

# ENVIRONMENTAL STUDIES (ENVS)

## **ENVS 0053 Sustainable Development and Culture in Latin America**

This interdisciplinary course exposes students to the three dimensions of sustainable development -environmental, economic, and social- through an examination of three products -peyote, coca, and coffee- that are crucial in shaping modern identity in areas of Latin America. The course integrates this analysis of sustainable development in relation to cultural sustainability and cultural practices associated with peyote, coca, and coffee and their rich, traditional heritage and place in literature, film, and the arts.

Not Offered Every Year

Also Offered As: ANTH 0091, LALS 0091, SPAN 0091

Mutually Exclusive: SPAN 3910

1 Course Unit

## **ENVS 0054 Latinx Environmental Justice**

This course explores the involvement of the Latinx environmental justice movement since the 1960s. It addresses theories and concepts of environmental racism and environmental justice, underscoring how Latinx have challenged, expanded, and contributed to the environmental justice discourse. In this course, students will explore national case studies of environmental and racial injustice as they bear on Latinx communities both in rural areas and in urban barrios throughout the United States. The course will analyze these case studies through the lens of Latinx artistic and literary texts (essays, paintings, short stories, documentaries, and short films) as they provide a unique historic and multicultural perspective of the Latinx experience with environmental injustice and of how Latinxs imagine alternative transitions and responses to environmental marginalization. In addition, the works of Latinx artists and writers will serve as case studies to deconstruct racial stereotypes of Latinxs as unconcerned about environmental issues, shedding light on how they share a broad engagement with environmental ideas. The case studies analyzed in this course emphasize race and class differences between farmworkers and urban barrio residents and how they affect their respective struggles. The unit on farmworkers will focus on workplace health issues such as toxic chemicals and collective bargaining contracts. The unit on urban barrios will focus on gentrification, affordable housing, and toxic substances in the home. We will also review current and past programs that have been organized to address the aforementioned problems. This is an Academically Based Community Service Course (ABCS course) through which students will learn from and provide support to a Latinx-serving organization in the City of Philadelphia on preventing exposure to hazardous substances, thus bridging the information gap on environmental justice issues in the Latinx community in Philadelphia. Information dissemination and education efforts will be conducted by collaborating with Esperanza Academy Charter School in Philadelphia to implement lessons on preventing exposure to hazardous substances. Studying environmental justice and pairing it with community service will heighten students' awareness of the complexities of culture, race, gender, and class while providing them with an invaluable experience of cross-cultural understanding.

Spring

Also Offered As: ANTH 0930, LALS 0093, SPAN 0093, URBS 0093

1 Course Unit

## **ENVS 1000 Introduction to Environmental Science**

This course will explore the physical science of the Earth's environment and human interactions with it. Coverage will include the Earth's various environmental systems, various environmental problems, and the direct and indirect causes of these environmental problems. Freshman seminar will mirror the ENVS 1000 recitation, and have additional discussions and social media projects.

Spring

1 Course Unit

## **ENVS 1020 Humans and the Earth System: How it Works, How We Got Here, and How to Save Our Planet**

As our planet's climate changes, it is imperative to understand the basic structures of the earth system and our connections to these, past, present, and future. The goal of this course is to help students develop an integrated understanding of climate change, linking the fundamental science - from the microscopic to the global scale - to human actions and possible futures. This course brings together approaches from environmental science, social sciences, history, and policy. Beyond providing basic climate and environmental literacy, we will also explore current and projected impacts of change, including changes to human life and biodiversity as well as other physical and biological systems. The course is divided into three units: 1. Science: what are the chemical and physical drivers of our changing climate, and what are the biological, health and environmental implications so far. 2. Impacts: how human activity has affected environments and climate so far and how climate change is currently impacting society, nature, agriculture, health, cities, and the most vulnerable communities. 3. Solutions: the roles of policy, business, agriculture, planning, and personal choices. The course is open to undergraduate students of all disciplines. While the reading and weekly assignments will be specific to the module, students may define a capstone project that reflects their academic interests.

Spring

Also Offered As: ANTH 1610

1 Course Unit

## **ENVS 1040 Water Worlds: Cultural Responses to Sea Level Rise & Catastrophic Flooding**

As a result of climate change, the world that will take shape in the course of this century will be decidedly more inundated with water than we're accustomed to. The polar ice caps are melting, glaciers are retreating, ocean levels are rising, polar bear habitat is disappearing, countries are jockeying for control over a new Arctic passage, while low-lying cities and small island nations are confronting the possibility of their own demise. Catastrophic flooding events are increasing in frequency, as are extreme droughts. Hurricane-related storm surges, tsunamis, and raging rivers have devastated regions on a local and global scale. In this seminar we will turn to the narratives and images that the human imagination has produced in response to the experience of overwhelming watery invasion, from Noah to New Orleans. Objects of analysis will include mythology, ancient and early modern diluvialism, literature, art, film, and commemorative practice. The basic question we'll be asking is: What can we learn from the humanities that will be helpful for confronting the problems and challenges caused by climate change and sea level rise?

Not Offered Every Year

Also Offered As: CIMS 1130, COML 1130, GRMN 1130

1 Course Unit

**ENVS 1043 Repairing the Planet: Tools for the Climate Emergency**

This course is a comprehensive introduction to the climate emergency and the tools with which we can fight it. It will integrate natural science, social science, philosophy of science, history, ethics, and policy. The course opens with an overview of the historical discovery of global warming and our contemporary understanding of climate change. We then turn to the framework that the United Nations' Intergovernmental Panel on Climate Change has developed to study climate risks, focusing on both general issues and case studies throughout the world. The existence and severity of these risks raises questions of climate justice at many levels: individuals to individuals, countries to countries, and the present generation to future generations. We will study these issues in detail, and then examine the policy tools developed to address them. Although we will discuss national and sub-national policy and policy proposals such as the Green New Deal, special attention will be given to global policy tools, especially the Framework Convention on Climate Change and the Paris Agreement. In addition to standard writing assignments, students will have a chance to develop policy proposals that address the core issues of the class.

Also Offered As: PHIL 1571

1 Course Unit

**ENVS 1050 Sustainability & Utopianism**

This seminar explores how the humanities can contribute to discussions of sustainability. We begin by investigating the contested term itself, paying close attention to critics and activists who deplore the very idea that we should try to sustain our, in their eyes, dystopian present, one marked by environmental catastrophe as well as by an assault on the educational ideals long embodied in the humanities. We then turn to classic humanist texts on utopia, beginning with More's fictive island of 1517. The "origins of environmentalism" lie in such depictions of island edens (Richard Grove), and our course proceeds to analyze classic utopian texts from American, English, and German literatures. Readings extend to utopian visions from Europe and America of the nineteenth and twentieth centuries, as well as literary and visual texts that deal with contemporary nuclear and flood catastrophes. Authors include: Bill McKibben, Jill Kerr Conway, Christopher Newfield, Thomas More, Francis Bacon, Karl Marx, Henry David Thoreau, Robert Owens, William Morris, Charlotte Perkins Gilman, Ayn Rand, Christa Wolf, and others.

Not Offered Every Year

Also Offered As: COML 1160, ENGL 1579, GRMN 1160, STSC 1160

1 Course Unit

**ENVS 1400 Global Environmental History from Paleolithic to the Present**

This course explores the changing relationships between human beings and the natural world from early history to the present. We will consider the various ways humans across the globe have interacted with and modified the natural world by using fire, domesticating plants and animals, extracting minerals and energy, designing petrochemicals, splitting atoms and leaving behind wastes of all sorts. Together we consider the impacts, ranging from population expansion to species extinctions and climate change. We examine how human interactions with the natural world relate to broader cultural processes such as religion, colonialism and capitalism, and why it is important to understand the past, even the deep past, in order to rise to the challenges of the present.

Also Offered As: HIST 1706

1 Course Unit

**ENVS 1410 Ecocritical Lit: Nature, Ecology and the Literary Imagination**

This course introduces students to ecocritical literature. It is an exploration of how language and literature engages with and shapes our relations to and our understandings of the natural world. See the English Department's website at [www.english.upenn.edu](http://www.english.upenn.edu) for a description of the current offerings.

Also Offered As: ENGL 1595

1 Course Unit

**ENVS 1440 Liquid Histories and Floating Archives**

Climate change transforms the natural and built environments, and it is re-shaping how we understand, make sense, and care for our past. Climate changes history. This course explores the Anthropocene, the age when humans are remaking earth's systems, from an on-water perspective. In on-line dialogue and video conferences with research teams in port cities on four continents, this undergraduate course focuses on Philadelphia as one case study of how rising waters are transfiguring urban history, as well as its present and future. Students projects take them into the archives at the Independence Seaport Museum and at Bartram's Garden. Field trips by boat on the Schuylkill and Delaware Rivers and on land to the Port of Philadelphia and to the John Heinz National Wildlife Refuge invite transhistorical dialogues about how colonial and then industrial-era energy and port infrastructure transformed the region's vast tidal marshlands wetlands. Excursions also help document how extreme rain events, storms, and rising waters are re-making the built environment, redrawing lines that had demarcated land from water. In dialogue with one another and invited guest artists, writers, and landscape architects, students final projects consider how our waters might themselves be read and investigated as archives. What do rising seas subsume and hold? Whose stories do they tell? What floats to the surface?

