

ENVIRONMENTAL SCIENCE

College of Science, Health & Engineering

| BIOLOGY                         |                  |              |
|---------------------------------|------------------|--------------|
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| CHEMISTRY/BIOCHEMISTRY          |                  |              |
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| GEOLOGY                         |                  |              |
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| BS                              |                  |              |

UNDERGRADUATE PROGRAM

Required courses in the following program of study may have prerequisites. Reference the course description section for clarification.

BACHELOR OF SCIENCE (BS)

STUDENT LEARNING OUTCOMES – STUDENTS WILL:

- develop broad-based knowledge of major concepts in the area of environmental science and an understanding of fundamental roles that biology, chemistry and geology play in environmental science;
- demonstrate knowledge of the interrelationship between the geosphere, atmosphere and biosphere;
- use modern instrumentation and classical techniques for the analysis of soil and water samples and demonstrate an ability to design and carry out experiments and to interpret data;
- develop sufficient preparation in environmental science to successfully compete in a graduate or professional program or to realize employment in a environmental science-related career;
- demonstrate effective oral and written communication skills and critical thinking skills as related to the field of environmental science.

ENVIRONMENTAL SCIENCE MAJOR (132-137 CREDITS)

The Environmental Science program offers a practical, technically based, cross-disciplinary program centered on biology, chemistry and geology. The program integrates classroom work with extensive field, lab and research experience and allows students opportunities to interact with working environmental professionals. All students take an identical core of Environmental Science courses complemented by a concentration in one of the three core sciences. Motivated students have the opportunity to obtain a double major in both Environmental Science and their concentration area. Graduates leave Eastern with the opportunity for immediate employment in the environmental profession or for entry into graduate or professional school.

Although a major in Environmental Science may be declared upon arrival at Eastern, students must petition for formal admission to the program after completion of 50 credit hours of the core courses. This formal acceptance must be granted before students enroll in the junior seminar series (ENVS 391-393). To be accepted, a student must have maintained a minimum average GPA of 2.50 in the core courses. After acceptance, students must maintain a 2.50 GPA overall to remain in the program. To finish in four years, it is assumed that students will start the program with the necessary math background to enter into the calculus sequence.

Environmental Science Required Courses (88 credits)

- BIOL 171 Biology I (4)
- BIOL 172 Biology II (4)
- BIOL 173 Biology III (4)
- BIOL 270 Biological investigation (3)
- BIOL 440 Ecology (4)
- CHEM 151 General Chemistry (5)
- CHEM 152 General Chemistry (5)
- CHEM 153 General Chemistry (5)
- CHEM 316 Environmental Chemistry (5)
- DSCI 245 Data Analysis for Business (4)
- DSCI 346 Advanced Data Analysis for Business (4)
- ENVS 100 Introduction to Environmental Science (5)
- ENVS 391 Environmental Science Seminar (1)
- ENVS 392 Environmental Science Seminar (1)
- ENVS 393 Environmental Science Seminar (1)
- ENVS 488 Environmental Reg. Framework (3)

- ENVS 490 Environmental Science Senior Capstone (4)<sup>1</sup>
- GEOG 323 GIS for Environmental Science (3)
- GEOL 120 Physical Geology--The Solid Earth (5)
- GEOL 121 Physical Geology--Surficial Processes (5)
- GEOL 220 Environmental Geology (4)
- GEOL 470 Hydrogeology (4)
- MATH 161 Calculus I (5)

Environmental Emphases

Students must satisfy course requirements in any one of the following three subject areas:

ENVIRONMENTAL BIOLOGY (45 CREDITS)

Required General Biological Knowledge

Any two of the following (10 credits)

- BIOL 301 Microbiology (5)
- BIOL 302 Botany (5)
- BIOL 303 Invertebrate Zoology (5)
- BIOL 304 Vertebrate Zoology (5)

All of the following (16 credits)

- BIOL 310 Fundamentals of Genetics (5)
- BIOL 423 Evolution (5)
- BIOL 441 Ecology Lab (2)
- BIOL 444 Field Ecology (4)

Required Organism and/or Habitat-Specific Knowledge (15 credits)

- BIOL 324 Entomology (5)
- BIOL 405 Limnology (5)
- BIOL 409 Mycology (5)
- BIOL 411 Field Botany (5)
- BIOL 450 Mammalogy (5)
- BIOL 454 Ornithology (5)
- BIOL 462 Ichthyology (5)
- BIOL 481 Freshwater Invertebrate Zoology (5)

Required Applied Biology and Management (4 credits)

- BIOL 442 Conservation Biology (4)
- BIOL 443 Wildlife Management (4)
- BIOL 463 Fisheries Biology and Management (4)

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| Required environmental science credits                      | 88 credits  |
| General biological knowledge credits                        | 26 credits  |
| Required organism and/or habitat-specific knowledge credits | 15 credits  |
| Required applied biology and management credits             | 4 credits   |
| Minimum total credits for above emphasis                    | 133 credits |

ENVIRONMENTAL CHEMISTRY (47-49 CREDITS)

All Required Supporting Courses (17 credits)

- PHYS 151 General Physics (4)
- PHYS 152 General Physics (4)
- PHYS 153 General Physics (4)
- MATH 162 Calculus II (5)

All Required General Chemistry Courses (26 credits)

