ENVIRONMENTAL SCIENCE, BS

Program Description

Introduction

The mission of the Bachelor of Science program in Environmental Science is to educate students to succeed in their chosen careers, to transfer environmental knowledge to the community and to peers, and to provide an environmentally literate workforce and citizenry. The program is intended to provide the environmental science major with a broad foundation in the sciences and mathematics, as well as specialized knowledge in Marine and Coastal Resources, Earth System Science, Environmental Health and Monitoring, Policy and Regulations, and Science Education concentration areas. The environmental science curriculum prepares students for career positions in environmental science or science education, or for further professional development.

Student Learning Outcomes

Students will:

- Demonstrate a command of environmental science concepts and principles at the undergraduate level.
- Analyze and interpret a variety of environmental science data, and
- Communicate environmental science information effectively at the undergraduate level, in oral and written form, with appropriate use of technology.

Fast Track from Bachelor’s to Master’s Degree

The university allows the opportunity for high-achieving students to count a select number of graduate credits toward their undergraduate degree and thereby obtain a graduate degree at an accelerated pace. For more information, see Fast Track Environmental Science, BS and Environmental Science, MS (http://catalog.tamucc.edu/undergraduate/science-engineering/fast-track/fast-track-environmental-science-bs-ms/).

General Requirements

Students who wish to obtain a Bachelor of Science degree in Environmental Science may do so by following one of five curriculum plans referred to as concentrations. The concentration options include Earth Systems Science, Marine and Coastal Resources, Environmental Health and Monitoring, Policy and Regulations, and Science Education. A prospective 4-8 level science teacher could obtain a BS in Environmental Science while following the science education concentration. Information on the BS in Environmental Science - Science Education Concentration is found in the College of Science and Engineering Science, Mathematics and Technology Education section of the catalog. Details of the requirements for obtaining a teaching certificate are provided in the College of Education and Human Development section of this catalog.

The minimum requirement for a Bachelor of Science Degree in Environmental Science with a concentration in Earth Systems Science, Marine and Coastal Resources, Environmental Health and Monitoring, or Policy and Regulations is a total of 120 hours.

Program Requirements

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ESCI 1401</td>
<td>Environmental Science I: Intro to Environmental Science</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 1406</td>
<td>Biology I</td>
<td>4</td>
</tr>
<tr>
<td>GEOL 3443</td>
<td>Environmental Geology</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1401</td>
<td>General Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 2425</td>
<td>University Physics I</td>
<td>4</td>
</tr>
<tr>
<td>ESCI 3202</td>
<td>Professional Skills</td>
<td>2</td>
</tr>
<tr>
<td>ESCI 3351</td>
<td>Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>ESCI 3403</td>
<td>Introduction to Meteorology</td>
<td>4</td>
</tr>
<tr>
<td>ESCI 4335</td>
<td>Climate and Climate Variability</td>
<td>3</td>
</tr>
<tr>
<td>ESCI 4498</td>
<td>Internship in Environmental Science</td>
<td>2</td>
</tr>
<tr>
<td>ESCI 4202</td>
<td>Issues in Environmental Science</td>
<td>2</td>
</tr>
<tr>
<td>ESCI 3443</td>
<td>Environmental Biology</td>
<td>8</td>
</tr>
<tr>
<td>GEOL 3443</td>
<td>Environmental Geology</td>
<td></td>
</tr>
</tbody>
</table>

1 Full-time, first time in college students are required to take the first-year seminars.
   - UNIV 1101 First-Year Seminar I (1 sch)
   - UNIV 1102 First-Year Seminar II (1 sch)
Earth System Science Concentration
This concentration is appropriate for students preparing for careers in earth system science, meteorology, or other fields. Students preparing for graduate school are strongly encouraged to take additional hours in consultation with their faculty mentor.

In addition to the courses listed below, it is recommended that students choosing this concentration take Calculus I (MATH 2413) as part of the University Core requirements and University Physics I (PHYS 2425) as part of the Foundations requirements.

