ENVIRONMENTAL SCIENCE (ENVS)

Discover, search, courses (https://catalog.luc.edu/course-search/)!

ENVS 101 The Scientific Basis of Environmental Issues (3 Credit Hours)
The foundational course in science is predicated on the view that understanding environmental issues and their underlying scientific principles will occupy a central role in our students' lives and will be critical in their development as informed and participating members of society. The overarching strategy of the course will be to frame environmental science in terms of a series of interacting systems to allow students to analyze a variety of environmental issues. This is a foundational Tier I class; it is prerequisite to all Tier II science core classes.
Knowledge Area: Foundational Scientific Knowledge
Course equivalencies: ENVS137/UCSF137/ENVS101
Outcomes:
1) Exhibit knowledge of the nature of the four Earth systems; 2) Draw inferences from evidence, constructing testable and falsifiable hypotheses and analyzing data; 3) Understand the role of energy and thermodynamics in ecosystems; 4) Understand and describe important cycles in nature

ENVS 137 Foundations of Environmental Science I (3 Credit Hours)
Pre-requisites: Restricted to Majors and Minors in the School of Environmental Sustainability
This course will introduce concepts that form the basis of environmental science, including elemental cycling, energy flow/transformation, and the interconnectivity among atmosphere, lithosphere, hydrosphere and biosphere, and within ecosystems. Ways in which knowledge of these concepts informs policy, management and social perception to produce positive change will also be examined.
Course equivalencies: ENVS137/UCSF137/ENVS101
Outcomes:
Recognize interconnections among scientific disciplines and how their principles are used to investigate and address environmental issues; understand physical, chemical and ecological principles underlying environmental science and how these interact

ENVS 200 Environmental Careers and Professional Skills (1 Credit Hour)
Pre-requisites: ENVS 101 or ENVS 137; Restricted to Majors and Minors in the School of Environmental Sustainability
Introduction to environmental professions and determining skills and individual traits best suited for professions in policy, science, business, community organizing, etc. Begin developing a professional network.
Outcomes:
Select appropriate internships, curriculum, projects to enhance knowledge, skills and experience; develop job hunting and communication skills specific to environmental fields, including resumes, cover letters, presentations

ENVS 203 Environmental Statistics (3 Credit Hours)
Pre-requisites: Restricted to Majors and Minors in the School of Environmental Sustainability
This course introduces basic statistics from probability through multiple regression, employing computer programs with ecological, environmental, and relevant social science examples and data sets.
Outcomes:
Programming/spreadsheet skills; data structure practices and diagnosis; data visualization; appropriate test selection; test execution and interpretation; introduction to qualitative data analysis

ENVS 204 Gender, Health & Environment (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
Exploration of connections between social justice and environmental health using scientific tools of analysis. Focus on experiences of those at intersection of marginalized social locations. Issues include impacts of modern disposable culture and how socially constructed gender roles affect exposure to environmental health risks while biological sex shapes their impacts.
Interdisciplinary Option: Bioethics
Outcomes:
Understanding the web of causality (relationships among scientific, medical, ecological, cultural, behavioral, economic, political, and ethical dimensions) of environmental health problems and how to ameliorate the disproportionate burden of risk

ENVS 207 Plants and Civilization (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
Examines the structure, function, ecology, and diversity of plants, their importance to human civilization, and the impact of societal decisions regarding their use and exploitation.
Knowledge Area: Tier 2 Scientific Knowledge
Interdisciplinary Option: Bioethics, Urban Studies
Outcomes:
Students will demonstrate an understanding of the critical role of plants in the biosphere, their physiological processes, adaptations for specialization, and linkages to humans including agriculture, pest control, and extraction/use of plant-derived products

ENVS 215 Ornithology (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
An introduction to the biology of birds including the topics of anatomy, physiology, behavior, ecology, and evolution. Includes some field trips to learn how to identify species and to collect behavioral information.
Course equivalencies: BIOL 215/ENVS 215
Outcomes:
Students will demonstrate an understanding of the biology of birds and be able to identify some of the commoner species of birds in our area

ENVS 218 Biodiversity & Biogeography (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
This course covers the creation and maintenance of biodiversity across taxonomic, temporal and spatial scales. It will provide an overview of the history of biogeography, increase understanding of the evolutionary processes that create biodiversity, the influence of biodiversity on ecosystem services, and the rapid biodiversity loss resulting from human actions.
Knowledge Area: Tier 2 Scientific Knowledge
Interdisciplinary Option: Bioethics, Urban Studies
Outcomes:
Students will gain knowledge of and appreciation for the biodiversity of life, its formation through the process of evolution, and the importance of biodiversity to ecosystem function and human welfare

ENVS 223 Soil Ecology (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
This course introduces the properties, functions, and conservation of soil. Topics include belowground ecosystem services, soil biodiversity, biogeochemical cycles, and conservation, human impacts to soils, and the socioeconomic implications of soil degradation. Lectures, laboratory/field soil testing, field trips, and presentations by experts in sustainable soil management are employed.
Knowledge Area: Tier 2 Scientific Knowledge
Interdisciplinary Option: Bioethics, Urban Studies
Outcomes:
Students will understand the properties, functions and methods of conservation/remediation of soils, learn how human activities affect soils and associated socioeconomic consequences, and develop analytical skills to assess soil health

ENVS 224 Climate & Climate Change (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
This course introduces students to basic principles and knowledge to explain climate change. Students will learn about natural and anthropogenic causes of climate change, the interactions between earth-atmosphere-ocean systems, climate feedback mechanisms, and impacts of climate change on the natural physical environment.
Knowledge Area: Tier 2 Scientific Knowledge
Interdisciplinary Option: Bioethics, Urban Studies
Outcomes:
Students will develop cognitive and mathematical skills to draw valid, logical conclusions regarding various observed phenomena such as observed changes in the climate system and observed impacts of climate change

ENVS 226 Science & Conservation of Freshwater Ecosystems (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
Freshwater ecosystems are threatened by water extraction, pollution, invasive species, and many other pressures. This course covers physical, chemical, and biological processes in freshwaters, and the benefits that humans derive from these ecosystems. Major issues for conservation will be covered at global and Great Lakes scales.
Interdisciplinary Option: Bioethics, Urban Studies
Outcomes:
Students will gain understanding of different types of freshwater ecosystems, their functioning and importance for human societies, and the range of pressures they currently face

ENVS 227R Ecology of the Mediterranean Sea (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
This course examines the ecology of the Mediterranean Sea and how human activity has shaped the present-day ecosystem. Students will learn fundamental ecological concepts including ecosystem functioning, energy flow, matter transformation, and elemental cycles and the human impacts on the Mediterranean environment, including discussion of impact reduction and remediation.
Knowledge Area: Tier 2 Scientific Knowledge
Interdisciplinary Option: Italian Studies
Outcomes:
Students will gain understanding of ecological processes/interconnections within the Mediterranean Sea ecosystem, of historical & current human-induced changes therein

ENVS 230 Feeding the Planet: Global Perspectives on Sustainability, Culture and Food (3 Credit Hours)
Cross-cultural policies, practices, and beliefs about the production, preparation, consumption, and distribution of food vary widely. This course examines food in historical, political, social, and cultural contexts around the globe. It is divided into four sections that require students to apply concepts in food studies to international case studies and global examples: Cross-Cultural & Global Perspectives on Food; Culture, Identity, and Food; The Political Economy of Food; and Social, Cultural, Political, and Economic Responses to Hunger. Course topics include subsistence patterns and cultural patterns of food preparation and consumption; cultural practices involving food preferences and taboos; the globalization of foods and cuisines; labor practices in industrial agriculture; alternative economies of food; global policies and practices developed to eliminate hunger and malnutrition; the use/misuse of global food aid, and others.
Outcomes:
Explain the rationales of cross-cultural beliefs and practices of our own and others' foodways; Apply interdisciplinary perspectives to analyze the historical, cultural, and political roots of social phenomena and world problems involving food and society; Assess various dimensions of the forms and mechanisms of oppression, discrimination, or privilege in global and local food systems; Investigate coalitions and key ideas, past and present, which address and advocate for economic and social justice in the food system

ENVS 237 Foundations of Environmental Chemistry (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; Restricted to BA majors in the School of Environmental Sustainability
This course is the second in a three-course sequence required of all ENVS BA majors. These courses provide the basic scientific grounding needed to intelligently discuss environmental issues and to prepare students for more advanced study on the environment. ENVS 237 focuses on the physical and chemical science needed to understand environmental processes. Students will build their quantitative skills in evaluating energy and chemical transactions that impact our environment.
The course will also work on building skills in interpreting scientific information, including using academic peer-reviewed journal articles.
Outcomes:
Be able to quantitatively assess environmental systems and anthropogenic processes that impact the environment; Gain understanding of the physical and chemical processes of environmental systems to be able to describe global climate dynamics, chemical reactions that contribute to environmental issues, the energetics of different energy sources, and technological aspects of alternative energy sources; Appreciate the importance of chemistry and physics as applied to different environmental issues and used by different environmental fields

