit variable, maximum 6 units.

L82 EnSt 392 Directed Fieldwork in Environmental Studies
Fieldwork carried out under the direction or supervision of an instructor in the Program. Permission of an instructor and of the chair of the program is required.
Credit variable, maximum 6 units.

L82 EnSt 400 Topics in Environmental Science
Credit 1 unit. A&S IQ: NSM Arch: NSM Art: NSM BU: SCI

L82 EnSt 405 Sustainability Exchange: Community and University Practicums
The Sustainability Exchange engages interdisciplinary teams of students to tackle real-world energy, environmental, and sustainability problems through an experiential form of education. Students participate in projects with on- or off-campus clients developed with and guided by faculty advisors from across the University. Teams deliver to their clients an end-product that explores "wicked" problems requiring innovative methods and solutions. Past projects have included investigating soil impacts of de-icing practices on campus, collecting data on inequitable trash collection in neighborhoods, working with St. Louis City's building division to make buildings more energy efficient, developing an understanding of how buildings impact birds on campus, and analyzing the performance and viability of sustainable investments. Upcoming projects are still being finalized and may include mitigating plastic pollution in the Mississippi, creating and publishing an illustrated book on the social, cultural, and ecological importance of Forest Park, and assisting with the planning and development of a rain-scaping proposal for a St. Louis City neighborhood. Team-based projects are complemented by seminars that explore problem solving strategies and methodologies drawn from a wide range of creative practices, including design, engineering, and science, as well as contemporary topics in energy, environment, and sustainability. Students will draw on these topics to influence their projects. The course is designed primarily for undergraduates, with preference given to seniors.
Same as I50 INTER D 405
Credit 3 units. A&S IQ: SSC Arch: SSC Art: CPSC, SSC EN: S

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 this interdisciplinary course 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/for-faculty-and-staff/community-engaged-teaching/) course.
Same as I50 INTER D 406
Credit 3 units. A&S IQ: SSC Arch: SSP EN: S

L82 EnSt 407 RESET - Renewable Energy Policy, Engineering and Business
RESET is an interdisciplinary course that explores the incredible potential of renewable energy, energy storage, and electrification to mitigate climate change. Students will gain an in-depth understanding of the complex dynamics that are driving rapid deployment of renewables and present both opportunities and challenges to decarbonization in the years ahead. Through the lenses of business, policy, and engineering, students in RESET will learn through classroom lectures from faculty, industry professionals, and policy-makers; group discussions; field trips to solar arrays and a landfill gas power plant; and a final team project where students serve as consultants to a local government, proposing an on-site solar strategy, local policy changes to support decarbonization, and more. By the end of the course, students will have an understanding of many large-scale issues influencing decarbonization, as well as the real-world factors that are necessary for designing, financing, and building new renewable energy projects. Why renewables and the grid? Decarbonizing the electric grid paired with electrifying sectors that currently run on fossil fuels -

including transportation, heating, buildings, and manufacturing and construction - together have the potential to reduce more than 50% of global greenhouse gas emissions. The global energy transition, which was already well-underway, accelerated in 2022 due to a combination of countries' energy security concerns following Russia's invasion of Ukraine and expanding climate ambition resulting in new policies that support renewable energy, including the Inflation Reduction Act in the United States. The International Energy Agency's 2022 Renewables report found that "renewables are set to account for over 90% of global electricity expansion over the next five years, overtaking coal to become the largest source of global electricity by early 2025." This class is a direct-to-waitlist, application-based class. To be enrolled in this course, you must be on the waitlist and must have submitted an application. This course description will be updated with a live application link prior to registration opening. All majors and disciplines are encouraged to apply.
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 EEPS 408
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 413 Introduction to Soil Science
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. Sustainable use of soils and their role in climate change. Prerequisites: EEPS 202, EEPS 323 or Chem 106 (or AP Chem score of 4); or permission of instructor.
Same as L19 EEPS 413
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 415W Writing Home: Creating Cultural Guides for Environmental Site Workers
Each of you comes from a different cultural landscape, each with its own demographic, racial, religious, linguistic, economic profile, (and endless other attributes). Effectively describing your community is integral to its sense of being respected by outsides and to its capacity to support others., For example, each community carries a different sense of what kind of landscape constitutes safety, well-being and happiness. Whatever your cultural landscape, sharing the unique nature of your commuity with global citizen experts is integral to the success of applied environmental solutions to climate change. Towards the attainment of that success, join this guided, writing intensive class to identify and reflect upon the cultural attributes that constitute your community, and how those are reflected in its landscape requirements. Identify, assess, and prioritize those sensitivities deemed most important by you for others to understand,. By semester's end, write a cultural guide for environmental site workers, leading them to a better awareness of how best to help and move through, your world. Revisions and resubmission of writing work will be emphasized, as well as camaraderie and mutual interest in each other's landscapes.
Credit 3 units. A&S IQ: HUM, WI Arch: HUM Art: HUM BU: ETH EN: H

