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.

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. Course Fees: IUS1 $15; LRC1 $12; LRS1 $15; STSI $5.

ES 1113. Environmental Botany. (3-0) 3 Credit Hours. (TCCN = BIOL 1311)
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. Course Fees: IUS1 $15; L001 $30; LRS1 $5; STSI $5.

ES 1121. Environmental Zoology Laboratory. (0-3) 1 Credit Hour. (TCCN = BIOL 1113)
Laboratory studies to accompany Environmental Zoology Lecture. Selected laboratories pertaining to the taxonomy, molecular biology, and ecology of animals. Course Fees: IUS1 $15; L001 $30; LRS1 $5; STSI $5.

ES 1123. Environmental Zoology. (3-0) 3 Credit Hours. (TCCN = BIOL 1313)
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. Course Fees: LRC1 $12; LRS1 $15; STSI $15.

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. Course Fees: IUS1 $15; L001 $30; LRS1 $5; STFE $40; STSI $5.

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. Course Fees: LRC1 $12; LRS1 $15; STSI $15.

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. Course Fees: IUS1 $15; LRS1 $20; STSI $20.

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 world, 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: LRC1 $12; LRS1 $15; STSI $15.

ES 2021. Introduction to Environmental Science I Laboratory. (0-3) 1 Credit Hour.
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 $5; STSI $5.

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 $15; STSI $15.

ES 2031. Introduction to Environmental Science II Laboratory. (0-3) 1 Credit Hour.
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 $5; STSI $5.

ES 2113. Fundamentals of Geographic Information Systems (GIS). (2-2) 3 Credit Hours.
Prerequisite: CS 1173. 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. (Credit cannot be earned for both ES 2113 and GEO 2113.) Course Fees: IUS1 $15; LRS1 $15; STSI $15.

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 cannot be earned for more than one of the following: ES 3033, ES 3034 or BIO 3283.) Generally offered: Fall, Spring. Course Fees: LRS1 $15; STSI $15.
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. (Credit cannot be earned for both ES 3042 and BIO 3292.) Generally offered: Fall, Spring. Course Fees: IUS1 $15; L001 $30; LRS1 $10; STFE $40; STSI $10.

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. Course Fees: LRS1 $15; STSI $15.

ES 3061. Environmental Remediation Laboratory. (0-3) 1 Credit Hour.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. Concurrent enrollment in ES 3053 is recommended. This laboratory and field-based course will provide hands-on experience in environmental remediation that will focus on regulatory aspects of assessing environmental contamination, technologies/strategies used to remediate, and current literature research investigations into remediation. Generally offered: Spring. Course Fees: IUS1 $15; LRS1 $5; STSI $5.

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 cannot be earned for more than one of the following: ES 3103, ES 3104 or BIO 3713.) Course Fees: LRS1 $15; STSI $15.

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. Course Fees: IUS1 $15; LRS1 $15; STFE $40; STSI $15.

ES 3121. Introduction to Soils Laboratory. (0-3) 1 Credit Hour.
Prerequisites: ES 2013 and ES 2023, or equivalents. Laboratory exercise and field trips designed to develop student competency in soil description, analysis, and assessment. Course Fees: IUS1 $5; L001 $30; LRS1 $5; STSI $15.

ES 3123. Introduction to Soils. (3-0) 3 Credit Hours.
Prerequisites: ES 2013 and ES 2023, or equivalents. A study of soil properties and processes and relationships to land use, plant growth, environmental quality, and society. Course Fees: LRS1 $15; STSI $15.

ES 3133. Oceanography. (3-0) 3 Credit Hours.
Prerequisites: ES 2013, ES 2021, ES 2023, and ES 2031, or equivalents. 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. (Credit cannot be earned for both ES 3133 and GEO 3163.) Course Fees: LRS1 $15; STSI $15.

ES 3141. Watershed Processes Laboratory. (0-3) 1 Credit Hour.
Prerequisites: ES 2013, ES 2023 and ES 1213, or equivalents. Laboratory exercises and field trips designed to develop an understanding of watershed processes, watershed assessment, and watershed management. Course Fees: IUS1 $15; L001 $30; LRS1 $5; STFE $40; STSI $5.