ENVS 238 Foundations of Environmental Science Lab (1 Credit Hour)
Pre-requisites: ENVS 237 (pre- or co-requisite); Restricted to BA majors in the School of Environmental Sustainability
A lab course designed to be associated with ENVS 237, this course is designed to introduce all ENVS majors to lab safety, basic lab techniques such as use of balances and microscopes, data analysis, and the application of these techniques to the study of environmental science.
Outcomes:
Students will understand and demonstrate safe lab practices and learn to use basic lab equipment to take and analyze environmental science data

ENVS 260 Environmental Journalism (3 Credit Hours)
Pre-requisites: Department Consent Required
The mission of environmental journalism is to raise public awareness about environmental news and issues. It is about being ethical, accurate, fair, and clear, whether reporting, investigating, or advocating for change.
Course equivalencies: X-ENVS 260/ COMM 260
Outcomes:
Students will be able to find, report, and present challenging stories around this topic, in print and in broadcast writing

ENVS 267 Bird Conservation and Ecology (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 102
This engaged-learning course provides an introduction to the theory and practice of avian conservation, ecology and management. Field trips for viewing birds in the wild, observing behavior and collecting data on habitat assessments are highlighted. Students participate in a community service project to gather data for avian conservation and management
Course equivalencies: X-ENVS 267/BIOL 347
Outcomes:
Students will become skilled in critical reasoning and some bird monitoring techniques, and demonstrate an understanding of the many facets of bird conservation

ENVS 273 Energy and the Environment (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
The concept of energy developed from antiquity through the present day and applied to national and worldwide energy use patterns, the technologies supporting their use, as well as the societal impact and environmental consequences of energy usage.
Interdisciplinary Option: Bioethics, Peace, Justice, and Conflict Studies
This course satisfies the Engaged Learning requirement.
Outcomes:
Students will become skilled in critical reasoning and methods of inquiry, demonstrate an understanding of critical concepts and knowledge: heat and energy, the laws of thermodynamics, and current and future technologies and their impact

ENVS 274 Chemistry of the Natural Environment (3 Credit Hours)
Pre-requisites: ENVS 137, MATH 118 and CHEM 160; Restricted to Majors and Minors in the School of Environmental Sustainability
Environmental Chemistry is the study of how materials move through the environment and interact within different environmental systems, including the atmosphere, hydrosphere, lithosphere, and biosphere. In this course, we will use this approach to better understand the chemical and physical reactions taking place and their equilibrium in the natural environment on Earth. The course will investigate these chemical and physical interactions in the three unique environmental compartments of the atmosphere, hydrosphere, and the soil environment, where the lithosphere and biosphere overlap, as we learn more about the materials and reactions that make up the natural environment. Students will utilize problem solving to explore the materials and reactions of the major compartments.
Interdisciplinary Option: Bioethics
Outcomes:
Apply key equations, concepts, and physical laws relevant to environmental chemistry to analyze how materials move through the environment between different environmental compartments (atmosphere, hydrosphere, lithosphere, biosphere); Quantitatively assess materials in air, water, soil, and cells across a range of scales appropriate in environmental science, from the microscopic to the global range; Describe underlying ecosystem functions that establish the chemistry of natural waters, air, and soil

ENVS 275 Chemistry of the Environment Lab (1 Credit Hour)
Pre-requisites: ENVS 280 and (CHEM 112 or CHEM 181); ENVS 274 as pre- or co-requisite; Restricted to Majors and Minors in the School of Environmental Sustainability
Basic techniques for chemical analysis of environmental samples, including air, water and soil. Learn to use electronic data acquisition systems and further develop scientific writing skills.
Outcomes:
Plan experiments, develop good lab techniques, conduct accurate chemical analyses on environmental samples, interpret chemical data, short and long reports describing work and interpreting significance of results

ENVS 276 Chemistry of Environmental Pollution (3 Credit Hours)
Pre-requisites: ENVS 137, CHEM 160, MATH 118, and SES Major
Environmental Chemistry is the study of how materials move through the environment and interact within different environmental systems, including the atmosphere, hydrosphere, lithosphere, and biosphere. In this course, we will use this approach to better understand the chemical and physical reactions that influence the transport and fate of chemical pollutants in our environment. This course will identify major sources of environmental pollutants and technologies for source pollution control as well as understanding how pollutants move through the environment to potentially impact ecosystems and human health. The course will cover pollutants in all environmental compartments including air pollution from combustion sources, water quality issues and water treatment, and soil pollutants with a focus on agrochemicals and their impact on both soil environments and groundwater.
Outcomes:
Apply key equations, concepts, and physical laws relevant to environmental chemistry to analyze how pollutants move through and between different environmental compartments (atmosphere, hydrosphere, lithosphere, biosphere); Describe underlying chemistry of technologies and policies that would address key sources of major pollutants; Be able to utilize physical chemical properties of pollutants as a tool for assessing their persistence and potential to do harm in natural ecosystems

ENVS 278 Hydrology (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
Study of processes which cycle water between oceans, atmosphere, and land surface. This course examines precipitation, evaporation, infiltration, transpiration, groundwater and surface water flow. Understanding these processes is fundamental to managing our resources in the face of mounting environmental challenges and natural resource pressures.
Outcomes:
Understanding of key physical processes and multidirectional complex interactions between different components of the water cycle; ability to apply fundamental equations of conservation to quantify flows

ENVS 279 Climate and History (3 Credit Hours)
Pre-requisites: Department Consent Required
Explores the role of climate in history, from the emergence of homo sapiens to recent anthropogenic climate change. Major topics include the social impact of climate variability, sources of resilience, origins of scientific knowledge, and the use of historical knowledge in the present.
Course equivalencies: X-HIST279E/ ENVS279
Outcomes:
Students will analyze examples of climate shaping history, learn different ways that scholars have treated this relationship, and reflect on how this knowledge might be useful today

ENVS 280 Principles of Ecology (3 Credit Hours)
Pre-requisites: (ENVS 101 or ENVS 137) and (ENVS 237 or CHEM 101 or CHEM 160); Restricted to Majors and Minors in the School of Environmental Sustainability
The purpose of this course is to foster an in-depth understanding of ecology, the study of relationships between organisms and the environment at organizational scales ranging from genes, individuals, and populations to communities, ecosystems, and landscapes. Topics include population dynamics, species interactions, community dynamics, food webs, ecosystem functions, and landscape ecology with a strong emphasis on scientific inquiry and data interpretation.
Interdisciplinary Option: Bioethics
Outcomes:
Students will understand key concepts and principles concerning ecological processes in nature at the gene, individual, population, community, ecosystem and landscape scales and apply knowledge of ecological concepts to current environmental challenges

ENVS 283 Environmental Sustainability (3 Credit Hours)
Pre-requisites: ENVS 101 or equivalent; please check requirements for declared majors/minors for exceptions
Examines the impact of humans as consumers on the environment and how these interactions affect the probability of establishing sustainability for human and non-humans on Earth.
Interdisciplinary Option: Bioethics, Urban Studies
This course satisfies the Engaged Learning requirement.
Outcomes:
Students will become skilled in critical reasoning and methods of inquiry, and demonstrate an understanding of knowledge critical to the field including current human consumptive practices and their effects on the health and well-being of living organisms

ENVS 284 Environmental Justice (3 Credit Hours)
This course examines how policy interacts with race and class to affect differentially people's access to a clean, safe, productive environment; Reviews history of the environmental justice movement, and community, policy, and legal responses; Develops students' ability to work across diverse social groups to advance environmental justice and sustainability.
Interdisciplinary Option: Bioethics
Outcomes:
Students will understand forces that have led to people of different race and class being differentially affected by environmental benefits, and the burdens and strategies for addressing environmental injustices

ENVS 285 Eco-spirituality (3 Credit Hours)
Eco-spirituality is an emerging field in ecology, conservation, and religion that recognizes the spiritual component of environmentalism and Earth stewardship. This course explores how ecological efforts are enhanced by including a spiritual dimension and spirituality and religion must include awareness and engagement with ecology and ecological issues.
Outcomes:
1) Draw connections between ecology, spirituality, and Loyola¿s mission; 2) Implement tools and practices that foster personal awareness and reflection; 3) Demonstrate how reflection leads to necessary action

