Environmental Sciences (ES) Courses

ES 5011. Graduate Studies in Environmental Science. (1-0) 1 Credit Hour.
This course offers an orientation to graduate study, introducing students to the professional standards and practices of our discipline. The course also offers a survey of environmental science. Development of a tentative program of studies and other relevant requirements will be discussed. Differential Tuition: $50. Course Fees: GS01 $30.

ES 5013. Survey Topics in Environmental Science. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. Analysis of the basic concepts and new scientific developments in environmental science. Case studies will cover a range of relevant topics to promote a thorough understanding of the emergent issues in environmental science. Emphasis will be placed on developing both written and verbal scientific presentation skills. (Formerly EES 5013. Same as BIO 5013. Credit can be earned for only one of the following: BIO 5013, EES 5013, or ES 5013.) Differential Tuition: $150 Course Fees: GS01 $90.

ES 5023. Environmental Statistics. (3-0) 3 Credit Hours.
Prerequisites: ES 1314 and MAT 1133 or their equivalents, or consent of instructor. Emphasis on methods and applications of statistics for environmental science. Measure of location, variability, and association. Interpretation of categorical data, hypothesis testing, and use of statistical software programs and applications. (Formerly EES 5023. Same as GEO 5023 and CE 5043. Credit can be earned for only one of the following: EES 5023, ES 5023, GEO 5023, or CE 5043.) Differential Tuition: $150 Course Fees: GS01 $90.

ES 5043. Global Change. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in the program or consent of instructor. 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 the atmosphere and environmental temperature will be examined. (Formerly EES 5043. Same as CE 6383 and GEO 5043. Credit can be earned for only one of the following: EES 5023, ES 5023, GEO 5023, or CE 5043.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5063. Environmental Microbiology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3713 or consent of instructor. To provide a basic understanding of environmental microbiology primarily from two aspects: microbial interactions with chemical pollutants in the environment and the fate of microbial pathogens in the environment. Topics covered include microbial environments, detection of bacteria and their activities in the environment, microbial biogeochemistry, bioremediation, and water quality. (Formerly EES 5063. Same as BIO 5063 and CE 5673. Credit can be earned for only one of the following: BIO 5063, CE 5020, CE 5673, EES 5043, ES 5043, or GEO 5043.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5083. Mammalogy. (3-0) 3 Credit Hours.
Prerequisite: Graduate Standing. An advanced course covering various aspects of the biology of mammals, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips may be required. Differential Tuition: $150 Course Fees: GS01 $90.

ES 5093. Herpetology. (3-0) 3 Credit Hours.
Prerequisite: Graduate Standing. An advanced course covering various aspects of the biology of herpetofaunal, including anatomy, physiology, systematics, evolution, behavior, ecology, and biogeography. Field trips may be required. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5103. Applied Ecology. (3-0) 3 Credit Hours.
The impact of humanity's activities on the environment: their effect on water, land, animal, and human resources. An evaluation of present and future strategies to preserve a healthy environment. (Formerly EES 5103. Credit cannot be earned for both EES 5103 and ES 5103.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5113. River Ecosystems. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in biology or environmental science, or consent of instructor. 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. Field trip required. (Same as BIO 5103. Credit cannot be earned for both BIO 5103 and ES 5113. Formerly titled "Freshwater Ecology") Differential Tuition: $150. Course Fees: GS01 $90.

ES 5133. Fundamentals of Environmental Law. (3-0) 3 Credit Hours.
Prerequisite: Graduate Standing. This course exposes students to basic legal theories relevant to contemporary environmental practice, and provides an introduction to administrative law as well as six federal environmental statutes: the Clean Air Act, Clean Water Act, National Environmental Policy Act, Endangered Species Act, Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Differential Tuition: $150. Course Fees: GS01 $90.

ES 5143. Technical Writing for Environmental Scientists. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. A course designed to give graduate students the skills necessary to write a manuscript for peer review and to prepare other professional materials for presentation or publication. Topics covered in this course include: searching the scientific literature; scientific writing style; writing graduate level papers, proposals, projects, and thesis components; preparing scientific presentations; presentation of data; using visual aids; and using word processing, spreadsheet, and presentation software. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5153. Urban Environmental Planning and Sustainability. (3-0) 3 Credit Hours.
This course examines how the concept of sustainable development applies to buildings, cities and urban regions and gives students insight into a variety of contemporary urban planning and green building issues through the sustainability lens. Ways to coordinate goals of environmental, economic, and social equity at different scales of planning are addressed, including the region, the city, the neighborhood, the site, and buildings. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5213. Environmental Geology. (3-0) 3 Credit Hours.
Prerequisite: GEO 4063 or consent of instructor. Geologic materials and processes as related to their influence on the human physical environment. Effects of landscape modification and geologic hazards such as earthquakes and landslides. Properties of minerals, rocks, and soils and geologic aspects of waste disposal and water resources are examined. Course cannot be used for graduate credit by students in Geology. (Formerly EES 5213. Credit cannot be earned for both EES 5213 and ES 5213.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5233. Experimental Design and Analysis. (3-0) 3 Credit Hours.
Prerequisite: ES 5023 or an equivalent, or consent of instructor. This course offers an orientation to graduate study, introducing students to the professional standards and practices of our discipline. The course also offers a survey of environmental science. Development of a tentative program of studies and other relevant requirements will be discussed. Differential Tuition: $50. Course Fees: GS01 $30.