Not Offered Every Year

Also Offered As: ANTH 1440, COML 1140, ENGL 1589, GRMN 1140, HIST 0872

1 Course Unit

**ENVS 1450 Global Sustainabilities**

This research-oriented seminar focuses on the ways in which "sustainability" and "sustainable development" are linguistically and culturally translated into the world's languages. We may take the terms for granted, but they have only really been on the global stage since they were widely introduced in the 1987 United Nations report, Our Common Future. Seminar participants will first become acquainted with the cultural and conceptual history of the terms and the UN framework within which sustainability efforts directly or indirectly operate. Having established the significance of cultural and linguistic difference in conceiving and implementing sustainability, participants will collaboratively develop a research methodology in order to begin collecting and analyzing data. We will draw heavily on Penn's diverse language communities and international units. Seminar members will work together and individually to build an increasingly comprehensive website that provides information about the world's languages of sustainability.

Not Offered Every Year

Also Offered As: COML 1170, GRMN 1170

1 Course Unit

**ENVS 1540 Comparative Cultures of Sustainability**

Sustainability is more than science, engineering, policy, and design. Surveying the world, we see that the politics and practice of sustainability play out in different ways depending on cultural factors. Some cultures are more prone to pursue ecological goals than others. Why? Do the environmental history and experience of a nation affect policy? Do nature and the environment play a crucial role in the cultural memory of a nation? Can cultural components be effectively leveraged in order to win approval for a politics of sustainability? And what can we, as residents of a country where climate change and global warming are flashpoints in an enduring culture war, learn from other cultures? This course is designed to equip undergraduate students with the historical and cultural tools necessary to understand the cultural aspects of sustainability in two countries noted for their ecological leadership and cultural innovation, Germany and the Netherlands. This hybrid course combines online instruction with a short-term study abroad experience in Berlin and Rotterdam. During the pre-trip online portion of the course, students will become acquainted with the cultural histories of German and Dutch attitudes toward sustainability and the environment through a combination of recorded lectures by the instructor, reading assignments, viewing assignments (documentary and feature films), threaded discussions, and short written assignments. The goal of the pre-trip instruction are to help students develop tools for analyzing and interpreting cultural difference, construct working models of German and Dutch concepts of sustainability, and formulate hypotheses about the relation between culture and policy in Germany and the Netherlands. The class will spend a total of ten days in Europe: five days in Berlin and five days in the area of Rotterdam. The days will be jam-packed with visits to important sites of sustainable practice; discussion with policy makers, activists, and scientists; and immersion in the cultures of the Netherlands and Germany. Upon our return from Europe, the class will debrief and students will present online projects. There are no prerequisites or language requirements.

Summer Term

Also Offered As: GRMN 1150

1 Course Unit

**ENVS 1550 Forest Worlds: Mapping the Arboreal Imaginary in Literature and Film**

The destruction of the world's forests through wild fires, deforestation, and global heating threatens planetary bio-diversity and may even, as a 2020 shows, trigger civilizational collapse. Can the humanities help us think differently about the forest? At the same time that forests of the world are in crisis, the "rights of nature" movement is making progress in forcing courts to acknowledge the legal "personhood" of forests and other ecosystems. The stories that humans have told and continue to tell about forests are a source for the imaginative and cultural content of that claim. At a time when humans seem unable to curb the destructive practices that place themselves, biodiversity, and forests at risk, the humanities give us access to a record of the complex inter-relationship between forests and humanity. Forest Worlds serves as an introduction to the environmental humanities. The environmental humanities offer a perspective on the climate emergency and the human dimension of climate change that are typically not part of the study of climate science or climate policy. Students receive instruction in the methods of the humanities - cultural analysis and interpretation of literature and film - in relation to texts that illuminate patterns of human behavior, thought, and affect with regard to living in and with nature.

Spring

Also Offered As: CIMS 1520, COML 1054, GRMN 1132

1 Course Unit

**ENVS 1615 Urban Environments: Speaking About Lead in West Philadelphia**

Lead poisoning can cause learning disabilities, impaired hearing, behavioral problems, and at very high levels, seizures, coma and even death. Children up to the age of six are especially at risk because of their developing systems; they often ingest lead chips and dust while playing in their home and yards. In ENVS 1615, Penn undergraduates learn about the epidemiology of lead poisoning, the pathways of exposure, and methods for community outreach and education. Penn students collaborate with middle school and high school teachers in West Philadelphia to engage middle school children in exercises that apply environmental research relating to lead poisoning to their homes and neighborhoods.

Fall

1 Course Unit

**ENVS 1625 Community Based Environmental Health**

From the fall of the Roman Empire to Love Canal to the epidemics of asthma, childhood obesity and lead poisoning in West Philadelphia, the impact of the environment on health has been a continuous challenge to society. The environment can affect people's health more strongly than biological factors, medical care and lifestyle. The water we drink, the food we eat, the air we breathe, and the neighborhood we live in are all components of the environment that impact our health. Some estimates, based on morbidity and mortality statistics, indicate that the impact of the environment on health is as high as 80%. These impacts are particularly significant in urban areas like West Philadelphia. Over the last 20 years, the field of environmental health has matured and expanded to become one of the most comprehensive and humanly relevant disciplines in science. This course will examine not only the toxicity of physical agents, but also the effects on human health of lifestyle, social and economic factors, and the built environment. Topics include cancer clusters, water borne diseases, radon and lung cancer, lead poisoning, environmental tobacco smoke, respiratory diseases and obesity. Students will research the health impacts of classic industrial pollution case studies in the US. Class discussions will also include risk communication, community outreach and education, access to health care and impact on vulnerable populations. Each student will have the opportunity to focus on Public Health, Environmental Protection, Public Policy, and Environmental Education issues as they discuss approaches to mitigating environmental health risks. This honors seminar will consist of lectures, guest speakers, readings, student presentations, discussions, research, and community service. The students will have two small research assignments including an Environmental and Health Policy Analysis and an Industrial Pollution Case Study Analysis. Both assignments will include class presentations. The major research assignment for the course will be a problem-oriented research paper and presentation on a topic related to community-based environmental health selected by the student. In this paper, the student must also devise practical recommendations for the problem based on their research.

Fall

1 Course Unit

**ENVS 1635 Urban Environments: Prevention of Tobacco Smoking in Adolescents**

Cigarette smoking is a major public health problem. The Centers for Disease Control and Prevention Control reports that more than 80% of current adult tobacco users started smoking before age 18. The National Youth Tobacco Survey indicated that 12.8% of middle school students and 34.8% of high school students in their study used some form of tobacco products. In ENVS 1635, Penn undergraduates learn about the short and long term physiological consequences of smoking, social influences and peer norms regarding tobacco use, the effectiveness of cessation programs, tobacco advocacy and the impact of the tobacco settlement. Penn students will collaborate with teachers in West Philadelphia to prepare and deliver lessons to middle school students. The undergraduates will survey and evaluate middle school and Penn student smoking. One of the course goals is to raise awareness of the middle school children to prevent addiction to tobacco smoke during adolescence. Collaboration with the middle schools gives Penn students the opportunity to apply their study of the prevention of tobacco smoking to real world situations.

Spring

1 Course Unit

**ENVS 1645 Urban Environments: The Urban Asthma Epidemic**

Asthma as a pediatric chronic disease is undergoing a dramatic and unexplained increase. It has become the number one cause of public school absenteeism and now accounts for a significant number of childhood deaths each year in the USA. The Surgeon General of the United States has characterized childhood asthma as an epidemic. In ENVS 1645, Penn undergraduates learn about the epidemiology of urban asthma, the debate about the probable causes of the current asthma crisis, and the nature and distribution of environmental factors that modern medicine describes as potential triggers of asthma episodes. Penn students will co-teach asthma classes offered in public schools in West Philadelphia and survey asthma caregivers, providing them with the opportunity to apply theoretical knowledge to real-world situations, promote community education and awareness about asthma, and use problem-solving learning to enhance student education in environmental health.