ENVS 286 Principles of Ecology Lab (1 Credit Hour)
Pre-requisites: ENVS 203 and (ENVS 238 or CHEM 111 or CHEM 161) and ENVS 280 (pre- or co-requisite); Restricted to BA Majors in the School of Environmental Sustainability
This course will allow students to develop experience and skills employed in ecological studies, with an emphasis on field work, laboratory analysis, and hypothesis testing. Topics for lab exercises will correspond closely with material from Ecology (ENVS 280) lecture. Course does not satisfy requirements for BIOL major.
Outcomes:
Students will understand basic ecological principles, apply these to design experiments, develop skills in data analysis and interpretation, and learn techniques used to characterize ecosystem properties and human environmental impacts

ENVS 286S Principles of Ecology Lab (1 Credit Hour)
Pre-requisites: ENVS 203 and (CHEM 111 or CHEM 161) and ENVS 280 (pre- or co-requisite); Restricted to BS Majors in the School of Environmental Sustainability
Course content includes lab skills and analytical techniques commonly employed in ecological studies; emphasizes sampling, research design, field work, laboratory technique, data analysis, project development, hypothesis testing, and scientific report writing.
Outcomes:
Understand ecological principles, apply knowledge to ecological experiments, observational studies, and entry-level mathematical models; assess biotic responses to the abiotic environment and to anthropogenic impacts

ENVS 288 Applied Interdisciplinary Data Analysis (3 Credit Hours)
Pre-requisites: (ENVS 280 or BIOL 265) and (STAT 103 or STAT 203)
Restricted to students in SES majors. This course teaches students to approach environmental problem-solving from a systems perspective by understanding the complex adaptive nature of socio-ecological. It introduces analytic techniques used in the natural/social sciences, and provides opportunity to analyze and connect data from various disciplines (e.g., ecology, economics, sociology) to address pressing environmental concerns.
Outcomes:
Students will be able to describe characteristics of complex adaptive systems, become familiar with analytical approaches suited to different sub-disciplines, and apply numerous analytical techniques to real data sets

ENVS 297 North American Environmental History (3 Credit Hours)
Pre-requisites: Department Consent Required
This course surveys the environment and environmentalism in United States history, from the transformation of New England into a farm ecology, the expansion of the cotton South, the settlement of the West, to the rise of industrial cities, suburban sprawl, and the globalization of the economy.
Course equivalencies: X-ENVS297/HIST297E
Outcomes:
Students will be able to demonstrate historical knowledge of environmental thought and ecological science, to draw links between environmental concerns and public policies, and to develop critical thinking and communication skills

ENVS 298 Special Topics (1-12 Credit Hours)
Specific titles and contents vary from semester to semester. Variable credit hours.

ENVS 298L Special Topics with Lab (1-4 Credit Hours)
Specific titles and contents vary from semester to semester. Includes lab component.

ENVS 300 Introduction to Public Health (3 Credit Hours)
Pre-requisites: Restricted to Majors and Minors in the School of Environmental Sustainability; Junior or Senior Standing; Department Consent Required
Public health is the science of preventing disease and protecting and promoting the health of populations and communities. Through interactive exercises and application of concepts, this course considers its history; ethical principles; scientific foundation and tools; biomedical bases; socioeconomic and behavioral factors; environmental issues; and relationship to medical care.
Course equivalencies: X -PUBH 300/ ENVS 300
Outcomes:
Describe the history, core concepts, functions, and methods of public health; Define health disparities and explain how they are produced; Synthesize public health information and communicate it effectively

ENVS 301 Environmental Health (3 Credit Hours)
Pre-requisites: Restricted to Majors and Minors in the School of Environmental Sustainability; Junior or Senior Standing; Department Consent Required
This course is designed as an introduction to the field of environmental health, including regulations, research, disease prevention, and advocacy.
Interdisciplinary Option: Bioethics
Course equivalencies: X-ENVS301/PUBH301/MBPH401
Outcomes:
Students will be able to outline approaches for assessing and controlling environmental hazards that affect community health and discuss major local, national, and global health challenges

ENVS 303 Introduction to Epidemiology (3 Credit Hours)
Pre-requisites: Restricted to Majors and Minors in the School of Environmental Sustainability; Junior or Senior Standing; Department Consent Required
Epidemiology is the study of the distribution and determinants of disease in populations and remains the basic science of public health. This methodology is unique to epidemiology, and in some cases, has even been appropriated by other fields. The objective of this course is to familiarize students with the range of tools used to conduct epidemiologic analysis, including design and measures of association. This course will be taught as an online course combined with an intensive interactive session with faculty and students one weekend in Spring.
Course equivalencies: X- PUBH 303/ENVS 303/MPBH 403

ENVS 310 Introduction to Environmental Law & Policy (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137
This introduction to environmental law surveys some critical federal environmental statutes, rules, and regulations in the United States; important case law decided under those statutes; interaction between federal, state, and local jurisdictions; and impacts on air, land, water, and natural resources.
Outcomes:
Understands how the natural environment is controlled, managed and promoted through the legal system

ENVS 311 Natural Resources and Land Use Law & Policy (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; and ENVS 310 (recommended)
Focus on legal and policy processes used to govern pollution, water use, endangered species, toxic substances, and environmental impact and risk.
Outcomes:
Students will understand how the natural environment is controlled, managed and promoted through the legal system and how land use laws and policy impact social and economic issues

ENVS 312 Water Law & Policy (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; and ENVS 310 (recommended)
This course looks at how the law allocates and protects one of our most crucial natural resources -- water. Understanding development and regulation of water ownership and use and how those decisions impact current environmental and socio-economic issues.
Outcomes:
Understand how key laws and policies impact protection and use of water in the United States; understand key legal concepts that shape the management of our water resources

ENVS 313 Energy Law & Policy (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; and ENVS 310 (recommended)
This course looks at the laws that shape traditional energy production and the growing regulation of renewable and sustainable energy.
Outcomes:
Understand how key laws and policies impact production and use of energy; and how energy is controlled by federal and local regulations and policies

ENVS 316 Energy and Power Systems (3 Credit Hours)
Pre-requisites: Junior or Senior standing; MATH 118
This course introduces the fundamental concepts of energy and power systems, covering essential principles, grid components, and generation technologies through a multidisciplinary lens. Students will explore current and future challenges in energy systems by applying mathematical tools, software, and programming to analyze the topics covered.
Outcomes:
Comprehend Basic Energy and Electrical Concepts: Explain the fundamental principles of electricity, energy, power, voltage, current, and resistance; Differential Generation Technologies: Compare and contrast conventional and renewable generation technologies, and assess their environmental, economic, and social impacts; Understand Grid Operations: Explain the basics of power flow analysis, load balancing, and grid operation; Analyze Energy Markets and Pricing: Discuss how electricity markets function, how electricity is priced, and how the grid is managed; Assess Further Grid Challenges: Evaluate the challenges of integrating renewable energy sources, managing load shifting, and electrifying other sectors, while considering social and equity implications; Apply Long-Term Grid Planning Tools: Identify and apply tools and methodologies used in generation expansion planning, and assess strategic considerations for achieving long-term goals in energy systems

ENVS 320 Conservation Biology (3 Credit Hours)
Pre-requisites: ENVS 280 and ENVS 286/s; or BIOL 265 and 266
Students will learn to apply ecological and evolutionary biological principles to the preservation of wild plant/animal species, and to the preservation/management of ecosystems. Conservation approaches and challenges for all types of ecosystems, will be covered, with emphasis on contemporary threats to biodiversity, including habitat fragmentation, invasive species, and climate change.
Outcomes:
Students will understand how the science of ecology can be used to address issues in species/ecosystem conservation, and recognize that consideration of human actions is essential to address conservation problems

ENVS 321 Conservation Biology Lab (1 Credit Hour)
Pre-requisites: ENVS 280 and ENVS 286/s; or BIOL 265 and 266; and ENVS 320 (pre- or co-requisite)
Students will apply principles learned in ENVS 320 to conservation problems in the Chicago region and elsewhere, through visits to conservation sites and discuss concerns/initiatives with land managers and policy makers. They will develop skills in species identification, ecosystem delineation and description, and the use of field equipment and methods.
Outcomes:
This course will provide practical field and lab experience in population, community and ecosystem conservation; Students will learn how the principles of Conservation Biology are applied, and the associated challenges

ENVS 322 Invasive Species (3 Credit Hours)
Pre-requisites: ENVS 280 or BIOL 265
Invasive species are one of the greatest global threats to biodiversity, ecosystem function, economies, and human health. Species become invasive when moved beyond native range, become established, and cause harm. This course covers how species are moved, how and when they become established, and potential harm they can cause.
Outcomes:
Understanding that because invasive species are moved by humans, and because many of their impacts are felt by humans, they are an inherently multi-disciplinary problem

