ENVIRONMENTAL SCIENCES (ES)

NOTE: All Environmental Sciences (ES) courses used as prerequisites for other Environmental Sciences courses must be completed with a grade of "C-" or better.

Environmental Sciences (ES) Courses

ES 1003. Survey Topics in Environmental Studies. (3-0) 3 Credit Hours.
A broad based survey course intended to provide a comprehensive introduction to the multidisciplinary field of environmental studies. This course examines the ecological, social, and political-economic aspects of contemporary environmental issues from an interdisciplinary perspective. May be applied toward the Core Curriculum requirement in Social and Behavioral Sciences. Generally offered: Fall and Spring. Course Fees: LRS1 $15.40; STSI $7.20.

ES 1111. Environmental Botany Laboratory. (0-3) 1 Credit Hour. (TCCN = BIOL 1111)
Laboratory studies to accompany Environmental Botany Lecture. Selected laboratories pertaining to the structure and function of plants. Generally offered: Fall and Spring. Course Fees: IUS1 $15; L001 $20; LRS1 $15.40; STSI $7.20.

ES 1113. Environmental Botany. (3-0) 3 Credit Hours. (TCCN = BIOL 1113)
Study of structure and function of plant cells, tissues, and organs. Includes an evolutionary survey and life histories of the following representative groups: algae, fungi, mosses, liverworts, ferns, and seed producing organisms. Plant reproductive and functional interactions with their environment and with humans. May apply toward the Core Curriculum requirement in Life and Physical Sciences. Generally offered: Fall and Spring. Course Fees: IUS1 $15; L001 $20; LRS1 $46.20; STSI $21.60.

ES 1121. Environmental Zoology Laboratory. (0-3) 1 Credit Hour. (TCCN = BIOL 1121)
Laboratory studies to accompany Environmental Zoology Lecture. Selected laboratories pertaining to the taxonomy, molecular biology, and ecology of animals. Generally offered: Fall and Spring. Course Fees: IUS1 $15; L001 $30; LRS1 $15.40; STSI $7.20.

ES 1123. Environmental Zoology. (3-0) 3 Credit Hours. (TCCN = BIOL 1123)
Study of the principles of taxonomy, molecular biology, and ecology as they relate to animal form and function, diversity, behavior, and evolution. May apply toward the Core Curriculum requirement in Life and Physical Sciences. Generally offered: Fall and Spring. Course Fees: LRC1 $12; LRS1 $46.20; STSI $21.60; DL01 $75.

ES 1211. Environmental Geology Laboratory. (0-3) 1 Credit Hour. (TCCN = GEOL 1105)
Laboratory studies to accompany Environmental Geology Lecture. Selected laboratories pertaining to urban and regional land use planning. Generally Offered: Fall and Spring. Course Fees: IUS1 $15; L001 $30; LRS1 $15.40; STFE $40; STSI $7.20.

ES 1213. Environmental Geology. (3-0) 3 Credit Hours. (TCCN = GEOL 1305)
The earth as a habitat. Interrelationships between humans and the environment. Geologic factors in urban and regional land use planning. May apply toward the Core Curriculum requirement in Life and Physical Sciences. Generally offered: Fall and Spring. Course Fees: LRC1 $12; LRS1 $46.20; STSI $21.60.

ES 1314. Environmental Statistics. (3-3) 4 Credit Hours. (TCCN = MATH 1442)
Collection, analysis, presentation, and interpretation of environmental data, and probability. Analysis includes descriptive statistics, correlation and regression, confidence intervals and hypothesis testing. Use of appropriate technology, including statistical software. Generally offered: Fall and Spring. Course Fees: IUS1 $15; LRS1 $61.60; STSI $28.80.

ES 2013. Introduction to Environmental Science I. (3-0) 3 Credit Hours. (TCCN = ENVR 1301)
An introduction to the scientific principles, concepts, and methodologies needed to understand the interactions of the biotic component of the natural world, to identify and analyze environmental problems within the biotic component of natural word, risk assessment of these environmental problems, and to examine alternate solutions. General attention is given to the biotic concepts of growth, processes, and changes occurring in ecosystems and social structures. May apply toward the Core Curriculum requirement in Life and Physical Sciences. Generally offered: Fall, Spring. Course Fees: DL01 $75; LRC1 $12; LRS1 $46.20; STSI $21.60.