ES 3143. Watershed Processes. (3-0) 3 Credit Hours.
Prerequisites: ES 2013, ES 2023 and ES 1213, or equivalents. This course focuses on watershed processes, watershed assessment, and watershed management. Course Fees: LRS1 $15; STFE $40; STSI $15.

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.) Course Fees: LRS1 $15; STSI $15.

ES 3163. Ornithology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, 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.) Course Fees: IUS1 $15; LRS1 $15; STSI $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. Course Fees: IUS1 $15; LRS1 $15; STSI $15.

ES 3183. Entomology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. A course covering various aspects of the biology of insects, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips may be required. Course Fees: IUS1 $15; LRS1 $15; STSI $15.

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. Course Fees: IUS1 $15; LRS1 $15; STSI $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: Spring. Course Fees: LRS1 $15; STSI $15.
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.) Course Fees: L001 $30; LRS1 $15; STFE $40; STSI $15.

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 can only be earned for ES 3223 or BIO 3263.) Course Fees: L001 $30; LRS1 $15; STFE $40; STSI $15.

ES 3953. Topics 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. Field trips may be required. May be repeated for credit when topics vary. Course Fees: LRS1 $15; STSI $15.

ES 4023. Aquatic Ecology. (3-0) 3 Credit Hours.
Prerequisites: ES 2013, ES 2021, ES 2023, and ES 2031, or equivalents. Study of aquatic ecosystems including streams, wetlands, and lakes. Topics include watershed processes, biological communities, physical habitats, nutrient cycling, energy flow, and management issues. The course culminates with individual research projects focused on local watersheds. Field trips may be required. Course Fees: LRS1 $15; STFE $40; STSI $15.

ES 4103. Global Change. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. 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. Course Fees: LRS1 $15; STFE $40; STSI $15.

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.) Course Fees: IUS1 $15; LRS1 $5; STSI $5.

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.) Course Fees: IUS1 $15; LRS1 $15; STSI $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. Course Fees: IUS1 $15; LRS1 $15; STSI $15.

ES 4133. Natural Resource Policy and Administration. (3-0) 3 Credit Hours.
Prerequisite: ES 3203 or equivalent. 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. Course Fees: LRS1 $15; STSI $15.

ES 4143. Environmental Geomorphology. (3-0) 3 Credit Hours.
Prerequisites: ES 1213 or consent of instructor, and junior or senior standing. Examination of landforms on the Earth’s surface and landscape-forming processes. Field trips may be required. Course Fees: LRS1 $15; STFE $40; STSI $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. Course Fees: LRS1 $15; STSI $15.

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. Course Fees: LRS1 $15; STSI $15.

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. Course Fees: IUS1 $15; LRS1 $15; STFE $40; STSI $15.

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 wastes materials. (Same as ES 4003. Credit cannot be earned for both ES 4183 and ES 4003.) Course Fees: LRS1 $15; STSI $15.

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.
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: Spring. Course Fees: LRS1 $15; STSI $15.

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).

ES 4213. Conservation Biology. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. 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.) Course Fees: LRS1 $15; STSI $15.

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. Course Fees: LRS1 $15; STSI $15.

ES 4243. Wildlife Management. (3-0) 3 Credit Hours.
Prerequisite: ES 3033 or BIO 3283, or equivalents. 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. (Same as BIO 4053. Credit cannot be earned for both ES 4243 and BIO 4053.) Course Fees: LRS1 $15; STSI $15.

ES 4253. Sources, Fate, and Transport of Chemicals in the Environment. (3-0) 3 Credit Hours.
Prerequisites: CHE 1083, CHE 1093, ES 2013, and ES 2023, or equivalents. Sources of chemicals in the environment. Processes regulating fate and transport of metals, organics, nutrients, salts, pathogens, and radionuclides in the environment. Course Fees: LRS1 $15; STSI $15.

ES 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisites: Permission in writing (form available) of 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. Course Fees: LRS1 $5; STSI $5.

ES 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisites: Permission in writing (form available) of 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. Course Fees: LRS1 $10; STSI $10.

ES 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Permission in writing (form available) of 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. Course Fees: LRS1 $15; STSI $15.

ES 4951. Special Studies in Environmental Science. (1-0) 1 Credit Hour.
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. Course Fees: LRS1 $5; STSI $5.

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. Course Fees: LRS1 $15; STSI $15.

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. Course Fees: LRS1 $15; STSI $15.