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 analysis, modeling and presentation of ecological data using the statistical program R. Prereq: Bio 2970 required, Bio 381 recommended, or permission of instructor. (Biology Major Area C)
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 tool, 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: EEPS 353 or Physics 191.
Same as L19 EEPS 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, a term paper, and two field trips are required. Most readings are from primary sources. Prerequisite: EEPS 352 or permission of instructor.
Same as L19 EEPS 430
Credit 3 units. A&S IQ: NSM Arch: NSM Art: NSM

L82 EnSt 444 Environmental Geochemistry
Introduction to the geochemistry of natural waters and the processes that alter their composition. 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: EEPS 202 and Chem 106 (or AP Chem score of 4); or permission of instructor.
Same as L19 EEPS 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. The 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 course is designed to prepare students to attend and observe annual meetings associated with the United Nations Framework Convention on Climate Change (UNFCCC) as a delegate of Washington University. The course and 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 interaction between climate policy, science and technology as they identify and analyze policy decisions across the international climate regime. The COP 28 meeting will be held in Dubai, United Arab Emirates, from Thursday, November 30, 2023, to Tuesday, December 12, 2023. The number of students who can attend meetings is limited by the United Nations. We will do our best to have course participants attend the COP meeting. Students attend one week. Course enrollment is limited. Indicate your interest by placing yourself 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. The application will be open in March and will be available on the Climate Change Program website at www.climatechange.wustl.edu. Participation in the course is possible without traveling to the meetings. The cost of meeting attendance is partially covered by the Climate Change Program, and need-based support is available. More information on cost is included on the application page. Prerequisite: junior standing. Contact the instructor with questions at martin@wustl.edu.
Credit 4 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 482 Applications in Geospatial Intelligence
This course introduces the concept of geospatial intelligence (GEOINT) and how to use location to see patterns, connections and relationships to ultimately "see what others can't". Learn about the Intelligence Cycle, the mission of the National Geospatial-Intelligence Agency (NGA), potential career pathways in GEOINT, and other members of the Intelligence Community (IC) leveraging GIS to solve problems and make decisions related to Intelligence. This course is designed to incorporate both a theoretical understanding with a variety of subject matter expert (SME) presentations from the industry, as well as a practical understanding with hands-on exercises using ArcGIS Pro Intelligence and other Esri software applications.
Credit 3 units. A&S IQ: NSM

L82 EnSt 483 Introduction to Spatial Epidemiology
This 14-week course is to introduce essential concepts and methods of spatial epidemiology. Spatial epidemiology is a methodology for dealing with spatial-correlated issues in environmental and public health,epidemiological, and medical research. The lecture will give the knowledge in the designs and approaches of spatial epidemiology. Homework assignments after each lecture will test student knowledge the concepts we covered. GIS mapping exercises will allow students to practice and apply their knowledge of basic geospatial analyses in epidemiology. The paper discussions and final project (presentation and paper) will help the students develop a better understanding how to integrate geospatial and GIS modeling into epidemiological and population health studies to address spatial-correlated research questions. This course requires a previous completion of a GIS course with basic skill in the application of GIS software (such as ESRI ArcGIS) for mapping. This course will be suggested to the third-, fourth-year undergraduate students and/or master students.
Credit 3 units. A&S IQ: NSM Art: NSM

L82 EnSt 492 Environmental Studies Fourth-Year Reflection Seminar
Over the course of your time at Washington University, you have taken a depth and breadth of coursework toward your major in Environmental Analysis. Your major coursework has likely been supplemented by your oursework in other departments and programs of study. The purpose of this course is for you to meet your peers who have done the same. As a group you will reflect on and share representations of your learning across the years, make connections among thngs you have learned and to experiences in other arenas of your life. Reflection will occur through personal writing, discussion with peers in the course and the sharing of favorite podcasts, films, etc.
Credit 1 unit.

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 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.