ENVS 323 Environmental Microbiology (3 Credit Hours)
Pre-requisites: BIOL 101, BIOL 102, CHEM 101, and (CHEM 102 or ENVS 274)
This course introduces the significant role of microorganisms in numerous environmental and human-engineered processes. It covers microbiology and its basic methods to orient students to this field of science and the importance of microbial diversity relevant to agriculture, public health, and ecological restoration.
This course satisfies the Engaged Learning requirement.
Course equivalencies: ENVS 323/ENVS 423
Outcomes:
Students will learn to isolate and characterize environmental microorganisms; Students will investigate the role of microorganisms in nutrient cycling, remediation of soils, and transmission of existing and emerging pathogens

ENVS 324 Climate Science (3 Credit Hours)
Pre-requisites: ENVS 224 and MATH 118
The focus of this course is Earth's climate system, including the role of the atmosphere, ocean, cryosphere and land-atmosphere interaction. This course digs deeper into the physical principles underlying climate processes, energy balance, feedback mechanisms, climate variability and climate dynamics, including large-scale atmospheric and ocean circulation. This course will discuss recent climate change, and projections for future climate scenarios. Students will have hands-on experience with practicing climate modelling tools, analyzing climate data, and exploring current research in climate science. Thus, this course will involve quantitative analysis and will reinforce students' reading, writing, and public-speaking skills through the class project on climate change.
Outcomes:
Understand Earth's Climate Systems: Students will gain an in-depth understanding of Earth's climate system, including the atmosphere, ocean, cryosphere, and land-atmosphere interactions, as well as the physical principles underlying climate processes such as energy balance, feedback mechanisms, and climate variability; Develop Quantitative Analysis Skills: Students will engage in quantitative analysis through climate modeling tools and data interpretation, enabling them to critically analyze climate data and understand large-scale climate dynamics like atmospheric and ocean circulation; Evaluate Climate Change Impacts and Projections: Students will explore recent scientific developments in climate change, assess current climate change impacts, and understand projections for future climate scenarios, preparing them to engage in informed discussions and decision-making related to climate policy and research; Enhance Communication and Research Skills: Through scientific paper reviews and presentations, students will enhance their ability to critically evaluate research, improve their public-speaking skills, and effectively communicate scientific findings to peers, fostering collaboration and scientific literacy

ENVS 325 Sustainable Agriculture (3 Credit Hours)
Pre-requisites: ENVS 280 or BIOL 265
This course provides an introduction to the environmental, social, and economic implications of sustainable agriculture. Students will learn the origins, major concepts, and current issues of sustainability in agriculture. Ecological concepts and principles applied to manage sustainable food production to support community health and economic justice will be explored.
Outcomes:
Students will be able to explain the characteristics of the US agricultural system, the inter-relation among components of sustainable agriculture, and steps necessary to develop a sustainable agricultural system

ENVS 326 Agroecosystems (3 Credit Hours)
Pre-requisites: ENVS 280 and ENVS 286/s; or BIOL 265 and 266; and ENVS 223 (recommended)
In this hands-on course, students will build knowledge and skills in agriculture and ecology through work in greenhouse, laboratory, classroom, and field settings. Students will build on foundations of Environmental Science and Biology by examining challenges of food production, management decisions, and environmental change facing agroecosystems both locally and abroad.
Outcomes:
Students will develop understanding of agricultural systems as related to sustainable practices, develop skills in ecological analysis of these systems, and demonstrate proficiency in communicating scientific information to diverse audiences

ENVS 327 Food Systems Analysis (3 Credit Hours)
Pre-requisites: ENVS 203
This course links conceptual and practical considerations of food-system assessment and develop a base of tools for practitioners. It examines major elements of the assessment process: systems thinking and conceptual frameworks; the food system from consumer and producer perspectives; identifying leverage points that might be influenced to affect positive change.
Outcomes:
Students will understand inter-relationships among environment, food supply, markets, American diets, and health, learn to analyze assessment methods for food-system sectors, and examine conceptual frameworks for food-system analysis

ENVS 330 Restoration Ecology (3 Credit Hours)
Pre-requisites: ENVS 280 and ENVS 286/s; or BIOL 265 and 266
This course provides a theoretical and practical basis for the increasing global efforts to reverse damage caused by humans to ecosystems and species, emphasizing the many perspectives (e.g., ecological, social, political, engineering) that must be considered to develop, implement, and assess restoration projects across a range of ecosystem types.
Outcomes:
Students will apply knowledge from ecology and other disciplines to the practice of ecosystem restoration, and learn to integrate information from multiple disciplines, and stakeholder input, to design/manage restoration projects

ENVS 331 Restoration Ecology Lab (1 Credit Hour)
Pre-requisites: ENVS 280 and 286/s; or BIOL 265 and 266; and ENVS 330 (pre- or co-requisite)
Students will apply principles learned in ENVS 330 to restoration sites in Chicago and beyond. They will visit restoration sites and discuss strategies and initiatives with land managers and policy makers. Students will develop skills in ecological-site description, and in the analytical methods required to determine success of restoration projects.
Outcomes:
Students will gain an understanding of how the science of restoration ecology is applied in practical settings and learn methods used in restoration and assessment of actual restoration projects

ENVS 333 Introduction to the Circular Economy (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; or MGMT 201 for Quinlan School of Business students
This course introduces principles and concepts of a circular economy that can support a more sustainable future. The course reviews circular design, materials management, business models, supply chains, policy, financing, metrics, and applications. This course may include speakers and/or field trips to learn about companies with circular business practices.
Outcomes:
Explain circular economy; identify applications of circularity; understand role of policy, finance, and design in system-wide change; understand social, environmental, economic impacts of linear economic system

ENVS 335 Ecological Economics (3 Credit Hours)
Pre-requisites: ECON 201 or ECON 202
Ecological Economics is a trans disciplinary course that takes a systems approach to the relationship between planetary stewardship, social justice, and the economy to design a prosperous and desirable future for humans on a finite planet. Ecological economics fuses economic theory and sustainability science to generate new solutions for today's challenges. Topics include sustainable scale, just distribution, efficient allocation and relationships between economic and ecological systems.
Outcomes:
Understanding of ecological economics history, conceptual foundations, principles, tools, indicators, and applications

ENVS 336 Design for Circular & Sustainable Business (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; or MGMT 201 for Quinlan School of Business students
This project-based course focuses on solving complex human sustainability challenges through the application of sustainable design methods at the product and process level. Students will learn and apply biomimicry, circular, and human-centered design methods to develop conceptual and prototype solutions. Understand and apply: (1) circular design methods (2) biomimicry design methods; and (3) human-centered design (design thinking) methods.
Outcomes:
Understand the role of design in creating a sustainable future

ENVS 338 Climate Change and Human Health (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101; Restricted to Majors and Minors in the School of Environmental Sustainability; Junior or Senior Standing
This course provides an introduction overview of the health consequences associated with climate change and the local, federal, and global response to mitigate these negative health outcomes. During the course students will be expected incorporate course content and develop a realistic response public health plan to climate change for a locality of their choosing.
Outcomes:
1) Outline fundamental public health concerns that have been associated with climate change; 2) Identify and critique future steps forward to reduce public health concerns of climate change

ENVS 340 Natural History of Belize (3 Credit Hours)
Pre-requisites: For SES majors and minors, ENVS 101 or ENVS 137; For BIOL majors and minors, BIOL 102 and BIOL 112; For ANTH or GLST majors and minors, Junior or Senior Standing
This Study Abroad field course is designed to build on the foundations learned in Ecology, Environmental Science, and Anthropology classes by examining the biodiversity and tropical ecosystems of Belize, by exploring the cultural traditions of some of its peoples, particularly the Mayans; and learn how local communities are involved in protecting and sustaining ecological and natural sites through community based conservation and sustainability practices.
This course satisfies the Engaged Learning requirement.
Course equivalencies: X - ENVS 340 /BIOL 340
Outcomes:
Provide a working understanding of the structure, function, and ecology of tropical ecosystems; their importance to local communities; and the social dimensions of environmental issues, especially those related to justice

ENVS 345 Conservation and Sustainability of Neotropical Ecosystems (3 Credit Hours)
Pre-requisites: ENVS 280 or BIOL 265; Instructor Consent Required
This course provides an introduction to conservation ecology in Neotropical ecosystems via classroom sessions and experiential learning activities during a Spring-Break field trip to Belize. Students will gain experience in environmental monitoring and biological survey methods. Ecosystems studied: coral reefs, mangrove forests, subtropical rain and dry forests, savannas, rivers, wetlands.
This course satisfies the Engaged Learning requirement.
Course equivalencies: X- ENVS 345/ BIOL 349
Outcomes:
Students will gain an understanding of tropical climates, neotropical terrestrial/aquatic ecosystems and applied conservation and environmental practices such as nature reserve design and management, community-based resource management, ecotourism, and ecoagriculture