ES 2021. Introduction to Environmental Science I Laboratory. (0-3) 1 Credit Hour.
Prerequisite: Concurrent enrollment in ES 2013 is recommended. Qualitative and quantitative methods in the study of biotic environmental systems. Generally offered: Fall, Spring. Course Fees: IUS1 $15; L001 $30; LRS1 $15.40; STSI $7.20.

ES 2023. Introduction to Environmental Science II. (3-0) 3 Credit Hours. (TCCN = ENVR 1302)
An introduction to the scientific principles, concepts, and methodologies needed to understand the interactions of the abiotic component of the natural world, to identify and analyze environmental problems within the abiotic component of the natural world, risk assessment of these environmental problems, and to promote environmental sustainability. General attention is given to the abiotic environmental factors including natural hazards, pollution processes, energy resources, sustainability, and changes occurring in ecosystems. May apply toward the Core Curriculum requirement in Life and Physical Sciences. Generally offered: Fall, Spring. Course Fees: LRC1 $12; LRS1 $46.20; STSI $21.60; DL01 $75.

ES 2031. Introduction to Environmental Science II Laboratory. (0-3) 1 Credit Hour.
Prerequisite: Concurrent enrollment in ES 2023 is recommended. Qualitative and quantitative methods in the study of abiotic environmental systems. Generally offered: Fall, Spring. Course Fees: IUS1 $15; L001 $30; LRS1 $15.40; STSI $7.20.
ES 2113. Fundamentals of Geographic Information Systems (GIS). (2-2) 3 Credit Hours.
This course will serve as a basic introduction to the concepts and techniques of utilizing a Geographic Information System (GIS) to study and model environmental issues. In lecture and laboratory, students will study methods of querying, analyzing, creating, and displaying GIS data utilizing industry standard software. Students will also be introduced to using the Global Positioning System (GPS) as a means for creating GIS data. Generally offered: Fall and Spring. (Same as GEO 2113. Credit cannot be earned for both ES 2113 and GEO 2113.) Course Fees: IUS$15; LRS$1 $46.20; STSI $21.60.

ES 3033. Environmental Ecology. (3-0) 3 Credit Hours.
Prerequisites: ES 2013 and ES 2023, or equivalents. Examination of the interactions of biotic and abiotic systems, including interactions of plants, animals, and the environment. (Formerly ES 3034. Credit can only be earned for one of the following: ES 3033, ES 3034, or BIO 3283.) Generally offered: Fall, Spring. Differential Tuition: $150.

ES 3042. Environmental Ecology Laboratory. (0-6) 2 Credit Hours.
Prerequisites: ES 2013, ES 2021, ES 2023, and ES 2031, or equivalents; concurrent enrollment in ES 3033 is recommended. A field-oriented course emphasizing modern ecological techniques, including examinations of plant and animal populations and measurement of selected chemical and physical parameters. (Same as BIO 3292. Credit cannot be earned for both ES 3042 and BIO 3292.) Generally offered: Fall, Spring. Differential Tuition: $100. Course Fees: IUS$15; L001 $30; STFE $40.

ES 3053. Environmental Remediation. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. This course will focus on the fundamentals associated with environmental remediation in relation to the overall environmental quality and protection. Topics covered include contaminant fate and transport; physical, chemical, and biological processes/characteristics of the air, soil, and water; remediation/restoration methods; environmental monitoring; environmental assessments; environmental regulations; and water/wastewater treatment. (Formerly ES 3054. Credit cannot be earned for both ES 3053 and ES 3054.) Generally offered: Spring. Differential Tuition: $150.