Spring

1 Course Unit

**ENVS 1650 The Role of Water in Urban Sustainability and Resiliency**

This course will provide an overview of the cross-disciplinary fields of civil engineering, environmental sciences, urban hydrology, landscape architecture, green building, public outreach and politics. Students will be expected to conduct field investigations, review scientific data and create indicator reports, working with stakeholders and presenting the results at an annual symposium. There is no metaphor like water itself to describe the cumulative effects of our practices, with every upstream action having an impact downstream. In our urban environment, too often we find degraded streams filled with trash, silt, weeds and dilapidated structures. The water may look clean, but is it? We blame others, but the condition of the creeks is directly related to how we manage our water resources and our land. In cities, these resources are often our homes, our streets and our communities. This course will define the current issues of the urban ecosystem and how we move toward managing this system in a sustainable manner. We will gain an understanding of the dynamic, reciprocal relationship between practices in a watershed and its waterfront. Topics discussed include: drinking water quality and protection, green infrastructure, urban impacts of climate change, watershed monitoring, public education, creating strategies and more. Not Offered Every Year

Prerequisite: ENVS 1000 OR EASC 1000

1 Course Unit

**ENVS 1665 Air Pollution: Sources & Effects in Urban Environments**

This is an ABCS course designed to provide the student with an understanding of air pollution at the local, regional and global levels. The nature, composition, and properties of air pollutants in the atmosphere will also be studied. The course will focus on Philadelphia's air quality and how air pollutants have an adverse effect on the health of the residents. The recent designation by IARC of Air Pollution as a known carcinogen will be explored. How the community is exposed to air pollutants with consideration of vulnerable populations will be considered. Through a partnership with Philadelphia Air Management Service (AMS) agency the science of air monitoring and trends over time will be explored. Philadelphia's current non-attainment status for PM2.5 and ozone will be studied. Philadelphia's current initiatives to improve the air quality of the city will be discussed. Students will learn to measure PM2.5 in outdoor and indoor settings and develop community-based outreach tools to effectively inform the community of Philadelphia regarding air pollution. The outreach tools developed by students may be presentations, written materials, apps, websites or other strategies for enhancing environmental health literacy of the community. A project based approach will be used to include student monitoring of area schools, school bus routes, and the community at large. The data collected will be presented to students in the partner elementary school in West Philadelphia. Upon completion of this course, students should expect to have attained a broad understanding of and familiarity with the sources, fate, and the environmental impacts and health effects of air pollutants.

Fall

1 Course Unit

**ENVS 2390 Freshwater Ecology**

Survey of the physical, chemical and biological properties of freshwater ecosystems, both riverine and lentic, natural and polluted.

Spring

Also Offered As: BIOL 4615

Mutually Exclusive: BIOL 5615

Prerequisite: BIOL 1101 OR BIOL 1121

1 Course Unit

**ENVS 2400 Petrosylvania: Reckoning with Fossil Fuel**

Fossil fuel powered the making—now the unmaking—of the modern world. As the first fossil fuel state, Pennsylvania led the United States toward an energy-intensive economy, a technological pathway with planetary consequences. The purpose of this seminar is to perform a historical accounting—and an ethical reckoning—of coal, oil, and natural gas. Specifically, students will investigate the histories and legacies of fossil fuel in connection to three entities: the Commonwealth of Pennsylvania, the City of Philadelphia, and the University of Pennsylvania. Under instructor guidance, students will do original research, some of it online, much the rest of it in archives, on and off campus, in and around Philadelphia. Philly-based research may also involve fieldwork. While based in historical sources and methods, this course intersects with business, finance, policy, environmental science, environmental engineering, urban and regional planning, public health, and social justice. Student projects may take multiple forms, individual and collaborative, from traditional papers to data visualizations prepared with assistance from the Price Lab for Digital Humanities. Through their research, students will contribute to a multi-year project that will ultimately be made available to the public.

Also Offered As: HIST 2157

1 Course Unit

**ENVS 2410 Religion and Ecology**

This class will introduce the overlaps between religion and ecology. Rather than assuming that there is a necessary positive or negative relationship between religion and ecology, we will look at how these relationships have materialized in complicated ways at different moments in history. We'll consider perspectives and case studies from a range of different moments in history. We'll consider perspectives and case studies from a range of different traditions, with a special attention paid to the genesis of the field of Religion and Ecology in critiques of Christian attitudes toward the environment in the 1960s and 1970s.

Not Offered Every Year

Also Offered As: ANTH 2110, RELS 2110

1 Course Unit

**ENVS 2420 Animals and Religion**

Religion is full of animals—lions and lambs, monkeys and elephants, buffalo and snakes, even mythical beasts. The identity of the human being is explained, in many traditions, by contrast with the identity of other species. We know who we are because we know who they are, or do we? This course interrogates—through an exploration of sacred texts, art, film, and museum artifacts—the tension present in many traditions between an anthropocentric prioritization of the human being and religious resources that encourage a valuing of other animal species. We'll explore the way animals function both as religious objects and as religious subjects across diverse traditions, asking how human-animal relationships have shaped religion and how religion has shaped the way we think about and interact with other animals. We'll ask how religion has engaged with animals over time and across global cultures, understanding them as symbols, messengers, and manifestations of the divine; as material for ritual and sacrifice; as kin and subordinates; as food and as filth; as helpmeets and as tempters. How have these perspectives shaped animal ethics, influencing the treatment, use, and consumption of animals and their bodies? Finally, we'll ask what it means that we ourselves are evolved animals. How does our own animality factor into the practice of human religion? Is our religious capacity part of what sets us apart from other animals or is religiosity a trait we might expect to find in other species? To what extent is religion a function of the animal?

Not Offered Every Year

Also Offered As: ANTH 2120, RELS 2120

1 Course Unit

**ENVS 2430 Spirituality in the Age of Global Warming: Designing a Digital Mapping Project in Scalar**

We are living in the midst of one of the most severe crises in the Earth's history. Science confirms the glaciers are melting, hurricanes are growing more intense, and the oceans are rising. But there is also a deeply spiritual dimension to global warming that does not factor into the scientific explanations of the Anthropocene. "Spirituality" will be defined not in terms of one particular religion, but in relationship to a passionate study of the environment and nature. Readings will include materials from both the sciences and the humanities such as Donella Meadows's *Thinking in Systems*, Elizabeth Kolbert's *The Sixth Extinction*, Barbara Kingsolver's *Flight Behavior*, and films such as *Black Fish* and *Wale Rider*. The theoretical focus of the course will be how "multispecies partnerships" can help us better understand and mitigate the effects of Climate Change. This class will work collaboratively on a digital archive with an interactive mapping interface designed in Scalar. This newly developed platform allows for the creation of multimedia exhibits that will document how Global Warming is affecting coral reefs in the tropics, glaciers in the Arctic and Antarctic, rainforests in the Amazon and rivers of Philadelphia. Students will also work individually to design interactive maps on the Scalar platform documenting their own more personal interactions with the environment.

Not Offered Every Year

Also Offered As: ENGL 1599, RELS 2460

1 Course Unit

**ENVS 2440 Extreme Heat: White Nationalism in the Age of Climate Change**

The Amazon is burning. The glaciers are melting. Heat waves, hurricanes, earthquakes, floods, wildfires, and droughts devastate ever larger swaths of the earth, producing crop failures, air pollution, soil erosion, famine and terrifying individual hardship. At the same time the so-called Western World is literally walling itself off from the millions who are fleeing from disaster and war with what little they can carry. White militants chant "blood and soil" and "Jews will not replace us," social media spreads memes and talking points about "white genocide" and "white replacement" and online ideologues fantasize about building white ethnostates. Are these developments connected? Is there a causal relationship? Or are these conditions purely coincidental? Increasingly, arguments about limits to growth, sustainability, development and climate change have come to stand in competitive tension with arguments for social and racial equality. Why is that case? What are the claims and underlying anxieties that polarize western societies? How do white nationalist movements relate to populist and fascist movements in the first half of the 20th century? What is new and different about them now? What is the relationship between environmentalism, rightwing populism and the climate crisis? And how have societies responded to the climate crisis, wealth inequality, finite resources and the threat posed by self-radicalizing white nationalist groups?

Also Offered As: HIST 2707

1 Course Unit

**ENVS 2984 Maritime Science and Technology: Woods Hole Sea Semester**

A rigorous semester-length academic and practical experience leading to an understanding of the oceans. The Sea Semester is composed of two intensive six-week components taken off-campus. The Shore Component is six weeks at Woods Hole, Massachusetts, with formal study in: Oceanography, Maritime Studies, and Nautical Science. This is followed by six weeks aboard a sailing research vessel, during which students conduct oceanographic research projects as part of the courses, Practical Oceanography I and II. Maritime Studies. A multidisciplinary study of the history, literature, and art of our maritime heritage, and the political and economic problems of contemporary maritime affairs. Nautical Science. The technologies of operation at sea. Concepts of navigation, naval architecture, ship construction, marine engineering systems, and ship management are taught from their bases in physics, mathematics, and astronomy. Practical Oceanography I. Taken aboard SSV Westward or SSV Corwith Cramer. Theories and problems raised in the shore component are tested in the practice of oceanography at sea. Students are introduced to the tools and techniques of the practicing oceanographer. During two lectures daily and while standing watch, students learn the operation of basic oceanographic equipment, the methodologies involved in the collection, reduction, and analysis of oceanographic data, and the attendant operations of a sailing oceanographic research vessel. Practical Oceanography II. Taken aboard SSV Westward or SSV Corwith Cramer. Students assume increasing responsibility for conducting oceanographic research and the attendant operations of the vessel. The individual student is responsible directly to the chief scientist and the master of the vessel for the safe and orderly conduct of research activities and related operation of the vessel. Each student completes an individual oceanographic research project designed during the shore component.