<table>
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<tr>
<th>Code</th>
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<tr>
<td>MATH 2414</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 3311</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 3342</td>
<td>Applied Probability and Statistics **</td>
<td>3</td>
</tr>
</tbody>
</table>

Designated Electives
Select 13 hours with written approval of the faculty mentor (at least 7 hours must be upper-level) of the following:

- BIOL 3428 Principles of Ecology
- ESCI 4360 Physical Oceanography
- MATH 2305 Discrete Mathematics I
- MATH 3315 Differential Equations
- MATH 2415 Calculus III
- GEOL 3442 Geomorphology
- GEOL 4316 Marine Geoscience
- GEOL 4411 Sedimentation and Stratigraphy
- GEOL 4444 Hydrogeology
- GISC 3421 Visualization for GIS

Total Hours 27

* Online offering
^ Blended offering

Marine and Coastal Resources Concentration
This concentration is appropriate for students planning careers in marine and coastal resources research or management. Students preparing for graduate school are strongly encouraged to take additional hours in consultation with their faculty mentor.

In addition to the courses listed below, it is recommended that students choosing this concentration take either MATH 1442 Statistics for Life (4 sch) or MATH 2413 Calculus I (4 sch) as part of the University Core requirements and take either PHYS 1401 General Physics I (4 sch) or PHYS 2425 University Physics I (4 sch) as part of the Foundations requirements. MATH 2413 Calculus I (4 sch) is strongly recommended for students anticipating graduate school or research careers; also, it is a prerequisite to some of the optional courses listed below under the concentration. If MATH 1442 Statistics for Life (4 sch) is not taken, then MATH 3342 Applied Probability and Statistics (3 sch) is required from the designated elective hours.

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<tr>
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<tr>
<td>BIOL 1407</td>
<td>Biology II</td>
<td>4</td>
</tr>
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<td>ESCI 4301</td>
<td>Environmental Regulations</td>
<td>3</td>
</tr>
</tbody>
</table>

Designated Electives
Select 24 hours with written approval of the faculty mentor (at least 18 hours must be upper-level) from the following:

- BIOL 2421 Microbiology
- BIOL 3428 Principles of Ecology
- BIOL 4405 Limnology
- BIOL 4336 Marine Ecology
- BIOL 4444 Estuarine Organisms
- CHEM 3411 Organic Chemistry I
- CHEM 3412 Organic Chemistry II
- ESCI 4230 Oil Spill Prevention and Response Theory
- CHEM 4344 Chemical Oceanography
- CHEM 4443 Environmental Chemistry
Environmental Health and Monitoring Concentration
This concentration is appropriate for students planning careers in environmental health, environmental assessment and remediation, and environmental management. Students preparing for graduate school are strongly encouraged to take additional hours in consultation with their faculty mentor.

In addition to the courses listed below, it is recommended that students choosing this concentration take either MATH 1442 Statistics for Life (4 sch) or MATH 2413 Calculus I (4 sch) as part of the University Core requirements and take either PHYS 1401 General Physics I (4 sch) or PHYS 2425 University Physics I (4 sch) as part of the Foundations requirements. MATH 2413 Calculus I (4 sch) is strongly recommended for students anticipating graduate school or research careers; also, it is a prerequisite to some of the optional courses listed below under the concentration. If MATH 1442 Statistics for Life (4 sch) is not taken, then MATH 3342 Applied Probability and Statistics (3 sch) is required from the designated-elective hours.

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<td>ESCI 4301</td>
<td>Environmental Regulations</td>
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<tr>
<td>ESCI 4320</td>
<td>Environmental Health</td>
<td>3</td>
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<tr>
<td>CHEM 3411</td>
<td>Organic Chemistry I</td>
<td>4</td>
</tr>
</tbody>
</table>

Designated Electives
Select 13 hours with written approval of the faculty mentor (at least 11 hours must be upper-level) from the following:

- BIOL 3430 Physiology
- BIOL 4408 Microbial Diversity and Ecology
- ESCI 4400 Environmental Microbiology
- BIOL 4406 Immunology
- BIOLS 4406 Immunology
- BIOL 4433 Parasitology
- BIOL 4336 Marine Ecology
- BIMS 4327 Introduction to Toxicology
- CHEM 3412 Organic Chemistry II
- CHEM 3417 Quantitative Analysis
- CHEM 3418 Instrumental Analysis