ES 3073. Environmental Rhetoric and Technical Communication. (3-0) 3 Credit Hours.
Prerequisite: ENG 2413. Restricted to students who have completed 60 or more hours. This course focuses on rhetoric, ecology, and technical/scientific communication in order to develop interdisciplinary, team-based, and applied research projects. This advanced professional writing and rhetoric course will examine ecological communications as an archetypical example of specialized technical communication. (Same as BIO 3073. Credit cannot be earned for both ES 3073 and BIO 3073.) Generally offered: Fall, Spring. Differential Tuition: $150.

ES 3103. Environmental Microbiology. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents; or consent of instructor. This course will survey environmental microbiology and will emphasize microbial interactions in terrestrial and aquatic environments as well as the fate of microbial pathogens. Topics covered include microbial environments, detection of bacteria and their activities in the environment, microbial biogeochemical cycling, bioremediation of organic and inorganic pollutants, and water quality. (Formerly ES 3104. Credit can only be earned for one of the following: ES 3103, ES 3104, or BIO 3713.) Generally offered: Fall. Differential Tuition: $150.

ES 3113. Ichthyology. (3-0) 3 Credit Hours.
Prerequisites: ES 2013, ES 2021, ES 2023, and ES 2031, or equivalents. Study of fishes, and includes a wide range of topics including taxonomy, systematics, and biogeography, anatomy and physiology, and behavior and ecology. This course will focus on form and function, behavior, life history, ecology, and key taxonomic characteristics of most of the orders of fishes. Field trips may be required. Same as BIO 3113, credit cannot be earned for both BIO 3113 and ES 3113. Generally offered: Spring. Differential Tuition: $150. Course Fees: IUS$15; STFE $40.

ES 3121. Introduction to Soils Laboratory. (0-3) 1 Credit Hour.
Prerequisites: CHE 1083 and CHE 1093, or equivalents. Laboratory exercise and field trips designed to develop student competency in soil description, analysis, and assessment. Generally offered: Fall and Spring. Course Fees: IUS$15; L001 $30. Differential Tuition: $50.

ES 3123. Introduction to Soils. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083 and CHE 1093, or equivalents. A study of soil properties and processes and relationships to land use, plant growth, environmental quality, and society. Generally offered: Fall and Spring. Differential Tuition: $150.

ES 3133. Oceanography. (3-0) 3 Credit Hours.
Prerequisite: ES 1213 or equivalent. Description of the oceans. Emphasis on relations of biology, chemistry, geology, and physics in marine environments. Examination of relationships and interactions at macro and micro scales in the ocean. Field trips may be required. (Same as GEO 3163. Credit cannot be earned for both ES 3133 and GEO 3163.) Generally Offered: Spring of even years. Differential Tuition: $150.

ES 3141. Watershed Processes Laboratory. (0-3) 1 Credit Hour.
Prerequisites: ES 2013, ES 2023, ES 2113, and ES 2113, or equivalents. Laboratory exercises and field trips designed to develop an understanding of watershed processes, watershed assessment, and watershed management. Generally offered: Fall and Spring. Differential Tuition: $50. Course Fees: IUS$15; L001 $30; STFE $40.

ES 3143. Watershed Processes. (3-0) 3 Credit Hours.
Prerequisites: ES 2013, ES 2023, ES 2113, and ES 2113, or equivalents. This course focuses on watershed processes, watershed assessment, and watershed management. Generally offered: Fall and Spring. Differential Tuition: $150. Course Fee: STFE $40.

ES 3153. Environmental Chemistry. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. This course explores the chemistry of the environment, the chemistry underlying environmental problems, and solutions to environmental problems. Emphasis is placed on thermodynamics and kinetics of reaction cycles; sources, sinks, and transport of chemical species; and quantitation of chemical species. Examples are selected from the chemistry of natural and contaminated air, water, and soil. (Same as CE 4613. Credit cannot be earned for both ES 3153 and CE 4613.) Generally offered: Spring. Differential Tuition: $150.