Fall or Spring

1 Course Unit

**ENVS 2999 Independent Study**

Directed study for individuals or small groups under supervision of a faculty member.

Fall or Spring

1 Course Unit

**ENVS 3053 Sustainable Development And Culture in Latin America**

This interdisciplinary course exposes students to the three dimensions of sustainable development -environmental, economic, and social- through an examination of three products -peyote, coca, and coffee- that are crucial in shaping modern identity in areas of Latin America. The course integrates this analysis of sustainable development in relation to cultural sustainability and cultural practices associated with peyote, coca, and coffee and their rich, traditional heritage and place in literature, film, and the arts. This is an upper level seminar open to majors and minors of Spanish and those who have completed Pre-requisite SPAN 1800 or SPAN 1900 or permission of the Undergraduate Chair.

Fall, even numbered years only

Also Offered As: LALS 3910, SPAN 3910

Mutually Exclusive: SPAN 0091

Prerequisite: SPAN 1800 OR SPAN 1900

1 Course Unit

**ENVS 3100 Environmental Case Studies**

This course, through the analysis of many different environmental cases studies, aims to introduce students to myriad earth and environmental issues—understanding how humans interact, affect and are influenced by our environment—as well as giving students an introduction to how complex cases are analyzed and what goes into decision-making at the individual, group, state, federal and global levels. The class analyzes 1-2 case studies each week, beginning with at-home preparatory assignments for each class, followed by in-class activities such as debates, drafting action plans, role-playing and group decision-making simulations. Each student will also research and develop a case study of their own, including a lesson plan for how the case study would be taught to a later college class.

Not Offered Every Year

Prerequisite: EESC 1000 OR ENVS 1000 OR permission of instructor

1 Course Unit

**ENVS 3103 Penn Global Seminar: Case Studies in Environmental Sustainability**

A detailed, comprehensive investigation of selected environmental sustainability problems specific to a selected region. This course aims to introduce students to myriad Earth and environmental issues (understanding how humans interact, affect and are influenced by our environment) through the analysis of several environmental case studies, as well as giving students an introduction to how complex cases are analyzed and what goes into decision-making at the individual, group, state, federal and global levels. The course includes an intensive international field trip - locations will vary by offering.

Spring, odd numbered years only

Prerequisite: ENVS 1000 OR EASC 1000 OR EASC 1060 OR EASC 1050 OR EASC 1030

1 Course Unit

**ENVS 3445 Latinx Environmental Justice**

This course explores the involvement of the Latinx environmental justice movement since the 1960s. It addresses theories and concepts of environmental racism and environmental justice, underscoring how Latinx have challenged, expanded, and contributed to the environmental justice discourse. In this course, students will explore national case studies of environmental and racial injustice as they bear on Latinx communities both in rural areas and in urban barrios throughout the United States. The course will analyze these case studies through the lens of Latinx artistic and literary texts (essays, paintings, short stories, documentaries, and short films) as they provide a unique historic and multicultural perspective of the Latinx experience with environmental injustice and of how Latinxs imagine alternative transitions and responses to environmental marginalization. In addition, the works of Latinx artists and writers will serve as case studies to deconstruct racial stereotypes of Latinxs as unconcerned about environmental issues, shedding light on how they share a broad engagement with environmental ideas. The case studies analyzed in this course emphasize race and class differences between farmworkers and urban barrio residents and how they affect their respective struggles. The unit on farmworkers will focus on workplace health issues such as toxic chemicals and collective bargaining contracts. The unit on urban barrios will focus on gentrification, affordable housing, and toxic substances in the home. We will also review current and past programs that have been organized to address the aforementioned problems. This is an Academically Based Community Service Course (ABCS course) through which students will learn from and provide support to a Latinx-serving organization in the City of Philadelphia on preventing exposure to hazardous substances, thus bridging the information gap on environmental justice issues in the Latinx community in Philadelphia. Information dissemination and education efforts will be conducted by collaborating with Esperanza Academy Charter School in Philadelphia to implement lessons on preventing exposure to hazardous substances. Studying environmental justice and pairing it with community service will heighten students' awareness of the complexities of culture, race, gender, and class while providing them with an invaluable experience of cross-cultural understanding.

Spring

Also Offered As: ANTH 3930, LALS 3930, SPAN 3930, URBS 3930

Prerequisite: SPAN 1800 AND SPAN 1900

1 Course Unit

**ENVS 3500 Principles of Sustainability**

What is sustainability? Can any fundamental concepts, principles or framework be constructed that adequately describes the search for sustainability? Is there a meaningful methodology? Sustainability science is a trans-disciplinary approach in which the quantitative and qualitative, natural and social, and theory and practice are reconciled and creatively combined. The objective of this course is to provide an in-depth analysis of the foundational concepts, principles, processes and practices of sustainability science. The course will explore three foundational laws governing sustainability: the law of limits to growth, the second law of thermodynamics, and the law of self-organization. Students will examine how these laws operate in biological, ecological, and physical systems, and then apply them to social, economic and political systems.

1 Course Unit

**ENVS 3550 Sustainable Goods**

The study of sustainability—the long term viability of humans in harmony with the environment—has been identified as a critical issue for society and industry and is evolving to examine how society should conduct itself in order to survive. This issue impacts the consumer goods that we use in our lives, the processes that are designed to make these goods, and the raw materials that we obtain to create these goods. The questions that we will examine will be: can these goods be obtained, made, and consumed in a fashion that allows the current quality of life to be maintained (or enhanced) for future generations? Can these processes be sustainable? A review of consumer goods is necessary as the starting point in order to understand the basic needs of people in society and why people consume goods as they do. Subsequently, each student will choose a product to examine in detail and will research the product for its impact with respect to natural resource selection, production, use, and disposal/reuse.

1 Course Unit

**ENVS 3700 GIS: Mapping Places & Analyzing Spaces**

This course is a hands-on introduction to the concepts and capabilities of geographic information systems (GIS). Students will develop the skills necessary for carrying out basic GIS projects and for advanced GIS coursework. The class will focus on a broad range of functional and practical applications, ranging from environmental science and planning to land use history, social demography, and public health. By the end of the course, students will be able to find, organize, map, and analyze data using both vector (i.e. drawing-based) and raster (i.e. image-based) GIS tools, while developing an appreciation for basic cartographic principles relating to map presentation. This course fulfills the spatial analysis requirement for ENVS and EASC Majors. Previous experience in the use of GIS is not required.

1 Course Unit

**ENVS 3991 Topics in Environmental Studies**

In-depth exploration of topical issues in environmental studies. Topics and instructors will vary with course offerings.

Spring

1 Course Unit

**ENVS 3997 Environmental Studies Research Seminar for Juniors**

This seminar is designed to help Juniors prepare for the Senior Thesis research. Topic selection, advisor identification, funding options, and basic research methods will be discussed.

Spring

Also Offered As: EESC 3997

Prerequisite: ENVS 1000

1 Course Unit

**ENVS 4200 The anthropocene: Human-dominated Earth**

How much have humans altered the planet they live on? Beyond climate change, humans have altered the Earth's land, oceans and biosphere to such an extent that the concept of a new geologic epoch defined by the action of humans is seriously debated. This seminar will examine the origins of the Anthropocene, the ways in which humans have altered Earth systems, whether or not these alterations warrant a new geologic designation, and what the future potentially holds for both humans and the planet.

1 Course Unit

**ENVS 4250 Our Water Planet**

Water, the “universal solvent”, is a miraculous substance that makes Earth unique in the solar system and, possibly, the galaxy. This course will dive into the wondrous physical and chemical properties of water from the micro (water properties and composition) to macro (global water resources) scale and highlight its role in sculpting almost every facet of Earth’s environment. Water will be examined within a scientific framework, from wicked water problems to wonderful water bodies to the paradox of an abundant yet incredibly precious resource. We will study the vital role of water in life, its movement across around our planet, its part in the growth (and downfall) of civilizations, and the ways in which humans are having profound impacts on all aspects of the water cycle. We will also look at how water interacts with other Earth systems, use topical case studies to examine water issues in the Anthropocene and examine what lies in store for water quality and availability in the twenty-first century during an era of rapid environmental change. Assignments will include class presentations, an opinion piece, and a review article for a leading journal. This course will include a local field trip.

Not Offered Every Year

1 Course Unit

**ENVS 4330 Climate Change and Communication: Theories and Applications**

This course will focus on understanding the multiple ways in which climate science is communicated to publics and how they come to understand it. In the process, we will explore ways to blunt susceptibilities to misconceptions, misconstruals, and deliberate deceptions about climate science. Forms of communication on which the class will focus include consensus statements, manifestos, commentaries, court briefs, news accounts, fact checks, op-eds, letters to the editor, speeches, and media interviews. Students will have the opportunity to interact with guest lecturers, among them leading journalists, climate activists, and climate survey analysts. Students will write letters to the editor and fact checks and will participate in mock interviews designed to increase their understanding of the nature of the interactions between journalists and climate scientists. As a class project, students will collaborate on a white paper on climate discourse fallacies to be distributed at the April 3-7 Society for Environmental Journalists annual convention (hosted by the Annenberg Public Policy Center and the Penn Center for Science, Sustainability, and Media). Students will interview attendees at that conference as part of the class project.