- ESCI 4270 Hazardous Waste Operations and Emergency Response Theory
- ESCI 4230 Oil Spill Prevention and Response Theory
- MATH 3342 Applied Probability and Statistics **

Total Hours 31

* Online offering
^ Blended offering

Policy and Regulations Concentration
This concentration is appropriate for students anticipating careers in environmental or natural resource regulation or environmental law. Students preparing for graduate school are strongly encouraged to take additional hours in consultation with their faculty mentor.

In addition to the courses listed below, it is recommended that students choosing this concentration take either MATH 1442 Statistics for Life (4 sch) or MATH 2413 Calculus I (4 sch) as part of the University Core requirements and take either PHYS 1401 General Physics I (4 sch) or PHYS 2425 University Physics I (4 sch) as part of the Foundations requirements. MATH 2413 Calculus I (4 sch) is strongly recommended for students anticipating graduate school or research careers; also, it is a prerequisite to some of the optional courses listed below under the concentration. If MATH 1442 Statistics for Life (4 sch) is not taken, then MATH 3342 Applied Probability and Statistics (3 sch) is required from the designated-elective hours.

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<td>Environmental Health</td>
<td>3</td>
</tr>
<tr>
<td>POLS 3313</td>
<td>The Legislative Process</td>
<td></td>
</tr>
<tr>
<td>POLS 3342</td>
<td>Introduction to Public Policy</td>
<td></td>
</tr>
<tr>
<td>MATH 3342</td>
<td>Applied Probability and Statistics **</td>
<td></td>
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Total Hours 27

* Online offering
^ Blended offering

Science Education Concentration
Information on the Bachelor of Science Degree in Environmental Science with a science education concentration is found in the College of Science and Engineering, Science, Mathematics and Technology Education (http://catalog.tamucc.edu/undergraduate/science-engineering/teaching-certificates/environmental-science-bs-grades-4-8-science-education-concentration/) section of the catalog.
Courses

ESCI 1401 Environmental Science I: Intro to Environmental Science
4 Semester Credit Hours (4 Lecture Hours)
Principles of the scientific method and critical thinking provide a foundation for subsequent consideration of environmental issues through a multidisciplinary approach. Laboratory exercises and local field experiences reinforce concepts introduced in the lectures. Fall, Spring.
Co-requisite: SMTE 0096.
TCCNS: ENVR 1401

ESCI 1490 Selected Topics
1-4 Semester Credit Hours (1-4 Lecture Hours)
Subject materials variable. May be repeated for credit when topics are significantly different. Faculty approval required. Offered on sufficient demand.

ESCI 3202 Professional Skills
2 Semester Credit Hours (2 Lecture Hours)
Presentation and discussion of selected topics relating to the professional skills of practicing environmental scientists including literature searches, reviews, paper presentation, professional and career opportunities, professional ethics. Fall, Spring.

ESCI 3351 Oceanography
3 Semester Credit Hours (3 Lecture Hours)
Methods and principles of oceanography. A survey of oceanography with emphasis placed on the physical processes affecting water and water masses of the world oceans. Fall (on sufficient demand), Spring.
Prerequisite: CHEM 1412, ESCI 1401 or GEOL 1403.

ESCI 3403 Introduction to Meteorology
4 Semester Credit Hours (4 Lecture Hours)
This course is an introduction to meteorology and the dynamics of planetary atmospheres. Emphasis on atmospheric accretion, composition, evolution, structure, and dynamics. Lab exercises cover basic measurement techniques, weather maps, and forecasting. Fall, Spring (on sufficient demand).
Co-requisite: SMTE 0096.

ESCI 3443 Environmental Biology
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
Historical, contemporary, and projected concerns of human activities on biological aspects of ecosystem functioning.
Prerequisite: BIOL 1407.
Co-requisite: SMTE 0096.