ES 3163. Ornithology. (3-0) 3 Credit Hours.
Prerequisite: ES 2013 and ES 2023, or equivalents. A course covering various aspects of the biology of birds, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips may be required. (Same as BIO 4063. Credit cannot be earned for both ES 3163 and BIO 4063.) Generally offered: Spring of even years. Course Fees: Differential Tuition: $150. Course Fee: IUS$15.
ES 3173. Mammalogy. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. A course covering various aspects of the biology of mammals, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips may be required. (Same as BIO 3293. Credit cannot be earned for both ES 3173 and BIO 3293.) Generally offered: Fall of odd years. Differential Tuition: $150. Course Fee: IUS1 $15.

ES 3183. Entomology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or ES 3083 with a grade of at least a 'C'. Restricted to students who have completed 60 or more hours. A course covering various aspects of the biology of insects, including anatomy, physiology, evolution, behavior, ecology, and biogeography. (Same as BIO 3303. Credit cannot be earned for both ES 3183 and ES 3183.) Generally offered: Spring odd years. Field trips may be required. Differential Tuition: $150.

ES 3193. Herpetology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. A course covering various aspects of the biology of amphibians and reptiles, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips may be required. (Same as BIO 3353. Credit cannot be earned for both ES 3193 and BIO 3353.) Generally offered: Fall of odd years. Differential Tuition: $150. Course Fee: IUS1 $15.

ES 3203. Environmental Law. (3-0) 3 Credit Hours.
Present-day environmental enabling acts and regulations will be covered, with emphasis on federal acts, such as the National Environmental Policy Act, Clean Water Act, Resource Conservation and Recovery Act, and associated regulations. Generally offered: Fall and Spring. Differential Tuition: $150.

ES 3213. Biology of Flowering Plants. (2-3) 3 Credit Hours.
Prerequisite: Junior or senior status; a minimum of 60 semester credit hours. A study of the wildflowers of Texas emphasizing identification of the more common wildflowers, as well as family characteristics, flower anatomy, plant morphology, and plant-collecting techniques will be included. Lecture, laboratory, and fieldwork will be included as part of the course. (Same as BIO 3273. Credit can only be earned for ES 3213 or BIO 3273.) Generally offered: Spring. Differential Tuition: $150. Course Fees: L001 $30; STFE $40.

ES 3223. Woody Plants. (2-3) 3 Credit Hours.
Prerequisite: Junior or senior status; a minimum of 60 semester credit hours. A study of the woody plants emphasizing the characteristics of family, genus, and species. Includes identification of the common woody plants. Leaf, stem, and flower morphology, anatomy, and collecting techniques. Lecture, laboratory, and fieldwork will be included as part of the course. (Same as BIO 3263. Credit cannot be earned for both ES 3223 and BIO 3263.) Generally offered: Fall. Differential Tuition: $150. Course Fees: L001 $30; STFE $40.

ES 3233. Survey of Insects. (3-0) 3 Credit Hours.
Prerequisites: ES 2013 and ES 2023 with a grade of at least a C, and junior or senior status. Insect systematics, including major orders and families. (Same as BIO 3233. Credit cannot be earned for both BIO 3233 and ES 3233.) Generally offered: Spring even years. Differential Tuition: $150.

ES 3253. R Coding in Environmental Science and Ecology. (3-0) 3 Credit Hours.
Prerequisite: ES 2113. Restricted to students who have completed 60 or more hours. This course will teach the management of environmental and ecological data using Program R. The focus will be on the structure and linguistics of data in R and how to integrate R into a data science workflow. (Same as BIO 3253. Credit cannot be earned for both ES 3253 and BIO 3253.) Generally offered: Spring even years. Differential Tuition: $150.

ES 3303. Sustainable Development. (3-0) 3 Credit Hours.
Prerequisite: ES 2013 and ES 2023. Restricted to students who have completed 60 or more hours. This course will focus on addressing the challenges of sustainability and development with actionable knowledge for innovating solutions to the world's most pressing problems like climate change, poverty and inequality, and biodiversity loss and ecosystem degradation. Generally offered: Spring even years. Differential Tuition: $150.

ES 3313. Advanced Geographic Information Systems (GIS). (3-0) 3 Credit Hours.
Prerequisite: ES 2113 or equivalent. This course is an undergraduate level course directed at developing more advanced Geographic Information Systems skills. The class is not introductory, and students will begin using more advanced analysis tools in ESRI GIS software (ArcGIS 10.3). Applications of the technology for scientific discovery and exploration will be used as case study examples. Generally offered: Fall of odd years. Differential Tuition: $150.