Also Offered As: COMM 4330

Mutually Exclusive: COMM 6330

1 Course Unit

**ENVS 4520 Sustainable Landscapes**

Sustainable Landscapes

Not Offered Every Year

1 Course Unit

**ENVS 4600 Environmental Policy**

Environmental policy

Fall

1 Course Unit

**ENVS 4997 Senior Thesis**

The culmination of the Environmental Studies major. Students, while working with an advisor in their concentration, conduct research and write a thesis.

Two Term Class, Student may enter either term; credit given after both terms are complete

1 Course Unit

**ENVS 5100 Proseminar: Contemporary Issues in Environmental Studies**

A detailed, comprehensive investigation of selected environmental problems. This is the first course taken by students entering the Master of Environmental Studies Program.

Fall or Spring

1 Course Unit

**ENVS 5204 Regional Ecology: Restoration and Management to Build Resilience**

Using the regional geology as a framework for comparison, this online course aims to 1) introduce the varied ecosystems of the region extending from the Atlantic Ocean to the Appalachian Mountains, 2) provide an approach to site analysis that examines connections between climate, geology, topography, hydrology, soils, vegetation, wildlife, and disturbance, both natural and anthropogenic, and 3) investigate restoration and management efforts to build resilience in a changing climate. We will study natural and modified areas representative of regional physiographic provinces (areas of similar geology and topography) to better understand landscape patterns and processes as well as case studies of restoration and management projects. Students will complete weekly assignments and a research project involving a presentation and paper on a topic of interest. \*This is an online course\*+ 1 Course Unit

**ENVS 5220 Sustainable Agriculture and Product Stewardship.**

This course will focus on how food is produced around the globe and inputs required to ensure food security. Topics explored include: Integrated Pest Management, Precision Agriculture, Product Stewardship, Biodiversity, Biologicals, Organics and Synthetic Products, GMOs, Sustainable Development Goals, Regulations, Stakeholders (Growers, NGOs, consumers, etc.), and Food waste.

1 Course Unit

**ENVS 5310 The History and Science of Climate Change**

This course will provide an understanding of the Earth’s climate system and how and why this has changed through time. The emphasis will be placed on spatial and temporal scales in the modern system while exploring the evidence for past change, possible mechanisms to explain these changes and the implications of these changes to past, present and future global climate. Students will learn to reconstruct the history and scales of climate change through the use of proxies; understand the mechanisms that act to drive climate change; show and understanding of the long-term natural climate variability on a global and regional scale; understand the importance of natural environmental change, against which to assess human impacts, recent climate change and issues of future environmental change.

1 Course Unit

**ENVS 5404 Wetlands**

The course focuses on the natural history of different wetland types including climate, geology, and hydrology factors that influence wetland development Associated soil, vegetation, and wildlife characteristics and key ecological processes will be covered as well. Lectures will be supplemented with weekend wetland types, ranging from tidal salt marshes to non-tidal marshes, swamps, and glacial bogs in order to provide field experience in wetland identification, characterization, and functional assessment. Outside speakers will discuss issues in wetland seed bank ecology, federal regulation, and mitigation. Students will present a short paper on the ecology of a wetland animal and a longer term paper on a selected wetland topic. Readings from the text, assorted journal papers, government technical documents, and book excerpts will provide a broad overview of the multifaceted field of wetland study.

Fall

1 Course Unit

**ENVS 5410 Environmental Humanities: Theory, Method, Practice**

Environmental Humanities: Theory, Methods, Practice is a seminar-style course designed to introduce students to the trans- and interdisciplinary field of environmental humanities. Weekly readings and discussions will be complemented by guest speakers from a range of disciplines including ecology, atmospheric science, computing, history of science, medicine, anthropology, literature, and the visual arts. Participants will develop their own research questions and a final project, with special consideration given to building the multi-disciplinary collaborative teams research in the environmental humanities often requires.

Not Offered Every Year

Also Offered As: COML 5430, ENGL 5430, GRMN 5430, SPAN 5430

1 Course Unit

**ENVS 5414 Conservation and Land Management**

Using protected lands in the Delaware Valley, this field-based course will explore various strategies for open-space conservation and protection. In addition, students will be introduced to land management techniques used on such sites to restore or preserve land trust properties in accordance with goals set for their use or protection. Sustainable land uses such as community supported agriculture, ecovillages, and permaculture design will be covered. Emphasis will be placed on developing skills in "Reading the Landscape" to determine conservation and restoration priorities. Students will produce a site assessment report on sites that they visit.

Summer Term

1 Course Unit

**ENVS 5440 Public Environmental Humanities**

By necessity, work in environmental humanities spans academic disciplines. By design, it can also address and engage publics beyond traditional academic settings. This seminar explores best practices in public environmental humanities. Students receive close mentoring and build collaborative community to develop and execute cross-disciplinary, public engagement projects on the environment. This spring, this broadly interdisciplinary course is designed in conjunction with the ongoing environmental humanities project, An Ecotopian Toolkit for the Anthropocene. In the framework of our seminar, students will have opportunities to work with the project's curators and educators as well as Toolmakers on project-based assignments that also engage wider publics around issues of climate and environmental justice. This lab-style seminar is suitable for advanced undergraduates (with permission) and fulfills the "Capstone" requirement for the Minor in Environmental Humanities. It is also open to graduate students in departments across Arts and Sciences as well as other schools at the university.

Not Offered Every Year

Also Offered As: ANTH 5440, COML 5440, GRMN 5440, URBS 5440

1 Course Unit

**ENVS 5600 Developing Environmental Policy**

When we think of environmental policies in the USA, we may think of one or more laws geared to improve our nation's air, water, ecosystems, and biodiversity. However, environmental policies and policy-making comprise more than just specific laws and regulations. Making and implementing environmental policy is a process influenced by multiple political, cultural, and economic factors in addition to scientific factors, all of which impact the ability of policies to be effective, that is, to actually improve the environment. In this course, we develop a framework to analyze the effectiveness of the social actors, process and outcomes of environmental policy-making. We ask questions such as: How do policy makers define environmental problems and solutions? Who are the social actors involved in the process? How are policies created and negotiated? What underlying assumptions and realities about the roles of government and society shape policy instruments and design? Are science and risk accurate or distorted? How are social and environmental justice intertwined? To answer these complex questions, we contextualize and critically analyze policies to determine how both government and society impact on regulatory approaches. We study the institutions involved and examine social and ecological outcomes of environmental policies. We also discuss contemporary issues and policy situations that arise throughout the course of the semester, and comment on them in a class blog. Finally, students will select an environmental issue and formulate a policy proposal to recommend to decisionmakers.

Spring

1 Course Unit

**ENVS 5706 Modeling Geographical Objects**

This course offers a broad and practical introduction to the acquisition, storage, retrieval, maintenance, use, and presentation of digital cartographic data with both image and drawing based geographic information systems (GIS) for a variety of environmental science, planning, and management applications. Its major objectives are to provide the training necessary to make productive use of at least two well known software packages, and to establish the conceptual foundation on which to build further skills and knowledge in late practice.

Fall

1 Course Unit

**ENVS 5716 Modeling Geographical Space**

This course explores the nature and use of digital geographic information systems (GIS) for the analysis and synthesis of spatial patterns and processes through 'cartographic modeling'. Cartographic modeling is a general but well defined methodology that can be used to address a wide variety of analytical mapping applications in a clear and consistent manner. It does so by decomposing both data and data-processing tasks into elemental components that can then be recomposed with relative ease and with great flexibility.

Spring

1 Course Unit

**ENVS 5744 Regional Field Ecology**

Over the course of six Sunday field trips, we will travel from the barrier islands along the Atlantic Ocean in southern New Jersey to the Pocono Mountains in northeastern Pennsylvania, visiting representative sites of the diverse landscapes in the region along the way. At each site we will study and consider interactions between geology, topography, hydrology, soils, vegetation, wildlife, and disturbance. Students will summarize field trip data in a weekly site report. Evening class meetings will provide the opportunity to review field trips and reports and preview upcoming trips. Six all-day Sunday field trips are required.

Summer Term

1 Course Unit

**ENVS 6020 Conservation Management in the Delaware Valley**

Using protected lands in the Delaware Valley, this field-based course will explore various strategies for open space conservation and protection, along with cultural perspectives on land preservation. In addition, students will be introduced to land management techniques used on such sites to restore or preserve them in accordance with goals set for their use or protection. Emphasis will be placed on developing skills in "reading the landscape" to determine conservation and restoration priorities. Students will produce a paper based on notes from field trips, class, and readings.