ESCI 4130 Oil Spill Prevention and Response Lab
1 Semester Credit Hour (1 Lab Hour)
Practical techniques for control, containment, countermeasures, removal, and disposal of oil spills in an environmentally safe manner. Field exercises will include use of boats, booms and skimmers. Fall, Spring, Summer (on sufficient demand).
Prerequisite: ESCI 4230.
*May be taken concurrently.
Co-requisite: SMTE 0096.

ESCI 4170 Hazardous Waste Operations and Emergency Response Lab
1 Semester Credit Hour (1 Lab Hour)
Practical techniques for handling, reducing, and disposing of hazardous wastes in an environmentally safe manner. Lab exercises in use of personal protective gear and safe handling of hazardous substances. Fall, Spring, Summer (on sufficient demand).
Prerequisite: ESCI 4270.
Co-requisite: ESCI 4270, SMTE 0096.

ESCI 4201 Scientific Diving Techniques
2 Semester Credit Hours (2 Lecture Hours)
Theory, science, and art of underwater diving technology and its application to scientific objectives. Course helps fulfill some training requirements of the Texas A&M University-Corpus Christi Guidelines for scientific diving.

ESCI 4202 Issues in Environmental Science
2 Semester Credit Hours (2 Lecture Hours)
Exploration of major issues in environmental science posing past, present and future challenges. Selected readings, student presentations and papers.
Prerequisite: ESCI 1401.

ESCI 4230 Oil Spill Prevention and Response Theory
2 Semester Credit Hours (2 Lecture Hours)
Historical perspective of laws and regulations governing oil spill prevention and response. Current methods for control, containment, countermeasures, removal, and disposal of oil spills in an environmentally safe manner. Fall, Spring, Summer (on sufficient demand).
Co-requisite: ESCI 4130.

ESCI 4270 Hazardous Waste Operations and Emergency Response Theory
2 Semester Credit Hours (2 Lecture Hours)
Study of the laws and regulations of hazardous waste management from an historical perspective followed by current techniques for handling, reducing, and disposing of hazardous wastes in an environmentally safe manner. Fall, Spring, Summer (on sufficient demand).
Co-requisite: ESCI 4230.

ESCI 4301 Environmental Regulations
3 Semester Credit Hours (3 Lecture Hours)
A survey of state and federal environmental laws and regulations, and their impact on the environment. Case studies of environmental issues and legislated regulations.
Prerequisite: POLS 2305 and 2306.

ESCI 4320 Environmental Health
3 Semester Credit Hours (3 Lecture Hours)
Overview of the toxicology and epidemiology of pollutants in the air, water and soil. Associations of environmental exposure with adverse health effects such as cancer, cardiovascular disease, and reproductive outcomes; also chemical markers and symptoms of disease. Pollutants studied include lead, asbestos, radiation, radon, noise, metals, halogenated hydrocarbons, aromatic hydrocarbons, silica, indoor air quality, formaldehyde, and outdoor air pollutants. Offered on sufficient demand.
Prerequisite: ESCI 4130.
Co-requisite: ESCI 4130.

ESCI 4321 Introduction to Soil and Groundwater Restoration
3 Semester Credit Hours (3 Lecture Hours)
Introduction to methods for restoring contaminated soil and groundwater by examining the factors and processes influencing the efficacy of remediation systems. An emphasis will be placed on the scientific principles upon which soil and groundwater remediation is based. Cross listed with GEOL 4321.

ESCI 4322 Introduction to Industrial Hygiene
3 Semester Credit Hours (3 Lecture Hours)
Introduction to health protection practices in the industrial environment. Health basis for OSHA laws, regulations. Sampling and testing procedures.
ESCI 4324  Introduction to Industrial Toxicology
3 Semester Credit Hours (3 Lecture Hours)
Review of human physiology, general concepts of toxicology: dose-response relationship, interactions between the host and the agents, risk assessment, to provide an introductory understanding of toxicology related to the chemicals in the workplace.