ENVS 350A Solutions to Environmental Problems: Water (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
'STEP. Water' is an interdisciplinary and hands-on course in which students learn about a relevant and complex environmental problems pertaining to water and then develop and implement projects that address the problem on campus and in the local community.
This course satisfies the Engaged Learning requirement.
Outcomes:
Students will develop understanding of water-related environmental problems, demonstrate skills/knowledge needed to address those problems, and develop skills to recognize/articulate future possibilities for environmental leadership and civic engagement

ENVS 350B Solutions to Environmental Problems: Biogas (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
'STEP. Biogas' is an interdisciplinary and hands-on course in which students learn about a relevant and complex environmental problems pertaining to biogas production, processing and transport and then develop and implement projects that address the problem on campus and in the local community.
Outcomes:
Students will develop understanding of environmental problems related to biogas, demonstrate skills/knowledge needed to address those problems, and develop skills to recognize/articulate future possibilities for environmental leadership and civic engagement

ENVS 350C Solutions to Environmental Problems: Climate Action (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101; and ENVS 224 (recommended)
Consideration of environmental, political, economic, historical, and cultural contexts of climate change. Examination of actions occurring at varying geographic scales to mitigate and/or adapt to climate change impacts. Problem- and solution-based learning of how to invest resources effectively to deal with a changing climate and its consequences.
This course satisfies the Engaged Learning requirement.
Outcomes:
Develop understanding of environmental problems related to climate change, demonstrate skills/knowledge needed to address those problems and recognize/articulate future possibilities for environmental leadership/civic engagement

ENVS 350F Solutions to Environmental Problems: Food Systems (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
'STEP. Food Systems' is an interdisciplinary and hands-on course in which students learn about a relevant and complex environmental problems pertaining to food production, processing and transport and then develop and implement projects that address the problem on campus and in the local community.
This course satisfies the Engaged Learning requirement.
Outcomes:
Students will develop understanding of environmental problems related to food systems, demonstrate skills/knowledge needed to address those problems, and develop skills to recognize/articulate future possibilities for environmental leadership and civic engagement

ENVS 351 Introduction to Sustainability Concepts & Impacts (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
Examines environmental, economic, social and political impacts of sustainable practices on general public and global and local organizations. Provides students with understanding of importance to corporations and other entities of measuring, monitoring, and reporting resource use to customers and stakeholders.
Outcomes:
Explaining basic concepts of sustainability and how they relate to operations and goals of institutions and organizations; interaction of social, economic, and ecological systems to influence sustainability challenges and solutions

ENVS 352 Sustainability Assessment & Reporting I (3 Credit Hours)
Pre-requisites: ENVS 351
Fundamental concepts and methodology of measuring and reporting environmental sustainability impacts in the areas of energy, air, buildings and transportation.
Outcomes:
Ability to assess and report sustainability metrics related to energy, air, buildings, and transportation

ENVS 353 Sustainability Assessment & Reporting II (3 Credit Hours)
Pre-requisites: ENVS 351
Fundamental concepts and methodology of measuring and reporting environmental sustainability impacts in the areas of water, land, food and waste. Environmental and social impacts of water use and sources, land use practices, food sourcing and production, and waste production and recovery.
Outcomes:
Ability to assess and report sustainability metrics related to water, land, food, and waste

ENVS 354 Sustainability Plan Development & Reporting (3 Credit Hours)
Pre-requisites: ENVS 351, ENVS 352, and ENVS 353
Capstone course in the four course sequence on Sustainability Assessment & Planning. Using concepts and methodology to create a comprehensive sustainability plan including stakeholder engagement, life cycle analyses, set resource baselines, short- and long-term sustainability goals, budgets and draft sustainability plan for a representative entity.
Outcomes:
Learn best practices to inspire and engage partners and stakeholders to advance environmental sustainability in different types of organizations; Ability to create a comprehensive sustainability plan for organizations and institutions

ENVS 363 Sustainable Business Management (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137; or MGMT 201 for Quinlan School of Business students
Course introduces students to the emerging field of sustainability in business and the growing focus on the social, environmental, and economic performance of businesses. The course presents the scientific, ethical, and business cases for adopting sustainability. This course fulfills a MGMT elective.
Course equivalencies: ENVS 363/ENVS 463
Outcomes:
Understand the dimensions of sustainability; understand economics for sustainability; understand the tools and techniques to apply sustainability in each functional area of the business

ENVS 367 Mammalogy (3 Credit Hours)
Pre-requisites: ENVS 280 or BIOL 265
This course will focus on the ecology, evolution, behavior, and conservation of the class, Mammalia. Students will gain insight how this unique group evolved over time and became the dominate lineage over the Tertiary period. Furthermore, we will investigate how mammals hold special social and cultural relationship with humans, and why we have such complicated relationships with mammals, from revering them in religious contexts, to keeping them in our homes, to consuming them as nutrition.
Outcomes:
Working knowledge and mastery of the traits, evolutionary timescale, ecology, and conservation of mammals; Students will also gain experience collecting data (on museum samples as well as observations of living samples) to learn current techniques scientists and conservationists use to advance our understanding of this group

ENVS 369 Field Ornithology (3 Credit Hours)
Pre-requisites: ENVS 280 and ENVS 286/s; or BIOL 265 and 266; and BIOL 215 (recommended)
Field ornithology is an intensive 3-week engaged-learning course at the Loyola University Retreat and Ecology Campus during the peak of the migratory season intended to provide an introduction to the theory and practice of field ornithology. Emphasis will be on field identification and song recognition, census techniques, and avian behavior.
Course equivalencies: X- ENVS 369/BIOL 348
Outcomes:
Students will become skilled in critical reasoning, field techniques, and scientific investigation that demonstrate an understanding of knowledge and techniques used in field ornithology

ENVS 380 Introduction to Geographic Information Systems (3 Credit Hours)
Pre-requisites: Restricted to Junior and Senior standing
Geographic Information Systems (GIS) is a mapping tool that allows users to create interactive searches, analyze spatial information, edit data and maps, and present the results visually. The course includes lecture, laboratory, and project components. Students will learn basic GIS skills and applications and work on projects with community organizations.
Interdisciplinary Option: Urban Studies
Course equivalencies: ENVS380/ENVS480
Outcomes:
Describe the conceptual/theoretical and practical/technological background of GIS; Describe ethical issues germane to GIS; Prepare/analyze GIS data in research; Apply GIS in community-service projects

ENVS 381 Advanced GIS Applications (3 Credit Hours)
Pre-requisites: ENVS 380 and Restricted to Junior and Senior standing
Students in this course will learn tools required to solve complex environmental problems and gain experience with spatial analysis, network analysis, 3-D analysis, GIS modeling, geostatistics, and other ArcGIS extensions. Students will also learn about internet-based mapping for dissemination of spatial data.
Outcomes:
Understand various spatial relationship concepts and their applications; identify and address common methodological challenges; understand how to use spatial data to make sound arguments in spatial problem solving and planning/policy

ENVS 382 Remote Sensing (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101; Restricted to Juniors and Seniors
Science of obtaining information about objects or areas using data from remote sensors on satellites or mounted on aircraft that can detect energy reflected from Earth. Topics include data collection; digital image processing, assessment, evaluation, and enhancement; display alternatives and visualization; electromagnetic radiation principles and radiometric correction; and geometric correction.
Outcomes:
Understand concepts, data, and methods of remotely sensed geographic data; Learn how to obtain and analyze remote sensing data, produce thematic maps, learn landscape patterns, and methods to decipher them

ENVS 383 Human Dimensions of Conservation (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
This course will increase student knowledge of the social, political, economic, psychological, and cultural dimensions that influence the success of conservation projects and develop skills in conducting human dimensions-inquiry using surveys, interviews, observation, and/or participatory methods. It will contribute to preparation for employment in the conservation field and/or graduate study.
Outcomes:
Students will understand the importance of treating the human dimensions of conservation problems with the same scientific rigor customarily given to the ecological dimensions

ENVS 384 Conservation Economics (3 Credit Hours)
Pre-requisites: ECON 201
Explores resource conservation issues using economic principles. Topics include management of forests, wildlife and mineral resources; the demand for parks and outdoor recreation; the debate between environmental preservation and conservation; valuation of ecosystem services; the economics of biodiversity and endangered species; and policies to promote conservation in agriculture.
Outcomes:
Students will learn how natural resource use is affected by economic values, how to critically evaluate natural resource management problems, and evaluate models of dynamic resource extraction and user preferences

ENVS 385 Introduction to Global Health (3 Credit Hours)
Pre-requisites: ENVS 101 or ENVS 137 or BIOL 101
This course introduces students to epidemiological and policy aspects of global health with a focus on health disparities at the international level.
Interdisciplinary Option: Bioethics
Course equivalencies: X-HSM210/PUBH314/ENVS385
Outcomes:
Understand approaches to existing and emerging health problems and the relationships between health, poverty, and development