Not Offered Every Year

1 Course Unit

**ENVS 6050 Industrial Ecology and the Circular Economy**

Industrial Ecology is the multidisciplinary study of industrial systems and economic activities and their links to natural systems. The word "industrial" represents how humans use natural resources in the production of goods and services. "Ecology" refers to the concept that our industrial systems need to operate within sustainable natural ecosystems. The application of industrial ecology requires a movement of industrial processes from open loop business processes, where resource and capital investments move through the system to create products and waste, to a closed loop system where wastes (aka by-products) become inputs for new processes. This approach will allow to move to a circular economy. The implementation of industrial ecology, which aligns business operations with the natural cycle, creates the opportunity for a circular economy and has the potential for significant benefit for industry as well as for the long term viability of the human population and the natural ecosystem. Prerequisite: Approval from the instructor if course prerequisites not met.

Summer Term

1 Course Unit

**ENVS 6221 Topics Course in Resource Management**

This is a topics course exploring resource management issues.

1 Course Unit

**ENVS 6224 Bioremediation**

This course is an introduction to current and developing techniques for analyzing environmental contamination and for remediation of damaged environments. Knowledge of these options is important for students interested in public/law applications and environmental/landscape design and as a starting point for those pursuing a more science-oriented understanding. The first portion of this course will address bioindicators- the use of living systems to assess environmental contamination. These include systems ranging from biochemical assays to monitoring of whole organisms or ecosystems, as well as techniques ranging from laboratory to field and satellite surveys. The second portion of the course will introduce technologies for bioremediation- the use of living systems to restore contaminated environments. The technologies scale from single-species systems to complex ecosystems such as constructed wetlands; case studies will be examined. Students will be expected to participate in field trips, as well as prepare a final paper examining a particular technology in detail.

Not Offered Every Year

1 Course Unit

**ENVS 6250 Charting a New Course for the Water Industry**

We are entering an era of growing water infrastructure failures and remaining "legacy" water pollution challenges. Fortunately, a network of global water CEOs from water utilities, industry and engineering consulting are leading the water sector towards innovative change. They are finding solutions at the intersection of science, engineering/ technology and policy and paving the path forward for our water industry and our global water resources. This short course is led by the former CEO of Philadelphia Water and the Chair of the Leading Utilities of the World Network. Professor of Practice Howard Neukrug will lead a series of discussions on: (1) a brief history of water infrastructure systems in the US and the paradox of how our water resources have been used, valued, and priced over time; (2) a specific focus on the past 50 years of Philadelphia's efforts to meet the challenges of the Clean Water Act and Safe Drinking Water Act through leadership in the legislative, regulatory, management, and policy and research arenas of the water business; and (3) personal interviews with key water leaders on their greatest challenges past and future and how they are managing change and innovation towards more sustainable water systems in the 21st century.

Not Offered Every Year

0.5 Course Units

**ENVS 6300 The Future of water**

From Wall Street to rural Sub-Saharan Africa, technology innovation to aging infrastructure- this course will explore the; impact of water and consider what future leaders need to know about the dynamics of the industry, investment and business opportunities, and water-related risk; Opportunities for water are booming around the world, in large part because of existing or looming shortages and decades of underinvestment, population growth, rapid industrialization and urbanization, pollution, and climate change. Water is the only irreplaceable natural resource on the planet. Its critical role in every aspect of the global economy, could, in fact, lead it to be the next gold or the next oil; This course will address the fundamentals of the water sector from an international perspective. The future of water will be critical to our global economic, social and political development and will likely become one of the most influential factors in business decisions for the future. Furthermore, it is essential for leaders across all sectors- from pharmaceuticals to financials, energy to agriculture- to understand how to sustainably manage and account for water resources, capitalize on new technologies, mitigate water-related risks and navigate through complex and dynamic policy and regulation. The course will engage students in high-level discussion and strategy formation, challenging them to develop creative and sustainable solutions to some of the greatest challenges facing environmental, business and water industry leaders today. Interactive sessions and projects will provide an introduction to appropriately managing, valuing and investing in water assets to create sustainable and compelling business opportunities.

Fall

1 Course Unit

**ENVS 6302 Climate Technology: Finance and Policy**

The growing field of climate technology requires a multifaceted skill set anchored in a sound understanding of finance and policy. This course is designed for students interested in the climate economy seeking to gain functional proficiency in climate finance and policy. The course will cover four key areas of the climate economy from a finance and policy angle: electrification, carbon management, critical minerals & materials, and breakthrough technologies. The finance portion of the course will deliver a basic understanding of the financial reporting of companies within the given subsector, functionality of the relevant technologies, capital structure of relevant companies, and general business model of relevant companies. The policy portion of the course will deliver a basic understanding of the salient policies and issues facing companies in the aforementioned subsectors as well as sector wide headwinds and tailwinds catalyzed by policy. Throughout the course, students will build a financial model, business plan, and present their end deliverable in a shark tank format at the end of the course with observers drawn from the field to provide networking opportunities.

Fall

1 Course Unit

**ENVS 6330 Climate Change and Communication: Theories and Applications**

This course will focus on understanding the multiple ways in which climate science is communicated to publics and how they come to understand it. In the process, we will explore ways to blunt susceptibilities to misconceptions, misconstruals, and deliberate deceptions about climate science. Forms of communication on which the class will focus include consensus statements, manifestos, commentaries, court briefs, news accounts, fact checks, op-eds, letters to the editor, speeches, and media interviews. Students will have the opportunity to interact with guest lecturers, among them leading journalists, climate activists, and climate survey analysts. Students will write letters to the editor and fact checks and will participate in mock interviews designed to increase their understanding of the nature of the interactions between journalists and climate scientists. As a class project, students will collaborate on a white paper on climate discourse fallacies to be distributed at the April 3-7 Society for Environmental Journalists annual convention (hosted by the Annenberg Public Policy Center and the Penn Center for Science, Sustainability, and Media). Students will interview attendees at that conference as part of the class project.

Also Offered As: COMM 6330

Mutually Exclusive: COMM 4330

1 Course Unit

**ENVS 6434 Avifaunal Ecology: Studying ornithological principles & behaviors to indicate ecosystem health**

This class will explore the foundations of avifaunal biology and ecology using a combination of hands-on classroom and in-the-field experiences. Classroom content includes physiology, anatomy, and morphology of birds. The fall migration of birds in North America is an epic and often tragic event. Sampling birds in migration has resulted in foundational understandings about stopover habitats, species-specific energy budgets and has helped realize the complete life cycle of hundreds of species. We will enter the field and participate in actual ornithological research, explore avifaunal ecology through birdwatching, and meet with regional leaders in the ornithological field.

Spring

1 Course Unit

**ENVS 6440 Meaningful Participation: Race, Place and Environmental Justice**

This course will focus on a critical exploration of the social movements and policies related to environmental injustices from a community development perspective. The course includes an overview of the Environmental Justice Movement as an evolution from the Civil Rights Movement as well as an exploration of the political economy of environmental inequalities and uneven development that contribute to urban land use patterns that catalyze a range of environmental injustices. This course will emphasize authentic engagement of frontline communities to address a range of environmental inequalities using urban planning and community based solutions. Exploring a Philadelphia-area organization is a key component in this course.

Not Offered Every Year

1 Course Unit

**ENVS 6450 Environmental Activism: Actors, Approaches, and Outcomes**

From Rachel Carlson to Greta Thunberg – and whether via public blockades or behind-the-scenes boardroom votes – activism has been a driving force of change on environmental issues. This course will offer an overview of environmental activism, including players, strategies and tactics, and impacts. Students will explore various types of activists (e.g., grassroots, NGO, employee, investor) and the relationships between activism aimed at businesses vs. governments. The course will help students understand the historical roots of environmental activism, and what influence current demographics, public opinion, and technology have had, including on recent climate activism. Through case studies, news stories, academic readings, and class discussion, students will learn the various roles activists play, how activism impacts business practices and laws, and many of the ways companies relate to activists. Quizzes, case analyses, and other methods will be used to demonstrate mastery of the material.

1 Course Unit

**ENVS 6520 Sustainable Estuaries: An Investigation of Resources & Recovery**

This course will evaluate the multiple factors that must function to ensure the sustainability of estuaries of national significance. Since the beginning of the environmental movement in the 1960s, we have attempted to protect and improve our watersheds and estuaries through a series of environmental laws, but we learned over the last three decades that regulatory-based "command & control" approaches may have achieved their limits of success, and we now need to think more holistically in order to achieve the Clean Water Act goal of "fishable and swimmable" waters. In this course we will explore the new collaborative strategies and partnerships, which are available, and how social, economic and cultural factors are equally important as regulation to achieve estuary restoration. The National Estuary Program (NEP) was established in 1987 by amendments to the Clean Water Act (Section 320) to identify, restore and protect estuaries along the coasts of the U.S. Unlike traditional regulatory approaches to environmental protection, the NEP targets a broad range of issues and engages local communities in the process. The program focuses not just on improving water quality in an estuary, but on maintaining the integrity of the whole system - its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic. This course will examine the twenty estuaries of national significance, including the Chesapeake and the Delaware Bays, in an effort to define the condition of estuaries in the US and what strategies can be utilized to attain water quality and habitat goals while achieving important socioeconomic needs of the estuary's diverse stakeholders. You will examine the history of estuary management, the factors that stress water quality and habitat, and what strategies are commonly used to reduce risks while safeguarding the environment and public health.