ESCI 4332  Wetlands and Water Quality
3 Semester Credit Hours (3 Lecture Hours)
Introduction to wetland ecosystems (natural, constructed and restored) with an emphasis on the role of wetlands in water quality. Topics include wetland systems, their history and role in society, relationships between biology, geology, ecology, hydrology and chemistry in wetland environments.
Prerequisite: BIOL 3428 and CHEM 4443 or ESCI 3443.

ESCI 4335  Climate and Climate Variability
3 Semester Credit Hours (3 Lecture Hours)
Course intended to guide environmental science majors in developing a conceptual understanding of Earth's global climate and its variability. Review of past climates, present mean state of the climate system, climate variability from seasonal to multidecadal time scales, and climate change. Special attention given to climates of the Gulf of Mexico, Caribbean Sea and surrounding land regions. Plausible climate-change scenarios, as well as mitigation and adaptation strategies are also discussed. Cross listed with ATSC 4335. Spring.
Prerequisite: (ESCI 3351 or 3403) and (PHYS 1401 or 2425).

ESCI 4340  Severe Weather
3 Semester Credit Hours (3 Lecture Hours)
Introduction to mesoscale weather systems including thunderstorms, squall lines and hurricanes, as well as the mechanisms of tornado and lightning. Methods of observing, analyzing, and predicting these severe weather systems with the interpretation of satellite and radar images will also be introduced in this class.
Prerequisite: ESCI 3403.

ESCI 4344  Air Pollution and the Clean Air Act
3 Semester Credit Hours (3 Lecture Hours)
Introduction to the chemistry and physics of air pollution and regulations. Topics include photochemistry, acid rain, air pollution meteorology and dispersion, global change, and the Clean Air Act.

ESCI 4360  Physical Oceanography
3 Semester Credit Hours (3 Lecture Hours)
Physical description of the sea, physical properties of seawater and sea ice, methods and measurements, wind-driven ocean circulation, thermohaline ocean circulation, boundary processes, waves, tides and mixing. Seasonal and interannual variability such as El Niño/Southern Oscillation phenomena. Implications for marine biology, marine geology, human impacts, other topics. Fall.
Prerequisite: PHYS 1401 or 2425.

ESCI 4365  Occupational Safety and Accident Prevention
3 Semester Credit Hours (3 Lecture Hours)
This course provides students with fundamental knowledge of regulatory requirements on occupational safety and practical techniques on accident prevention in the work environment. Offered on sufficient demand.

ESCI 4370  Hazardous Waste Operations and Emergency Response
3 Semester Credit Hours (3 Lecture Hours)
HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE Study of the laws and regulations of hazardous waste management from an historical perspective followed by current techniques for handling, reducing, and disposing of hazardous wastes in an environmentally safe manner. Lab exercises in use of personal protective gear and safe handling of hazardous substances. SMTE 0096 is a co-requisite for this course. Documented completion of this safety training is required early in the semester for continued participation in this course. Safety training given during a laboratory meeting early in the semester is required for continued participation in this course.
Co-requisite: SMTE 0096.

ESCI 4408  Environmental Microbiology
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
Relationships between microorganisms and their biotic and abiotic environment. Current topics such as air quality (i.e., molds), water quality and bioremediation will be discussed. Laboratory will include techniques for sampling from soil, air and water. Offered on sufficient demand.
Prerequisite: BIOL 2421.
Co-requisite: SMTE 0096.

ESCI 4480  Environmental Site Assessment
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
Interdisciplinary application of environmental regulations, risk assessment to specific examples. Knowledge of United States environmental regulations assumed; ESCI 4301 Environmental Regulations recommended.

ESCI 4490  Selected Topics
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
Subject materials variable. May be repeated for credit when topics are significantly different. Faculty approval required. Offered on sufficient demand.

ESCI 4496  Directed Independent Study
1-4 Semester Credit Hours
Requires a formal proposal of study to be completed in advance of registration and to be approved by the supervising faculty, the Chairperson, and the Dean of the College. Fall, Spring, Summer.

ESCI 4498  Internship in Environmental Science
1-4 Semester Credit Hours (4 Lecture Hours)
Two to four semester hours of credit may be earned by working in an internship position in a governmental agency or industry.