ES 5113. River Ecosystems. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing in biology or environmental science, or consent of instructor. 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. Field trip required. (Same as BIO 5103. Credit cannot be earned for both BIO 5103 and ES 5113. Formerly titled "Freshwater Ecology") Differential Tuition: $150. Course Fees: GS01 $90.

ES 5133. Fundamentals of Environmental Law. (3-0) 3 Credit Hours.
Prerequisite: Graduate Standing. This course exposes students to basic legal theories relevant to contemporary environmental practice, and provides an introduction to administrative law as well as six federal environmental statutes: the Clean Air Act, Clean Water Act, National Environmental Policy Act, Endangered Species Act, Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Differential Tuition: $150. Course Fees: GS01 $90.

ES 5143. Technical Writing for Environmental Scientists. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. A course designed to give graduate students the skills necessary to write a manuscript for peer review and to prepare other professional materials for presentation or publication. Topics covered in this course include: searching the scientific literature; scientific writing style; writing graduate level papers, proposals, projects, and thesis components; preparing scientific presentations; presentation of data; using visual aids; and using word processing, spreadsheet, and presentation software. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5153. Urban Environmental Planning and Sustainability. (3-0) 3 Credit Hours.
This course examines how the concept of sustainable development applies to buildings, cities and urban regions and gives students insight into a variety of contemporary urban planning and green building issues through the sustainability lens. Ways to coordinate goals of environmental, economic, and social equity at different scales of planning are addressed, including the region, the city, the neighborhood, the site, and buildings. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5213. Environmental Geology. (3-0) 3 Credit Hours.
Prerequisite: GEO 4063 or consent of instructor. Geologic materials and processes as related to their influence on the human physical environment. Effects of landscape modification and geologic hazards such as earthquakes and landslides. Properties of minerals, rocks, and soils and geologic aspects of waste disposal and water resources are examined. Course cannot be used for graduate credit by students in Geology. (Formerly EES 5213. Credit cannot be earned for both EES 5213 and ES 5213.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5233. Experimental Design and Analysis. (3-0) 3 Credit Hours.
Prerequisite: ES 5023 or an equivalent, or consent of instructor. Fundamental concepts of the statistical design and analysis of environmental experiments will be presented. Students will be required to design experiments and to analyze data using computer software. (Formerly EES 5233. Credit cannot be earned for both EES 5233 and ES 5233.) Differential Tuition: $150. Course Fees: GS01 $90.
ES 5243. Advanced Plant Ecology. (3-0) 3 Credit Hours.
Prerequisites: BIO 3283 and BIO 3292, or consent of instructor. A study of the major biomes of the world, including North America and Texas, and the factors that influence the development of these biomes. Special consideration is given to species interactions that lead to high and low density species. (Formerly EES 5243. Same as BIO 5243. Credit can be earned for only one of the following: BIO 5243, EES 5243, or ES 5243.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5493. Water Pollution Control. (3-0) 3 Credit Hours.
Principles and methods of water pollution control process design and operation; selection and optimization of total treatment processes as well as appurtenances and accessory equipments; and methods involved in the design process and the selection of the hardware. (Formerly EES 5493. Credit cannot be earned for both EES 5493 and ES 5493.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5503. Policy and Principles of Environmental Law. (3-0) 3 Credit Hours.
Prerequisite: ES 3203 or ES 5133, or equivalent. This course exposes students to advanced policies and principles relevant to contemporary environmental practice, and provides advanced knowledge of the six federal environmental statutes: the Clean Air Act, Clean Water Act, National Environmental Policy Act, Endangered Species Act, Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). (Same as PAD 5483. Credit can be earned for only one of the following: EES 5503, ES 5503, or PAD 5483.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 5513. Aquatic Ecology. (3-0) 3 Credit Hours.
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. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5523. Watershed Processes. (3-0) 3 Credit Hours.
This course focuses on watershed processes, watershed assessment, and watershed management. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5533. Planning and Response to Environmental Disasters. (3-0) 3 Credit Hours.
This course will focus on planning, response and recovery from large, complex environmental disasters and the roles and implications for Response Managers and Environmental Scientists. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5743. Ichthyology. (3-0) 3 Credit Hours.
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. Differential Tuition: $150. Course Fees: GS01 $90.