Summer Term

1 Course Unit

**ENVS 6530 Corporate Sustainability Strategies**

Before the year 2000, "environmental management" for a business was typically driven by the need to respond to restrictions imposed by environmental regulation. But, at the dawn of the new millennium, leading businesses began to change their concept of environmental management to look beyond simply meeting governmental dictates. These organizations began to evolve and utilize "environmental strategy" to create new ways of growing their businesses by bringing sustainability to the core of their business strategies. This seismic shift in view was accompanied by a bottom line emphasis that, in some cases, turned sustainability efforts into profit centers. Sustainability increasingly is not hidden within the silo of environmental, health, and safety departments but has become much more seamlessly integrated into the operations of corporate functional disciplines. Today, to effectively work in senior management, an executive needs to be knowledgeable not only about his or her specific business function but also how his or her business will be impacted by governmental regulations, policies, corporate sustainability initiatives, green marketing regulations, industry guidelines or 'best practices', new sustainable technologies, energy planning, environmental performance metrics, and required reporting on the environmental impact of their business unit.

Spring

1 Course Unit

**ENVS 6550 Life Cycle Assessment**

In order to make sensible decisions on products or projects, people need to understand the environmental impacts of these actions. Life cycle assessment (LCA) is a process to assess environmental impacts throughout the different stages of a product or project's life. This seminar is intended to be comprehensive and covers material extraction, processing, manufacture, distribution, use and end of life reuse, recovery or disposal. The objective of conducting an LCA is to compare the full range of environmental impacts that emanate from the provision of these products or services and then use that information to improve the situation to minimize or eliminate harm. The focus of this class will be to understand the phases of an LCA as well as conduct LCAs that compare the impacts of two related options. This course will enable the student to conduct LCAs and examine the use of software that could be used in this regard. The classic examples are cloth vs. disposable diapers, paper vs. ceramic cups, and so on. This course will enable the student to conduct LCAs and examine the use of software that could be used in this regard.

Fall

Prerequisite: ENVS 6500

1 Course Unit

**ENVS 6551 The Principles of Mapping for Environmental Justice**

Environmental Justice (EJ) mapping examines the intersection of environmental burdens and the vulnerable communities disproportionately impacted by their harm. From redlining to the static maps that first showed the correlation between race and waste, and moving through to today's truly dynamic EJ mapping tools, *The Principles of Mapping for Environmental Justice* explores how mapping quite literally put EJ on the environmental movement landscape. This is not a GIS course, nor a course on EJ generally, but an examination into the core components that are inherent to EJ mapping principles. Come explore the indicators and methodologies used by federal, state and local governments and the policy they influence, such as President Biden's Justice40 Initiative.

Not Offered Every Year

Prerequisite: ENVS 6500

1 Course Unit

**ENVS 6555 Gender and Climate Crisis**

The devastating impacts of climate change such as water scarcity, floods, migration, and sea level rise, are not gender neutral. Men and women, boys and girls are affected differently by these crises even though they live in the same household. Women and girls are more likely to face inequality in access to education and jobs, health, and safety with the current approaches to combating climate change. Climate action therefore must be investigated from a gender lens. Long-standing social norms around women providing food and water for their families have increasingly put them at risk of poor physical and mental health, sexual abuse, and lack of formal education. Further, the abuse of younger boys in water-scarce areas often goes undiscussed because of the cultural restrictions and taboos around homosexuality. In recent years, a small number of extraordinary women have emerged as global leaders in tackling the climate crisis. However, generally, women and the LGBTQIA+ community are greatly under-represented in high-level climate negotiations; tend to be disproportionately vulnerable to climate impacts, and climate solutions tend to ignore gender-specific issues perpetuating in a general bias of infrastructure and services not being gender-inclusive. This course will discuss such gender impacts of climate change, gender inclusion in climate-related workplaces, examples of gender empowerment, and ways by which gender-inclusive climate action can be designed.

1 Course Unit

### **ENVS 6570 Introduction to Superfund Sites and Health Effects of Hazardous Waste**

Superfund hazardous waste sites are prevalent in our nation and the exposures to toxicants from these sites raise immediate health concerns. The aims of this course are to educate students about such sites and provide a scientific basis for hazard identification, hazard characterization, risk communication and risk management. The course will describe the effect of these hazardous chemicals on the ecosystem and vice-versa, and remediation and mitigation approaches. These environmental science issues will lead into the environmental health aspects of exposures including: biomonitoring (external and internal dose, biomarkers and the exposome), toxicological properties of contaminants and mode-of-action. The course will be complemented with visits to two Superfund sites in the region: Ambler (asbestos) and Palmerton (heavy metals). Prerequisite: 400 level course in Biology/Chemistry and Biochemistry

Also Offered As: PHRM 6570

1 Course Unit

### **ENVS 6611 Floodplain Management in a Changing Climate**

According to a 2019 paper by Scott A. Kulp and Benjamin H. Strauss, published in Nature Communications, 230 million people worldwide occupy land that is less than 1 meter above current high tide. By 2100, land now home to 200 million people could sit permanently below the high tide line as a result of rising sea levels from heat-trapping pollution from human activities. Add to these coastal challenges the inherent flood risks in riverine and urban settings. How do we prepare and adapt? The class will explore the challenge of floodplain management in a changing climate through lectures, discussions, talks by guest experts, readings and multimedia. Our class will look at the United States National Flood Insurance Program, examine its goals, critique its 50-year plus history and debate reforms to the program at the same time the U.S. Congress is considering long overdue reauthorization of the program. We will look at resiliency efforts that states and local governments are pursuing and the new and evolving city- and state-level position of Chief Resiliency Officer. In class we will cover hazard mitigation planning, land use, hard and natural infrastructure, regulations, the Community Rating System and other issues pertaining to flooding and climate change, including social justice and public health issues. The class will have a field trip to the New Jersey coast to explore high tide flooding and adaptation measures being taken. Throughout the course, material will be introduced to aid the student in taking the Certified Floodplain Manager exam administered by the Association of State Floodplain Managers. This optional test, should the student pass, will provide credentialing that is well recognized throughout the United States and sought by government and the private sectors. While the course is heavily weighted in the United States, students are encouraged to introduce case studies, experiences, comparisons and ultimately consider focusing on countries, regions and locales that are outside the United States for the students Course Project.

Fall  
1 Course Unit

### **ENVS 6620 Global Water Conference in Stockholm, Sweden**

The global water and sanitation crisis kills over 4,000 children each day and represents one of the biggest health problems in the world. At the University of Pennsylvania school year 2010-2011 was declared the "Year of Water" in recognition of the many challenges that lie ahead as global increases in population and affluence and the influences of climate change will stress limited water resources. Each year the Stockholm International Water Institute convenes a Conference with experts from around the globe to exchange the latest water research findings and develop new networks. Students will attend the Conference, present research by presentations/posters, document a key issue, interview experts, and meet colleagues with common interests. They will also help other organizations at the Conference.

Summer Term

1 Course Unit

### **ENVS 6641 Topics in Water Policy**

This course will explore various themes such as the UN Millennium Development Goals, EPA regulatory practices, and global water policy and governance.

Spring

1 Course Unit

### **ENVS 6645 Practical Solutions to Global Climatic Change**

As climate change becomes an increasing threat, nations and organizations across the globe are setting ambitious net zero and environmental, social, and governance (ESG) goals, but how is this accomplished? Through case studies and assessments this class will investigate the leading techniques and practices to reduce carbon emissions and capture and remove carbon dioxide from the atmosphere. Case studies will include examples from agriculture and food; living shorelines, wetlands, and coastal restoration; biodiversity; energy; transportation; land use, and the social aspect (empowering women and girls); bioremediation, and anaerobic digesters vs composting. Relevant climate data will be reviewed, as well as approaches to business practices, economic considerations and legislation that can accelerate addressing climate impacts to our environment.

Spring

1 Course Unit

### **ENVS 6675 Global Supply Chain Decarbonization**

After four generations of explosive global trade growth, a growing awareness of climate change and other environmental externalities has triggered a global movement toward decarbonization, localization and re-shoring. ESG pressure from investors as well as carbon-related taxes, incentives and reporting requirements are driving operations and supply management to go green. However, lowering the carbon profile of global supply chains is a massive undertaking. This class teaches a proven sequence of management decision-making frameworks and optimization tools for eliminating carbon throughout the supply chain. Students will apply logistical and supply management models that integrate carbon objectives with cost, service level, and other conventional supply chain management objectives, making the course valuable for supply chain professionals and students alike. The combination of academic constructs and real-life case studies is designed to equip students to successfully lead their companies' decarbonization programs. It also prepares students to take the optional REVchain™ supply chain decarbonization certificate exam.