ES 3353. Sustainable Development. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Field trips may be required. May be repeated for credit when topics vary. Generally offered: Fall and Spring. Differential Tuition: $150.

ES 3393. Topics in Environmental Science. (3-0) 3 Credit Hours.
Prerequisites: ES 3033 and ES 3042, or equivalents. A survey of physiological approaches to understanding plant-environment interactions from the functional perspective. (Same as BIO 4303. Credit cannot be earned for both ES 4023 and BIO 4303.) Generally offered: Fall of even years. Differential Tuition: $150.

ES 4023. Aquatic Ecology. (3-0) 3 Credit Hours.
Prerequisites: ES 3033 and ES 3042, or equivalents. A survey of physiological approaches to understanding plant-environment interactions from the functional perspective. (Same as BIO 4303. Credit cannot be earned for both ES 4023 and BIO 4303.) Generally offered: Fall of even years. Differential Tuition: $150.

ES 4033. Plant Physiological Ecology. (3-0) 3 Credit Hours.
Prerequisites: ES 3033 and ES 3042, or equivalents. A survey of physiological approaches to understanding plant-environment interactions from the functional perspective. (Same as BIO 4313. Credit cannot be earned for both ES 4033 and BIO 4313.) Generally offered: Fall of even years. Differential Tuition: $150.

ES 4103. Global Change. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents; and junior or senior status. Changes in the global distribution of plants and animals and the causes of the changes will be examined. Factors that are apparently coupled to changes in these distributions will be examined including, but not limited to, atmospheric composition change and temperature change. Additionally, examination of the impact of humans and their activities on the environment: their effect on aquatic, marine, and terrestrial plant, animal, and human resources. (Formerly ES 4104. Credit cannot be earned for both ES 4103 and ES 4104.) Generally offered: Fall and Spring. Differential Tuition: $150.
ES 4111. Field Biology Laboratory. (0-3) 1 Credit Hour.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours, or consent of instructor; concurrent enrollment in ES 4113 is recommended. A field-oriented course offering the opportunity for practical experience observing, collecting, and identifying Texas plants and animals. (Same as BIO 4241. Credit cannot be earned for both ES 4111 and BIO 4241.) Generally offered in Summer. Differential Tuition: $50. Course Fee: IUS1 $15.

ES 4113. Field Biology. (3-0) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours, or consent of instructor; concurrent enrollment in ES 4111 is recommended. A study of the natural history of plants and animals in their native environment. Techniques for the identification of birds, mammals, reptiles, amphibians, insects, and the dominant flowering plants will be discussed. (Same as BIO 4233. Credit cannot be earned for both ES 4113 and BIO 4233.) Generally offered: Summer. Differential Tuition: $150. Course Fee: IUS1 $15.

ES 4123. Desert Biology. (3-0) 3 Credit Hours.
Prerequisite: Junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. An introduction to wildlife biology and management including ecological principles dealing with ecosystems, natural communities, and populations. The importance of animal behavior, the availability of food, cover, wildlife diseases, predators, hunting, and trapping will be included. Field studies will allow students to observe and apply classroom topics. (Same as BIO 4043. Credit cannot be earned for both ES 4123 and BIO 4043.) Generally offered: Summer. Differential Tuition: $150. Course Fee: IUS1 $15.

ES 4133. Natural Resource Policy and Administration. (3-0) 3 Credit Hours.
Prerequisite: Junior or senior status. Factors in evolution of forest, range, wildlife, and related natural resources administration and policies in the United States; policy components; policy formation implementation, administration, and change processes; introduction to criteria for evaluating effectiveness of policies and administration. Same as BIO 4233, credit cannot be earned for both ES 4133 and BIO 4043.) Generally offered: Summer. Differential Tuition: $150. Course Fee: IUS1 $15.