- CHEM 304 Quantitative Analysis (6)
- CHEM 319 Modern Inorganic Chemistry (5)
- CHEM 351 Organic Chemistry (4)
- CHEM 352 Organic Chemistry (4)
- CHEM 416 Advanced Environmental Chemistry (3)
- CHEM 421 Physical Chemistry (4)

Chemistry Elective, select one (4-6 credits)

- CHEM 353 Organic Chemistry (3) and CHEM 372 Organic Chemistry Lab I (3)
- CHEM 418 Modern Analytical Chemistry (5)
- CHEM 422 Physical Chemistry (3) and CHEM 431 Physical Chemistry Lab (1)
- CHEM 480 Biochemistry (5)

Recommended supporting courses, not required

- CSCD 210 Programming Principles I (5)
- CSCD 255 C Programming for Engineers (5)

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|--|-------------|
| Required environmental science credits   | 88 credits  |
| Required supporting credits              | 17 credits  |
| Required general chemistry credits       | 26 credits  |
| Chemistry elective credits               | 4-6 credits |
| Minimum total credits for above emphasis | 135 credits |

## ENVIRONMENTAL GEOLOGY (46-47 CREDITS)

### All Required Geology Courses (38 credits)

GEOL 122 Historical Geology (5)  
 GEOL 311 Earth Materials (4)  
 GEOL 312 Crystallography and Optical Mineralogy (4)  
 GEOL 313 Igneous and Metamorphic Petrology (4)  
 GEOL 330 Structural Geology I (4)  
 GEOL 331 Structural Geology II (4)  
 GEOL 411 Sedimentology and Stratigraphy (4)  
 GEOL 463 Environmental Geochemistry (5)  
 GEOL 475 Engineering Geology: Soils (4)

### Select any two (8–9 credits)

GEOL 360 Geologic Hazards (4)  
 GEOL 408 Invertebrate Paleontology (4)  
 GEOL 462 Principles of Geochemistry (5)

**Required environmental science credits**

**88 credits**

**Required geology credits**

**46–47 credits**

**Minimum total credits for above emphasis**

**134 credits**

<sup>1</sup>Students in the Environmental Science program will be required to take the Environmental Science capstone. Exceptions will only be made for students pursuing a double major but prior written approval of the Program Director will be required. This exception will ensure that students are not required to take two capstone courses.

## MINORS

### ENVIRONMENTAL SCIENCE MINOR (32-33 CREDITS)

#### Required Courses (28 credits)

BIOL 171 Biology I (4)  
 BIOL 172 Biology II (4)  
 CHEM 121 Chemistry and its Role in Society (5)  
 ENVS 100 Introduction to Environmental Science (5)  
 GEOL 120 Physical Geology—The Solid Earth (5)  
 GEOL 121 Physical Geology—Surficial Processes (5)

#### Elective (4–5 credits)

One elective course (4–5) at the 200-level or above in either BIOL, CHEM or GEOL subject to approval by advisor or program director

**Total minimum credits for above minor**

**32 credits**

## Environmental Science Courses

*Terms offered:* fall, winter, spring, summer (FWSU). If no terms are indicated check with the department or EagleNET.

### ENVS 100 Introduction to Environmental Science (5)

[satisfies the GECR for natural sciences, environmental science.]

*Prerequisites:* CPLA, ENGL and MATH clearance.

This course is an introductory exploration of environmental science that emphasizes a scientific approach toward understanding contemporary human interaction with the natural environment. The structure, function and interrelationships of terrestrial, aquatic and atmospheric systems are treated through the application of biological, chemical and geological principles. This course includes a weekly laboratory that uses basic quantitative techniques for collecting and analyzing data from environmental systems.

### ENVS 323 GIS Environmental Sciences (3)

*Prerequisite:* CPLA 101 or CPLA 120.

Introduction to Geographic Information Systems (GIS) with an emphasis on its applications in the environmental sciences. Course includes hands-on GIS work in the lab. This course satisfies an option for the Certificate in GIS. (Cross-listed GEOG 323)

### ENVS 391, 392, 393 Environmental Science Seminar (1, 1, 1)

*Prerequisite:* formal admission to the Environmental Science program.

This course focuses on career development for the Environmental Science student and is given in three 1-credit increments. Students may only enter the sequence in fall and all three courses must be completed sequentially in the same academic year. Interaction with working professionals and refining of oral and written presentation skills are emphasized. During the spring quarter, students will concentrate on preparations for their comprehensive mid-term program assessment and testing. To enroll in this course, students must have completed 50 credit hours in the environmental science core with a minimum GPA of 2.50 in these courses. An accepted petition for formal admission to the program is also required.

### ENVS 488 Environmental Regulatory Framework (3)

This course acquaints students with federal, state and local environmental laws, regulations and ordinances. It includes a brief historical perspective of the 1970's when most of the main laws were promulgated and examines how well they have been implemented through time. This course also brings students up-to-date on current events regarding the environment by reviewing newspaper articles, writing brief summary papers and discussing the articles in class.

### ENVS 490 Environmental Science Senior Capstone (4)

[satisfies senior capstone university graduation requirement]

*Prerequisites:* completion of ENVS 391-393 and senior standing.

The environmental science capstone is the final core course in the program. Students from the three emphasis areas will work as teams and complete an integrative project involving library research, field and lab work. The final will consist of a comprehensive oral and written examination covering all aspects of the environmental science curriculum and the student's concentration area.