ENVS 386 Python Programming for GIS (3 Credit Hours)
Pre-requisites: Junior or Senior Standing
This course aims to provide students with a comprehensive understanding of Python programming for Geographic Information Systems. Through a combination of lectures, hands-on exercises, and projects, students will develop the skills necessary to leverage Python in GIS applications, automate geospatial workflows, and analyze spatial data. ENVS 380 pre- or co-requisite
Outcomes:
Understand Python programming language, loops and conditional statements; acquire a foundation knowledge of GIS; apply Python programming skills to perform spatial analysis; develop Python scripts to automate common GIS tasks

ENVS 387 Principles of Ecotoxicology (3 Credit Hours)
Pre-requisites: ENVS 280 or BIOL 265; and ENVS 274
This course will provide information on how pollutants affect ecosystems and how we might ameliorate their negative effects in our world. The emphasis of this course will be the fate and effects of pollutants in the ecosystem. The effects will be from molecular level to individual organism, community, and ecosystem levels.
Interdisciplinary Option: Bioethics
Outcomes:
This course will provide students with scientific knowledge in the cause and effects of pollutants in ecosystems and to prepare them for graduate study/future career

ENVS 389 Ecological Risk Assessment (3 Credit Hours)
Pre-requisites: ENVS 274 and ENVS 275
This course covers the area of potential effects of pollutants to ecosystems and practices on risk assessment for pollutants based on exposure and effect data in the literature. Different approaches for assessing the potential ecological impacts and risks of pollutants in support of environmental management will be discussed and practiced.
Outcomes:
Learn toxic effects of pollutants, acquire, organize, and synthesize monitoring and effect data using advanced analysis methods and skills in support of environmental impact and risk assessment via case studies

ENVS 390 Integrative Seminar (3 Credit Hours)
This course requires students to focus on a specific environmental issue or theme, integrating multidisciplinary perspectives, through individual or group presentations, discussion, and analysis of presentations by outside speakers.
Outcomes:
Students will demonstrate an understanding of the multi-faceted and interdisciplinary nature of environmental issues

ENVS 391 Environmental Research (1-3 Credit Hours)
Students may register for independent research on a topic mutually acceptable to the student and any professor in the department. Usually this research is directed to a particular course or to the research of the professor. Enrollment Conditions: Administrative Permission.
This course satisfies the Engaged Learning requirement.
Outcomes:
Students will be able to design and carry out the research that is original and meaningful, including data collection, analysis, and interpretation

ENVS 391C Independent Environmental Research (Capstone) (3 Credit Hours)
Pre-requisites: Senior standing and Instructor Consent
Fulfills capstone requirement for SES majors. Through independent research experience, examine how scientific, sociological, economic and political knowledge and perspectives interact and define environmental problems and solutions/mitigation efforts. Research projects must use a multi-disciplinary perspective in analysis and interpretation.
This course satisfies the Engaged Learning requirement.
Outcomes:
Design and carry out research that is original and meaningful, including data collection, analysis, and interpretation

ENVS 391L Independent Environmental Research-Lab (1-3 Credit Hours)
Students may register for independent research on a topic mutually acceptable to the student and any professor in the department. Usually this research is directed to a particular course or to the research of the professor. This version is used when funds must be drawn from a 'lab fees' budget line to conduct the research. Requires Administrative Permission to enroll.
This course satisfies the Engaged Learning requirement.
Outcomes:
Students will be able to design and carry out research that is original and meaningful, including data collection, analysis, and interpretation

ENVS 395 Environmental Internship (3 Credit Hours)
Students seek out and engage in a semester- or summer-long internship with a civic, business, governmental, or academic group providing hands-on experience in work on environmental issues.
This course satisfies the Engaged Learning requirement.
Course equivalencies: ENVS395/ESP395/NTSC395
Outcomes:
Students will demonstrate, through daily activity logs and a comprehensive final report, a clear understanding of the environmental context and practical applications of their internship experience

ENVS 395C Environmental Internship (Capstone) (3 Credit Hours)
Pre-requisites: Senior standing and Department Consent
Fulfills capstone requirement for SES majors. Through internship experience, students reflect upon academic and extra-curricular activities in their degree program and learn how scientific, sociological, economic and political knowledge and perspectives interact and define environmental problems and solutions/mitigation efforts.
This course satisfies the Engaged Learning requirement.
Outcomes:
Guided reflection on relationship between coursework and internship experience, relate learning to specific activities and experiences in the internship, assess value of internship to future career plans

ENVS 398 Special Topics (3 Credit Hours)
Specific titles and contents vary from semester to semester.

ENVS 398B Environmental Science Topics for BIET Minor Capstone (3 Credit Hours)
Pre-requisites: Two Science courses and two Ethics courses
The interdisciplinary team-taught Bioethics capstone course examines a topic in bioethics from both scientific and ethical points of view. Topics may include biotechnologies, concepts of race and gender, the environment, reproduction, and others. This course number provides a cross-listed elective for Environmental Science students when the Bioethics capstone's topic is environmental.
Interdisciplinary Option: Bioethics
Outcomes:
Students will understand the connection between ethical and environmental science issues with regard to the special topic in environmental science

ENVS 398L Special Topics with Lab (1-4 Credit Hours)
Specific titles and contents vary from semester to semester. Includes lab component.

ENVS 399 Directed Readings (1-3 Credit Hours)
Pre-requisites: Instructor Consent
Directed by an ESP faculty member, students will read, analyze, and discuss a publications focusing on different aspects of a specific environmental issue or theme.
Outcomes:
Students will demonstrate comprehension of, and the ability to apply information from, scientific literature and be able to synthesize information to produce a cogent, synthetic analysis of their topic based on these readings

ENVS 401 Sustainable Systems - Natural Science Perspectives (3 Credit Hours)
This required core course provides an integrated overview of environmental science and sustainability which connect to sustainable development and ecological economics goals to define a just and safe space for the equitable distribution of life's essential re-sources that does not exceed the Earth's capacity to provide and replenish them. Restricted to GRAD students.
Outcomes:
Students will be able to make logical connections between environmental science and sustainability and evaluate data and primary literature in learning best practices for making evidence-based decisions

ENVS 402 Sustainable Systems - Social Science Perspectives (3 Credit Hours)
This required core course examines theoretical perspectives on and practical examples of sustainable development at both global and local/regional scales. Restricted to GRAD students.
Outcomes:
Students learn concepts of sustainable development and system ,resilience, including history, contested meanings, strengths, and limitations of each; How change towards sustainability occurs at multiple scales using social sciences research

ENVS 410 Introduction to Environmental Law & Policy (3 Credit Hours)
This introduction to environmental law surveys some critical federal environmental statutes, rules, and regulations in the United States; important case law decided under those statutes; interaction between federal, state, and local jurisdictions; and impacts on air, land, water, and natural resources. Restricted to GRAD students.
Outcomes:
Understand how the natural environment is controlled, managed and promoted through the legal system

ENVS 411 Natural Resources and Land Use Law & Policy (3 Credit Hours)
Focus on legal and policy processes used to govern pollution, water use, endangered species, toxic substances, and environmental impact and risk. Restricted to GRAD students.
Outcomes:
Students will understand how the natural environment is controlled, managed and promoted through the legal system and how land use laws and policy impact social and economic issues

ENVS 412 Water Law & Policy (3 Credit Hours)
This course looks at how the law allocates and protects one of our most crucial natural resources -- water. Understanding development and regulation of water ownership and use and how those decisions impact current environmental and socio-economic issues. Restricted to GRAD students.
Outcomes:
Understand how key laws and policies impact protection and use of water in the United States; understand key legal concepts that shape the management of our water resources

ENVS 413 Energy Law & Policy (3 Credit Hours)
This course looks at the laws that shape traditional energy production and the growing regulation of renewable and sustainable energy. Restricted to GRAD students.
Outcomes:
Understand how key laws and policies impact production and use of energy; and how energy is controlled by federal and local regulations and policies

ENVS 420 Conservation Biology (3 Credit Hours)
Students will learn to apply ecological and evolutionary biological principles to the preservation of wild plant/animal species, and to the preservation/management of ecosystems. Conservation approaches and challenges for all types of ecosystems, will be covered, with emphasis on contemporary threats to biodiversity, including habitat fragmentation, invasive species, and climate change. Restricted to GRAD students.
Outcomes:
Students will understand how the science of ecology can be used to address issues in species/ecosystem conservation, and recognize that consideration of human actions is essential to address conservation problems

ENVS 422 Invasive Species (3 Credit Hours)
Invasive species are one of the greatest global threats to biodiversity, ecosystem function, economies, and human health. Species become invasive when moved beyond native range, become established, and cause harm. This course covers how species are moved, how and when they become established, and potential harm they can cause. Restricted to GRAD students.
Outcomes:
Understanding that because invasive species are moved by humans, and because many of their impacts are felt by humans, they are an inherently multi-disciplinary problem