ES 4153. Introduction to Sustainability. (3-0) 3 Credit Hours.
Prerequisites: ES 2023 and junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. This course will examine the major environmental issues and trends happening in modern society from a scientific and practical perspective, including biodiversity, population, food and water resources, climate change, energy, public health, and the overall forecast for the environment for the next several decades. Differential Tuition: $150. Course fee: DL01 $75.

ES 4163. Renewable Energy. (3-0) 3 Credit Hours.
Prerequisites: ES 2023 and junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. This course is an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. Generally offered: Fall of even years. Differential Tuition: $150.

ES 4173. Waste Water Treatment. (2-3) 3 Credit Hours.
Prerequisite: ES 2023 and junior or senior status: a minimum of 60 semester credit hours, or consent of instructor. The application of chemical, biochemical, and physical processes to water treatment, wastewater treatment, and pollution control. Generally offered: Spring of even years. Differential Tuition: $150. Course Fees: IUS1 $15; STFE $40.

ES 4183. Environmental Toxicology. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. Examination of advanced or specialized hazardous or toxic waste treatment methods. Emphasis will be on physical, chemical, and biological processes in treatment and processing of hazardous waste materials. Generally offered: Spring. Differential Tuition: $150.

ES 4193. Planning and Response to Environmental Disasters. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. Mitigation of preparation for, response to, and recovery from environmental disasters. Generally offered: Fall of even years. Differential Tuition: $150.

ES 4203. Environmental Assessment. (3-0) 3 Credit Hours.
Prerequisites: ES 2013 and ES 2023, or equivalents. This course evaluates the framework of an impact assessment and details regarding the environment (air, water, soil), its pollutants (atmospheric, noise, water, solid waste), their impacts (physical, social, economic), relevant regulations, and pollution minimization or management strategies. Students use this information to review and comment on an existing Environmental Impact Statement (EIS). Generally offered: Fall and Spring. Differential Tuition: $150.

ES 4212. Senior Seminar. (2-0) 2 Credit Hours.
Prerequisite: Senior status: Environmental Science majors and a minimum of 90 credit hours. The techniques of seminar presentation will be studied by preparing and presenting individual seminars on topics of interest. Enrollment for credit is limited to, and required of, all senior students majoring in environmental studies. (Formerly ES 4211. Credit cannot be earned for both ES 4212 and ES 4211). Generally offered: Fall and Spring. Differential Tuition: $100.

ES 4213. Conservation Biology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. The class topics will include studying the nature of the biosphere, threats to its integrity, and ecologically sound responses to these threats. Also included will be the origin and preservation of biotic diversity, how the rich variety of plant and animal life around us arose, how it has been maintained by natural processes, and how we can prevent its destruction. (Same as BIO 4033. Credit cannot be earned for both ES 4213 and BIO 4033.) Generally offered: Spring. Differential Tuition: $150. Course fee: DL01 $75.

ES 4223. Urban Wildlife Ecology. (3-0) 3 Credit Hours.
Prerequisites: ES 3033 and ES 3042, or equivalents. Fundamentals of urban ecology, field methods including urban wildlife and human surveys, and urban wildlife management and conservation strategies. Generally offered: Fall of even years. Differential Tuition: $150.

ES 4233. Restoration Ecology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. Applies ecological principles to the restoration of disturbed terrestrial, wetland, and aquatic ecosystems. Includes the restoration of soils and waterways, of flora and fauna, and of natural ecological processes such as plant succession and nutrient cycling. (Same as BIO 4323. Credit cannot be earned for both ES 4233 and BIO 4323.) Generally offered: Spring. Differential Tuition: $150.

ES 4243. Wildlife Ecology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033. Major environmental factors affecting wildlife; structure, and behavior of wildlife populations; regional wildlife communities and their conservation. (Same as BIO 4053. Credit cannot be earned for both ES 4243 and BIO 4053.) Generally offered: Spring even years. Differential Tuition: $150.
ES 4253. Sources, Fate, and Transport of Chemicals in the Environment. (3-0) 3 Credit Hours.
Prerequisites: ES 2013, ES 2023, and MAT 1093, or equivalents. Sources of chemicals in the environment. Processes regulating fate and transport of metals, organics, nutrients, salts, pathogens, and radionuclides in the environment. Generally offered: Fall and Spring. Differential Tuition: $150.