ES 5753. Conservation and Restoration Ecology. (3-0) 3 Credit Hours.
The class topics will include 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 arose, how it has been maintained by natural processes, and how its destruction can be prevented. (Same as BIO 5753. Credit cannot be earned for both BIO 5753 and ES 5753.) Differential Tuition: $150. Course Fees: GS01 $90.
ES 6013. Instrumental Environmental Methods for R Coding in Environmental Science and Ecology. (3-0) 3 Credit 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 in a data science workflow. Differential Tuition: $150. Course Fees: GS01 $90.

ES 6023. Plant Ecophysiology. (3-0) 3 Credit Hours.
A survey of physiological approaches to understanding plant-environment interactions from the functional perspective. Lectures cover physiological adaptation; limiting factors; resources acquisition/ allocation; photosynthesis, carbon, energy balance; water use, relations nutrient relations; linking ecophysiology and stable isotopes; stress physiology; life history physiology; evolution of physiological performance; ecophysiology at the population, community, ecosystem levels. Differential Tuition: $150. Course Fees: GS01 $90.

ES 6033. Applied Multivariate Statistics for Ecological Data. (3-0) 3 Credit Hours.
Prerequisite: ES 5023. This course provides students with a conceptual and practical understanding of the application of multivariate statistics in environmental science and ecology. Course will include analysis such as classification (creating discrete groups) and dimension reduction, as well as visualization techniques such as ordination. Applications include habitat classification, clustering (i.e., community classification), and exploring community-environment relationships. Differential Tuition: $150. Course Fees: GS01 $90.

ES 6043. Soil Chemistry. (3-0) 3 Credit Hours.
Prerequisites: CHE 1113 and CHE 2603. Overview of basic soil science and soil chemistry. Examination of the interactions between soil solids, precipitates, and solution phases will include mineralogy, ion exchange, adsorption/desorption, soil colloid behavior, acidic/basic soils, salinity, solid/solution phase interactions, and biological features. Differential Tuition: $150. Course Fees: GS01 $90.

ES 6053. Sustainability and Renewable Energy. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. This course provides an introduction to energy systems and renewable energy resources. It will be a scientific examination of the energy field and an emphasis on alternate energy sources, their technology, application, and how they can lead to a more sustainable future. The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, and then focus on alternate, renewable energy sources and how they can lead to sustainability. Differential Tuition: $150. Course Fees: GS01 $90.

ES 6063. Human Dimensions of Wildlife. (3-0) 3 Credit Hours.
This course will focus on the human dimensions of wildlife and will introduce students to how people's knowledge, values, opinions, and behaviors influence wildlife management. We will explore the ways that economics, politics, culture, and society shape wildlife management decisions and we will learn about conservation strategies that consider human dimensions. This course will have an emphasis on the human dimensions of wildlife management and conservation on private lands in Texas. Differential Tuition: $150. Course Fees: GS01 $90.