Spring

1 Course Unit

**ENVS 6680 ESG Integration in Business Practices**

This course will provide students with a comprehensive understanding of Environmental, Social, and Governance (ESG) principles and their significance in business practices. Students will explore the intersection of sustainability and financial performance by examining the frameworks, metrics, and strategies used to assess and integrate ESG factors into business strategies. This course will equip graduate students with the essential knowledge, analytical tools, and practical insights needed to navigate the dynamic landscape of ESG principles and sustainable business practices. By integrating theoretical foundations with real-world applications, students will be empowered to drive positive change and create value for businesses, investors, and society at large.

Fall

1 Course Unit

**ENVS 6810 Environmental Enforcement**

The goal of the course is to provide students with an introduction to the role of enforcement in federal, state and local environmental regulatory programs. Emphasis will be placed on federal enforcement actions initiated by the U.S. Environmental Protection Agency and U.S. Department of Justice. The course will provide students with an introduction to the American Legal System and legal concepts, like standing, jurisdiction, and burden of proof. A number of case studies and classroom exercises will be utilized as part of the discussion of civil and criminal enforcement actions. For example, a detailed case study will be presented concerning a successful prosecution by the federal government of a wastewater treatment plant operator (from the receipt of the initial tip through the sentencing of the defendant). A theme of all classes, presentations and assignments will be the role of the environmental professional in the enforcement context (e.g., the environmental professional who testifies as an expert in a judicial proceeding, or performs an audit that becomes the subject of a self-disclosure to EPA).

Fall

1 Course Unit

**ENVS 6820 The US Water Industry in the 21st Century**

This course is taught by the former Philadelphia Water Commissioner, the CEO of a \$1 billion water, wastewater and stormwater utility. The objective of the course is to expose the student to the inner workings and management of the US water industry and the transformation of this industry to a 21st-century sustainable utility model. Influences from new technologies and aging infrastructure, acceptable levels of risk, public and private sector competition, climate change, the bottled water industry, resource recovery, rates and affordability and other issues will be investigated. The context of the class discussions will center on how politics, vision and leadership are used to create and implement change in a traditional utility structure. The role of environmentalism, infrastructure financing, water/wastewater treatment facility operations, public affairs and media, and designing a capital improvement program are examples of other topic areas.

Fall

1 Course Unit

**ENVS 6825 Urban Water Policies and Practices for a Changing Climate**

Can we successfully adapt our urban water systems to meet the growing challenges of flood, drought, water contamination, heat/fires, extreme weather and sea level rise? How do we make our cities resilient and our communities sustainable, even in the face of these threats? When does change begin? How does it happen? Our urban water systems and their watersheds are already severely challenged. We will explore the human right to water and sanitation on a local and a global scale through a review of (1) water policies, practices and law; (2) technology; (3) governance and funding; and (4) land use (think green/blue infrastructure and "nature-based" solutions). Among many the many topics to be examined, we will study (1) how leadership, technology and politics were essential to achieving change through an analysis of Philadelphia's Green City Clean Waters program; (2) how we make potable water from wastewater palatable to the public, (3) how to manage PFAS in the environment, the drinking water, the land disposal of biosolids, and in communicating its risk to the public; and (4) make ESG, GHG emissions, energy independence and 100% water recycling/reuse integral to the water industry culture and operations.

Spring

1 Course Unit

**ENVS 6830 Sustainable Resource Recovery from Wastes**

This qualitative course will introduce students to sustainable waste management for resource recovery. We are a consumer-driven planet; the use of fossil fuels, mining for virgin materials, irresponsible water utilization, and relentless waste generation have only been degrading our planet at an alarming rate. Technology and policy innovations can help avoid extracting virgin materials and growing feedstock crops for industrial production and instead make use of waste feedstocks. Waste materials such as food waste, plastics, and electronic wastes are rich in energy and critical minerals which can be harnessed to achieve a lower environmental impact and greater socio-economic benefits. The goal of sustainable waste management for resource recovery is to keep materials in use as long as possible by taking a multiple 'R' approach-Reuse, Reduce, Recycle, Renew, Repair, Refurbish, Remanufacture, Recover, Repurpose, and Regulate.

Not Offered Every Year

1 Course Unit

**ENVS 6840 Energy, Waste and the Environment**

The aim of this course is to provide an incentive to use geochemical and mineralogical principles to address and solve major environmental problems. The students identify the problems that are associated with different types of waste. This course covers a wide range of problems associated with the waste arising from the generation of electricity. The main topics will be the uranium cycle, characterization of nuclear waste, and the containment and disposal of nuclear waste. Based on insights from the nuclear fuel cycle, solutions are presented that diminish the environmental impacts of coal and biomass combustion products, incineration of municipal solid waste, toxic waste due to refuse incineration, and landfills and landfill gases.

Spring

1 Course Unit

**ENVS 6860 Resiliency, Health & Built Environment**

Overnight field trips required Aug 20-21, 2020 and Aug 24-25, 2020. Additional fees apply. Healthy resilient communities are successful outcomes of built places. This course is designed for MES students to build area expertise through lectures, on-site visits and real time simulations. Students will travel to New York City and Washington DC to learn about these topics and observe current practices first hand. Through the design and synthesis of place, including educational and health facilities, and the workplace, the class will investigate the impact of Social Determinants of Health and sustainability. They will also integrate resiliency planning to address impacts of sea level rise, severe heat and different climate and environmental conditions affecting the built environment. Course work covers design and planning theory that intersects with diseases, mental health, climate action and their interconnectivity. Case studies, seminars and tours of projects and health departments will bring to focus how the built environment can be a culprit and a solution.

1 Course Unit

**ENVS 6870 City Sustainability Policies: Building Performance, Energy, and Carbon**

In Philadelphia, buildings account for nearly 70% of carbon emissions. What policies could be put in place to reduce these emissions? What can be learned from other U.S. cities? In this course, students will review climate action plans and building energy policies in four cities (Philadelphia, Boston, New York, Seattle), conduct research on the impact of Federal legislation, as well as current and future policies including the recent adoption of building performance standards across the nation. Students will work in groups to deep dive into these policies and hear from subject practitioners to formulate building policy suggestions focusing on the process of policy development, energy conservation, renewable energy generation, and greenhouse gas reduction.

1 Course Unit

**ENVS 6880 Risk Assessment: Science & Policy Challenges**

How do government policy-makers make decisions about potential threats to human health and the environment in the face of scientific uncertainty? The course develops the concept of Risk Assessment from the publication of the 1983 National Research Council (NRC) report commonly known as the "Red Book" which was used to rank the initial hazardous waste sites under the Superfund program. Using a variety of teaching tools, including lectures, panel discussions, and case studies, the course examines how public policy decisions regarding environmental risk are made and how effective those decisions are at reducing risks to affected populations. The course focuses on the complex interaction of science, economics, politics, laws, and regulations in dealing with environmental and public health risks. The course will begin with a review of the policy process and methods used in evaluating human health and environmental risks, including the traditional steps in the risk assessment process, including quantitative and qualitative aspects of hazard identification, dose-response assessment, exposure assessment, and risk characterization. The course will then focus on how scientific uncertainty, risk perceptions, socio-economic disparities, risk communication, and politics influence environmental risk-based decision-making. Issues such as special populations (e.g., children, elderly, immune-compromised, woman of pregnancy age, etc.) must be considered when developing risk reduction strategies. The use of the "precautionary principle" will be discussed in the context of different types of environmental stressors (e.g., pesticides, chemicals, climate change, air pollution, water quality, and land use) and how this important controversial principle is applied differently in contrasting national and European risk management policies.

Summer Term

1 Course Unit

**ENVS 6881 Topics Course in Resilience and Adaptation**

This is a topics course exploring current issues in resilience and adaptation.

Not Offered Every Year

1 Course Unit

**ENVS 6885 Fundamentals of Climate Action Planning for Cities**

Many cities around the world, both large and small, have created climate action plans over the past few years. This course will outline aspects of the planning process including: decision factors for creating a plan, resourcing, outreach, communications, data and tracking, and execution. Students will leave the course with a clear understanding of how city level climate plans come together and are executed.

Fall

1 Course Unit

**ENVS 6998 Masters of Environmental Studies Capstone Seminar**

This course is designed to help students successfully complete their MES Capstone. A set of milestones will be set and regular meetings will be held in groups and individually to aid the student as they complete the research portion of their degree. We will be working together to complete a series of steps towards the final project. These steps fall into five major areas 1) Reviewing the literature; 2) Finding a model; 3) Framing your research; 4) managing data; and 5) Writing your results. Throughout the semester, we will also discuss career goals and the job search.

Spring

1 Course Unit

**ENVS 9999 Independent Study**

Directed study for individuals or small groups under supervision of a faculty member.

Fall or Spring

1-2 Course Units