ES 4263. River Ecosystems. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 with a grade of at least a ‘C’. This course examines the physical, chemical, and biological factors that determine biodiversity and the structure and function of aquatic and riparian ecosystems. Key ecological and hydrogeomorphology concepts and their application to environmental concerns are covered. (Same as BIO 4263. Credit cannot be earned for both BIO 4263 and ES 4263.) Generally offered: Spring of even years. Differential Tuition: $150.

ES 4273. Fish Ecology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 with a grade of at least a ‘C’. A study of the biotic and abiotic factors affecting the diversity and distribution of fishes, with a focus on North American freshwater fishes. This course will include (1) lectures and discussions covering patterns and processes in fish ecology; and (2) a collaborative research project covering computational techniques used in fish ecology. (Same as BIO 4273. Credit cannot be earned for both BIO 4273 and ES 4273.) Generally offered: Fall of even years. Differential Tuition: $150.

ES 4283. Plant-Soil-Microbe Interactions. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 with a grade of at least a ‘C’. Restricted to students who have completed 60 or more hours. This course focuses on the microbial groups which live in soils and among plant species and methodologies used to understand their interaction. (Same as BIO 4283. Credit cannot be earned for both BIO 4283 and ES 4283.) Generally offered: Spring of odd years. Differential Tuition: $150.

ES 4293. Human Dimensions of Wildlife Management. (3-0) 3 Credit Hours.
Prerequisite: ES 3033. This course will introduce students to the role that humans play in the management of wildlife and how people’s knowledge, values, and behaviors influence conservation decisions. Students taking this course will develop an understanding of the social, political, and economical drivers of wildlife management. They will also explore ways to engage stakeholders in wildlife management through conservation tools and effective communication that considers human dimensions. An emphasis will be placed on working with private landowners, and in so doing train students to work in private landscapes where culture, society, politics, and economics often provide the context for management decisions. Generally offered: Spring even years. Differential Tuition: $150.

ES 4303. Principles of Wildlife Management. (3-0) 3 Credit Hours.
Prerequisite: ES 4243. Ways of conserving desired numbers of animals for the overall best interests of society, be they aesthetic, ecological, economic, commercial, or recreational; includes management of endangered species, exploited species, wildlife communities in nature reserves, and wildlife pests. Generally offered: Spring even years. Differential Tuition: $150.

ES 4503. Introduction to Environmental Risk Assessment. (3-0) 3 Credit Hours.
Prerequisite: ES 4183 with a grade of “C-” or better. This course will offer hands-on training in the primary areas of risk assessment (i.e., hazard identification, dose-response assessment, exposure assessment, and risk characterization). Generally offered: Fall of odd years. Differential Tuition: $150.

ES 4513. Advanced Environmental Risk Assessment. (3-0) 3 Credit Hours.
Prerequisite: ES 4503 with a grade of at least a ‘C’. This course will offer hands-on training in the advanced areas of risk assessment (i.e., hazard identification, dose-response assessment, exposure assessment, and risk characterization). Generally offered: Spring of even years. Differential Tuition: $150.

ES 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisites: Permission in writing (form available) from the instructor, the student’s advisor, the Department Chair, and Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $50.

ES 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisites: Permission in writing (form available) from the instructor, the student’s advisor, the Department Chair, and Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $100.

ES 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Permission in writing (form available) from the instructor, the student’s advisor, the Department Chair, and Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Generally offered: Fall, Spring, Summer. Differential Tuition: $150.

ES 4953. Special Studies in Environmental Science. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Generally offered: variable. Differential Tuition: $150. Course fee: DL01 $75.

ES 4963. Internship. (0-0) 3 Credit Hours.
Prerequisite: Consent of the Undergraduate Advisor of Record. An opportunity for students to work in a setting that permits them to apply what they have learned in the formal instruction part of the program. Generally offered: Fall, Spring, Summer. Differential Tuition: $150.