ES 6103. Environmental Assessment. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing. 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 will use this information to prepare a hypothetical Environmental Impact Statement (EIS). (Formerly EES 6103 and ES 5203. Credit can be earned for only one of the following: EES 6103, ES 5203, or ES 6103.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6133. Methods in Field Ecology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3283 or an equivalent. Examination of techniques to collect, identify, and preserve plants and animals. Field methods used in the analysis of populations and communities are considered. (Formerly EES 6133. Same as BIO 6133. Credit can be earned for only one of the following: BIO 6133, EES 6133, or ES 6133.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6213. Advanced Ecology. (3-0) 3 Credit Hours.
Prerequisite: BIO 3283 or an equivalent. Interaction of organisms with their environment, competition, distribution, succession, and factors that control growth and dispersal. Special consideration is given to the concepts of climax, succession, and land management. (Formerly EES 6213. Same as BIO 6213. Credit can be earned for only one of the following: BIO 6213, EES 6213, or ES 6213.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6273. Analyses of Environmental Problems. (3-0) 3 Credit Hours.
Prerequisite: ES 5503. This course exposes students the application of federal laws at the State level. The course will provide information on how environmental laws should be enforced, and whether the state or federal government should have the final word in specific environmental debates. (Formerly EES 6273. Credit can be earned for only one of the following: CE 6273, EES 6273, or ES 6273.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6723. Application of Federal Environmental Law at the State Level. (3-0) 3 Credit Hours.
Prerequisite: ES 5503. This course exposes students the application of federal laws at the State level. The course will provide information on how environmental laws should be enforced, and whether the state or federal government should have the final word in specific environmental debates. (Formerly EES 6723. Credit can be earned for only one of the following: CE 6723, EES 6723, or ES 6723.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6813. Water Resources. (3-0) 3 Credit Hours.
Application of management principles to the efficient use of water resources by people and their public and private institutions. Water is examined in terms of its value, use, and changing role in the context of economics, history, politics, and technology. (Formerly EES 6813. Credit can be earned for only one of the following: EES 6813, ES 6813, or GEO 6813.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6941. Environmental Science Colloquium. (1-0) 1 Credit Hour.
Prerequisite: Graduate standing. Discussions of current journal articles, reviews, and recent advances in specialized areas of the biological sciences. May be repeated for credit as topics vary. The grade report for this course is either “CR” (satisfactory participation in the colloquium) or “NC” (unsatisfactory participation in the colloquium). (Formerly EES 6941. Same as BIO 7041. Unless topic varies, credit can be earned for only one of the following: BIO 7041, EES 6941, or ES 6941.) Differential Tuition: $50. Course Fees: GS01 $30.
ES 6951. Independent Study. (0-0) 1 Credit Hour.
Prerequisites: Graduate standing and permission in writing (form available) from the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. (Formerly EES 6951-3.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6953. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing and permission in writing (form available) from the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. (Formerly EES 6951-3.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6961. Comprehensive Examination. (0-0) 1 Credit Hour.
Prerequisite: Approval of the appropriate Graduate Program Committee to take the Comprehensive Examination. Independent study course for the purpose of taking the Comprehensive Examination. May be repeated as many times as approved by the Graduate Program Committee. Enrollment is required each term in which the Comprehensive Examination is taken if no other courses are being taken that term. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination). (Formerly EES 6961.) Differential Tuition: $50. Course Fees: GS01 $30.

ES 6963. Internship. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing and consent of Graduate 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. May be repeated for credit, but not more than 3 hours will apply to the Master's degree. (Formerly EES 6963. Credit cannot be earned for both EES 6963 and ES 6963.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6973. Special Problems. (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 Problems courses may be repeated for credit when the topics vary, but not more than 6 hours, regardless of discipline, will apply to a Master's degree. Field trips may be required. (Formerly EES 6973.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 6981. Master's Thesis. (0-0) 1 Credit Hour.
Prerequisites: Permission of the Graduate Advisor of Record and thesis director. Thesis research preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. Differential Tuition: $50. Course Fees: GS01 $30.

ES 6983. Master's Thesis. (0-0) 3 Credit Hours.
Prerequisites: Permission of the Graduate Advisor of Record and thesis director. Thesis research preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. (Formerly EES 6983.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 7211. Doctoral Research. (0-0) 1 Credit Hour.
Prerequisite: Admission to candidacy for the Doctoral degree. May be repeated for credit, but no more than 15 hours may be applied to the Doctoral degree. (Formerly EES 7211-3.) Differential Tuition: $50. Course Fees: GS01 $30.

ES 7212. Doctoral Research. (0-0) 2 Credit Hours.
Prerequisite: Admission to candidacy for the Doctoral degree. May be repeated for credit, but no more than 15 hours may be applied to the Doctoral degree. (Formerly EES 7211-3.) Differential Tuition: $100. Course Fees: GS01 $60.

ES 7213. Doctoral Research. (0-0) 3 Credit Hours.
Prerequisite: Admission to candidacy for the Doctoral degree. May be repeated for credit, but no more than 15 hours may be applied to the Doctoral degree. (Formerly EES 7211-3.) Differential Tuition: $150. Course Fees: GS01 $90.

ES 7311. Doctoral Dissertation. (0-0) 1 Credit Hour.
Prerequisite: Admission to candidacy for the Doctoral degree. May be repeated for credit, but no more than 15 hours may be applied to the Doctoral degree. (Formerly EES 7311-3.) Differential Tuition: $50. Course Fees: GS01 $30.

ES 7312. Doctoral Dissertation. (0-0) 2 Credit Hours.
Prerequisite: Admission to candidacy for the Doctoral degree. May be repeated for credit, but no more than 15 hours may be applied to the Doctoral degree. (Formerly EES 7311-3.) Differential Tuition: $100. Course Fees: GS01 $60.

ES 7313. Doctoral Dissertation. (0-0) 3 Credit Hours.
Prerequisite: Admission to candidacy for the Doctoral degree. May be repeated for credit, but no more than 15 hours may be applied to the Doctoral degree. (Formerly EES 7311-3.) Differential Tuition: $150. Course Fees: GS01 $90.