ENVS 423 Environmental Microbiology (3 Credit Hours)
This course introduces the significant role of microorganisms in numerous environmental and human-engineered processes. It covers microbiology and its basic methods to orient students to this field of science and the importance of microbial diversity relevant to agriculture, public health, and ecological restoration. Restricted to Graduate Students in the ENSS-MS program.
Course equivalencies: ENVS 323/ENVS 423
Outcomes:
Students will learn to isolate and characterize environmental microorganisms; Students will investigate the role of microorganisms in nutrient cycling, remediation of soils, and transmission of existing and emerging pathogens

ENVS 425 Sustainable Agriculture (3 Credit Hours)
This course provides an introduction to the environmental, social, and economic implications of sustainable agriculture. Students will learn the origins, major concepts, and current issues of sustainability in agriculture. Ecological concepts and principles applied to manage sustainable food production to support community health and economic justice will be explored. Restricted to GRAD students.
Outcomes:
Students will be able to explain the characteristics of the US agricultural system, the inter-relation among components of sustainable agriculture, and steps necessary to develop a sustainable agricultural system

ENVS 426 Agroecosystems (3 Credit Hours)
In this hands-on course, students will build knowledge and skills in agriculture and ecology through work in greenhouse, laboratory, classroom, and field settings. Students will build on foundations of Environmental Science and Biology by examining challenges of food production, management decisions, and environmental change facing agroecosystems both locally and abroad. Restricted to GRAD students.
Outcomes:
Students will develop understanding of agricultural systems as related to sustainable practices, develop skills in ecological analysis of these systems, and demonstrate proficiency in communicating scientific information to diverse audiences

ENVS 427 Food Systems Analysis (3 Credit Hours)
This course links conceptual and practical considerations of food-system assessment and develop a base of tools for practitioners. It examines major elements of the assessment process: systems thinking and conceptual frameworks; the food system from consumer and producer perspectives; identifying leverage points that might be influenced to affect positive change. Restricted to GRAD students.
Outcomes:
Students will understand inter-relationships among environment, food supply, markets, American diets, and health, learn to analyze assessment methods for food-system sectors, and examine conceptual frameworks for food-system analysis

ENVS 430 Restoration Ecology (3 Credit Hours)
This course provides a theoretical and practical basis for the increasing global efforts to reverse damage caused by humans to ecosystems and species, emphasizing the many perspectives (e.g., ecological, social, political, engineering) that must be considered to develop, implement, and assess restoration projects across a range of ecosystem types. Restricted to GRAD students.
Outcomes:
Students will apply knowledge from ecology and other disciplines to the practice of ecosystem restoration, and learn to integrate information from multiple disciplines, and stakeholder input, to design/manage restoration projects

ENVS 433 Introduction to the Circular Economy (3 Credit Hours)
This project-based course focuses on solving complex human sustainability challenges through the application of sustainable design methods at the product and process level. Students will learn and apply biomimicry, circular, and human-centered design methods to develop conceptual and prototype solutions. Restricted to graduate students.
Outcomes:
Understand role of design in creating a sustainable future; Understand and apply: (1) circular design methods; (2) biomimicry design methods; and (3) human-centered design (design thinking) methods

ENVS 435 Ecological Economics (3 Credit Hours)
Ecological Economics is a trans disciplinary course that takes a systems approach to the relationship between planetary stewardship, social justice, and the economy to design a prosperous and desirable future for humans on a finite planet. Ecological economics fuses economic theory and sustainability science to generate new solutions for today's challenges. Restricted to GRAD students.
Outcomes:
Understanding of ecological economics history, conceptual foundations, principles, tools, indicators, and applications; Topics include sustainable scale, just distribution, efficient allocation and relationships between economic

ENVS 436 Design for Circular & Sustainable Business (3 Credit Hours)
This project-based course focuses on solving complex human sustainability challenges through the application of sustainable design methods at the product and process level. Students will learn and apply biomimicry, circular, and human-centered design methods to develop conceptual and prototype solutions. ENVS 436 Restricted to graduate students.
Outcomes:
Understand the role of design in creating a sustainable future; Understand and apply: (1) circular design methods (2) biomimicry design methods; and (3) human-centered design (design thinking) methods

ENVS 438 Climate Change and Human Health (3 Credit Hours)
This course provides an introduction overview of the health consequences associated with climate change and the local, federal, and global response to mitigate these negative health outcomes. During the course students will be expected incorporate course content and develop a realistic response public health plan to climate change for a locality of their choosing. Restricted to GRAD students.
Outcomes:
1) Outline fundamental public health concerns associated with climate change; 2) Identify and critique future steps forward to reduce public health concerns of climate change

ENVS 451 Introduction to Sustainability Concepts & Impacts (3 Credit Hours)
Examines environmental, economic, social and political impacts of sustainable practices on general public and global and local organizations. Provides students with understanding of importance to corporations and other entities of measuring, monitoring, and reporting resource use to customers and stakeholders. Restricted to GRAD students.
Outcomes:
Explaining basic concepts of sustainability and how they relate to operations and goals of institutions and organizations; interaction of social, economic, and ecological systems to influence sustainability challenges and solutions

ENVS 452 Sustainability Assessment & Reporting I (3 Credit Hours)
Pre-requisites: ENVS 451; GRAD students
Fundamental concepts and methodology of measuring and reporting environmental sustainability impacts in the areas of energy, air, buildings and transportation.
Outcomes:
Ability to assess and report sustainability metrics related to energy, air, buildings, and transportation

ENVS 453 Sustainability Assessment & Reporting II (3 Credit Hours)
Pre-requisites: ENVS 451; GRAD students
Fundamental concepts and methodology of measuring and reporting environmental sustainability impacts in the areas of water, land, food and waste. Environmental and social impacts of water use and sources, land use practices, food sourcing and production, and waste production and recovery.
Outcomes:
Ability to assess and report sustainability metrics related to water, land, food, and waste

ENVS 454 Sustainability Plan Development & Reporting (3 Credit Hours)
Pre-requisites: ENVS 451, 452, and 453; GRAD students
Capstone course in the four course sequence on Sustainability Assessment & Planning. Using concepts and methodology to create a comprehensive sustainability plan including stakeholder engagement, life cycle analyses, set resource baselines, short- and long-term sustainability goals, budgets and draft sustainability plan for a representative entity.
Outcomes:
Learn best practices to inspire and engage partners and stakeholders to advance environmental sustainability in different types of organizations; Ability to create a comprehensive sustainability plan for organizations and institutions

ENVS 463 Sustainable Business Management (3 Credit Hours)
Pre- or co-requisites: ENVS 410
To introduce students to the emerging field of sustainability in business and the growing focus on the social, environmental, and economic performance of businesses. The course presents the scientific, moral, business, & economic cases for adopting sustainability. This course fulfills a MGMT elective.
Course equivalencies: ENVS 363/ENVS 463
Outcomes:
Understand the dimensions of sustainability; understand economics for sustainability; understand the tools and techniques to apply sustainability in each functional area of the business

ENVS 467 Mammalogy (3 Credit Hours)
Pre-requisites: Graduate students only
This course will focus on the ecology, evolution, behavior, and conservation of the class, Mammalia. Students will gain insight how this unique group evolved over time and became the dominate lineage over the Tertiary period. Furthermore, we will investigate how mammals hold special social and cultural relationship with humans, and why we have such complicated relationships with mammals, from revering them in religious contexts, to keeping them in our homes, to consuming them as nutrition.
Outcomes:
Working knowledge and mastery of the traits, evolutionary timescale, ecology, and conservation of mammals; Students will also gain experience collecting data (on museum samples as well as observations of living samples) to learn current techniques scientists and conservationists use to advance our understanding of this group

ENVS 469 Field Ornithology (3 Credit Hours)
Field ornithology is an intensive 3-week engaged-learning course at the Loyola University Retreat and Ecology Campus during the peak of the migratory season intended to provide an introduction to the theory and practice of field ornithology. Emphasis will be on field identification and song recognition, census techniques, and avian behavior. Restricted to GRAD students.
Outcomes:
Students will become skilled in critical reasoning, field techniques, and scientific investigation that demonstrate an understanding of knowledge and techniques used in field ornithology

ENVS 480 Introduction to Geographic Information Systems (3 Credit Hours)
Geographic Information Systems (GIS) is a mapping tool that allows users to create interactive searches, analyze spatial information, edit data and maps, and present the results visually. The course includes lecture, laboratory, and project components. Students will learn basic GIS skills and applications and work on projects with community organizations. Restricted to GRAD students.
Course equivalencies: ENVS380/ENVS480
Outcomes:
Describe the conceptual/theoretical and practical/technological background of GIS; describe ethical issues germane to GIS; prepare/analyze GIS data in research; apply GIS in community-service projects

ENVS 481 Advanced GIS Applications (3 Credit Hours)
Pre-requisites: ENVS 480
Students in this course will learn tools required to solve complex environmental problems and gain experience with spatial analysis, network analysis, 3-D analysis, GIS modeling, geostatistics, and other ArcGIS extensions. Students will also learn about internet-based mapping for dissemination of spatial data.
Outcomes:
Understand various spatial relationship concepts and their applications; identify and address common methodological challenges; understand how to use spatial data to make sound arguments in spatial problem solving and planning/policy

ENVS 482 Remote Sensing (3 Credit Hours)
Science of obtaining information about objects or areas using data from remote sensors on satellites or mounted on aircraft that can detect energy reflected from Earth. Topics include data collection; digital image processing, assessment, evaluation, and enhancement; display alternatives and visualization; electromagnetic radiation principles and radiometric correction; and geometric correction. Restricted to GRAD students.
Outcomes:
Understand concepts, data, and methods of remotely sensed geographic data; Learn how to obtain and analyze remote sensing data, produce thematic maps, learn landscape patterns, and methods to decipher them

ENVS 483 Human Dimensions of Conservation (3 Credit Hours)
This course will increase student knowledge of the social, political, economic, psychological, and cultural dimensions that influence the success of conservation projects and develop skills in conducting human dimensions-inquiry using surveys, interviews, observation, and/or participatory methods. It will contribute to preparation for employment in the conservation field and/or graduate study. Restricted to GRAD students.
Outcomes:
Students will understand the importance of treating the human dimensions of conservation problems with the same scientific rigor customarily given to the ecological dimensions

ENVS 484 Conservation Economics (3 Credit Hours)
Explores resource conservation issues using economic principles. Topics include management of forests, wildlife and mineral resources; the demand for parks and outdoor recreation; the debate between environmental preservation and conservation; valuation of ecosystem services; the economics of biodiversity and endangered species; and policies to promote conservation in agriculture. Restricted to Grad students.
Outcomes:
Students will learn how natural resource use is affected by economic values, how to critically evaluate natural resource management problems, and evaluate models of dynamic resource extraction and user preferences

ENVS 486 Python Programming for GIS (3 Credit Hours)
Pre-requisites: Graduate Student Standing
This course aims to provide students with a comprehensive understanding of Python programming for Geographic Information Systems. Through a combination of lectures, hands-on exercises, and projects, students will develop the skills necessary to leverage Python in GIS applications, automate geospatial workflows, and analyze spatial data. ENVS 480 pre- or co-requisite
Outcomes:
Understand Python programming language, loops and conditional statements; acquire a foundation knowledge of GIS; apply Python programming skills to perform spatial analysis; develop Python scripts to automate common GIS tasks

ENVS 487 Principles of Ecotoxicology (3 Credit Hours)
This course will provide information on how pollutants affect ecosystems and how we might ameliorate their negative effects in our world. The emphasis of this course will be the fate and effects of pollutants in the ecosystem. The effects will be from molecular level to individual organism, community, and ecosystem levels. Restricted to GRAD students.
Outcomes:
This course will provide students with scientific knowledge in the cause and effects of pollutants in ecosystems

ENVS 489 Ecological Risk Assessment (3 Credit Hours)
This course covers the area of potential effects of pollutants to ecosystems and practices on risk assessment for pollutants based on exposure and effect data in the literature. Different approaches for assessing the potential ecological impacts and risks of pollutants in support of environmental management will be discussed and practiced. Restricted to Graduate students.
Outcomes:
Learn toxic effects of pollutants, acquire, organize, and synthesize monitoring and effect data using advanced analysis methods and skills in support of environmental impact and risk assessment via case studies

ENVS 490B Integral Ecology First Studies Program: Biodiversity (1 Credit Hour)
This course explores the environmental crisis of the loss of biodiversity. It covers the evolutionary origin of biodiversity, the importance and glory of biodiversity, and how ecosystem structure and function collapses when we reach the tipping point of species extinction. The course is intended for Jesuit men in formation in the First Studies Program, and is limited to them. No prerequisites are required.
Outcomes:
First Studies men will grasp the scientific concepts of biodiversity, explore the ethical and spiritual dimensions of biodiversity loss, and take actions to lessen the loss of biodiversity

ENVS 490C Integral Ecology First Studies Program: Climate Change (1 Credit Hour)
This course covers the science of climate change including the physical and chemical underpinnings of fossil fuels and greenhouse gases and their impact on trapping solar infrared radiation within the Earth's atmosphere and causing subsequent warming of the land and oceans. Warming of the planet increases the frequency and intensity of storms like hurricanes, cyclones, typhoons, it melts glaciers and causes sea levels to rise. Climate change is modifying the planetary distribution of precipitation which can produce water scarcity in some parts of the world, and leads to flooding and poor water quality in other locations. This course will study the scientific drivers of climate change, and the social and ethical ramifications of how the marginalized are disproportionately impacted. It will touch on environmental justice, water, land and food insecurity, and solutions to the climate crisis in first world countries as well as in developing countries. The course is intended for Jesuit men in formation in the First Studies Program, and is limited to them. No prerequisites are required.
Outcomes:
Understand the chemical composition of the three main classes of fossil fuels and connect the chemistry to greenhouse gases and the greenhouse effect; Explore the many ways in which climate change is impacting the planets' hydrologic cycle, the melting of polar ice caps and glaciers, rising sea levels, increased frequency and intensity of droughts, floods, wildfires and storm events worldwide; Understand the benefits and challenges of clean energy technologies, and where solar, geothermal, wind, biofuels and hydro are good solutions, and the geopolitical environment around clean energy technologies; Analyze key ethical challenges arising from climate change that human beings are confronting with in the world today and understand the moral principles, goals, and virtues important for guiding decisions about making a just transition to a clean energy economy; Discover ways in which spirituality has influenced the human understanding and use of fossil fuels, and recognize the importance of spirituality for responding constructively to today's climate crisis

ENVS 490W Integral Ecology First Studies Program: Water (1 Credit Hour)
This course covers the science of water - physical and chemical properties of water, how the hydrologic cycle distributes water across the planet, how climate change is modifying the distribution of water which can produce water scarcity in some parts of the world, and leads to flooding and poor water quality in other locations, and how the marginalized are disproportionately water insecure. It will touch on environmental justice and water insecurity, and some technologies for cleaning waste water and finishing drinking water in first world countries as well as in developing countries. The course is intended for Jesuit men in formation in the First Studies Program, and is limited to them. No prerequisites are required.
Outcomes:
First Studies men will explore the structure of the water molecule, the water cycle, and the changing water content in the atmosphere; Understand the sources of water, the distribution of water on Earth, and the effect of human activities on distribution cycles; Explore wastewater treatment plants and/or drinking water finishing plants in the city of Chicago to learn how water can be cleaned and reused for human consumption; Analyze key ethical challenges about water that human beings are confronting in the world today and understand the moral principles, goals, and virtues important for guiding water decisions; Discover ways in which spirituality has influenced the human understanding and use of water, and recognize the importance of spirituality for responding constructively to today's water crisis

ENVS 491 Independent Environmental Research (1-4 Credit Hours)
Students may register for independent research on a topic mutually acceptable to the student and any professor in the department. Usually this research is directed to a particular course or to the research of the professor. Post-baccalaureate students only.
Outcomes:
Dependent on the specific research project and goals

ENVS 495 Environmental Internship (3 Credit Hours)
Students seek out and engage in a semester -or summer-long internship with a civic, business, governmental, or academic group providing hands on experience in work on environmental issues. Post-baccalaureate students only.
Outcomes:
Students demonstrate, through daily activity logs and comprehensive final report, a clear understanding of the environmental context and practical applications of their internship experience

ENVS 496 Research (3-12 Credit Hours)
Restricted to GRAD students.

ENVS 498 Special Topics (1-12 Credit Hours)
Pre-requisites: Post-baccalaureate students only
Specific titles and contents vary from semester to semester. Variable credit hours.
Outcomes:
Dependent on the specific course content and goals

ENVS 498L Special Topics with Lab (1-4 Credit Hours)
Specific titles and contents vary from semester to semester. Includes a lab component. Variable credit hours. Post-baccalaureate students only.
Outcomes:
Dependent on the specific course content and goals

ENVS 499 Directed Readings (1-3 Credit Hours)
Directed by an SES faculty member, students will read, analyze, and discuss a publications focusing on different aspects of a specific environmental issue or theme. Post-baccalaureate students only.
Outcomes:
Students demonstrate comprehension, ability to apply information from scientific literature and synthesize information to produce cogent, synthetic analysis of their topic based on these readings

ENVS 595 Thesis Supervision (0 Credit Hours)
Students will make supervised progress towards completion of their theses. Restricted to SES, GRAD students.

ENVS 605 Master's Study (0 Credit Hours)
Restricted to GRAD students.