

## **ENVIRONMENTAL SCIENCE**

### **ENVIRONMENTAL SCIENCE STEERING COMMITTEE**

#### **Biology**

Pasteur Hall, Room 215 (507-457-5165)  
Delong, Mundahl

#### **Chemistry**

Pasteur Hall, Room 312 (507-457-5290)  
Engen, Franz

#### **Geoscience**

Pasteur Hall, Room 114 (507-457-5260)  
Summa

### **PURPOSE**

The Environmental Science Program is an interdisciplinary program sponsored by the biology, chemistry and geoscience departments. This broadly based program is composed of a common set of introductory courses; an in-depth set of option courses in either the biology, chemistry, or geoscience areas; and a capstone experience, which involves an individual research problem and a group seminar course. Depending on the set of in-depth option courses chosen for their program, students graduate with one of following degrees:

- B.S. Biology—Environmental Science Option
- B.S. Chemistry—Environmental Science Option
- B.S. Geoscience—Environmental Science Option

Graduates of this program are broadly educated and prepared for graduate school or entry-level positions in a variety of environmental science fields. The Environmental Science Program is designed to provide students with a basic understanding of the environmental challenges that face modern society and to provide students with the skills necessary to address these challenges through a successful career in an environmental science field. The common set of introductory courses provides students with the strong, interdisciplinary science background necessary to understand, critically evaluate, and mitigate environmental problems. While pursuing the common set of introductory courses, students have additional time to choose the option portion of their programs and the department in which they will declare their major. The option portion of the program allows students to develop an in-depth understanding of an area of environmental science of their choice.

The capstone research experience fosters independent thought and hones problem-solving skills while integrating the common set of environmental courses and the option area studies with a real-life, environmental problem. Field work is an integral part of the environmental science curriculum and the capstone research project in particular. Students participate in ongoing research projects such as the one being conducted at the field station located on the Featherstone Farm in the Wiscoy Valley. The capstone seminar course sharpens communication skills and encourages interactions between students from different majors and faculty from different environmental science areas by providing a forum for discussing, analyzing, and debating environmental issues and topics related to any branch of environmental science.

At all times, students are encouraged to maintain a broad perspective and to augment their in-depth study with an understanding of the connections among public policy, economics, law, and the adjustment to social needs, which can result in the destruction or the preservation of the environment.

### **ENVIRONMENTAL SCIENCE CORE REQUIREMENTS—ALL OPTIONS**

48-50 S.H. (These courses are listed again under

each department option.)

- \* CHEM 212 Principles of Chemistry I (4)
- \* CHEM 213 Principles of Chemistry II (4)
- \* CHEM 320 Environmental Chemistry (4)
- \* BIOL 241 Basics of Life (4)
- \* BIOL 242 Organismal Diversity (4)
- BIOL 312 General Ecology (3)
- BIOL 313 General Ecology Laboratory (1)
- \* GEOS 120 Dynamic Earth (4)
- \* GEOS 130 Earth and Life Through Time (4)
- \* GEOS 240 Hydrogeology (4)

Two of the following three courses:

- BUSA 451 Environmental Law (3)
- ECON 315 Environmental and Natural Resource Economics (3)
- \* POLS 340 Environmental Policy (3)

One of the following courses NOT within the major discipline of the elected option:

- BIOL 315 Environmental Biology (3)
- BIOL 335 Plant Ecology (4)
- BIOL 360 Entomology (4)
- BIOL 415 Ecology of Large Rivers (4)
- BIOL 420 Limnology (4)
- \* CHEM 425 Analytical Chemistry I (4)
- CHEM 436 Topics in Environmental Chemistry (3)
- \* GEOS 225 Environmental Geoscience (3)
- GEOS 310 Non-Renewal Natural Resources (3)
- GEOS 315 Surficial Processes and Soils (4)
- GEOS 370 GIS and Imaging Techniques (3)
- GEOS 420 Applied Hydrogeology (4)

A research capstone course from the major discipline of the elected option:

- BIOL 499 Student Research (3)
- CHEM 430 Individual Problems in Chemistry (2-3)
- GEOS 400 Directed Research in Geoscience (2-3)

A seminar capstone course from the major discipline of the elected option:

- BIOL 495 Seminar in Biology—Environmental Science (1)
- CHEM 475 Seminar in Chemistry—Environmental Science (1)
- GEOS 475 Geoscience Seminar—Environmental Science (1)

B.S. MAJOR BIOLOGY -  
ENVIRONMENTAL SCIENCE OPTION  
94-95 S.H. (No Minor required)

BIOLOGY CORE COURSES (18 S.H.)

- 241 Basics of Life (4)
- 242 Organismal Diversity (4)
- 312 General Ecology (3)
- 313 General Ecology Lab (1)
- 308 Cell Biology (3)
- 310 Genetics (3)

ENVIRONMENTAL SCIENCE OPTION

REQUIREMENTS (12 S.H.)

- 318 Invertebrate Zoology (4) OR 319 Vertebrate Biology (4)
- 335 Plant Ecology (4) OR 350 Plant Taxonomy (4)
- 315 Environmental Biology (3)
- 495 Seminar—Environmental Science (1)

ENVIRONMENTAL SCIENCE OPTION ELECTIVES (7 S.H.)

- 318 Invertebrate Zoology (4)
- 319 Vertebrate Biology (4)
- 320 Ornithology (4)
- 335 Plant Ecology (4)
- 350 Plant Taxonomy (4)
- 360 Entomology (4)
- 380 Evolution (3)
- 405 Fishery Biology (3)
- 409 Microbiology (4)
- 415 Ecology of Large Rivers (4)
- 420 Limnology (4)
- 423 Ecosystem Ecology (3)
- 424 Biogeography (3)
- 425 Animal Behavior (3)

BIOLOGY CAPSTONE REQUIREMENT (3 S.H.)

- 499 Student Research (3)

OTHER REQUIRED COURSES (54-55 S.H.)

Chemistry (16 S.H.)

- \* 212, \*213 Principles of Chemistry I, II (8)
- \* 320 Environmental Chemistry (4)
- \* 340 Organic Chemistry Survey (4)

Geoscience (12 S.H.)

- \* 120 Dynamic Earth (4)
- \* 130 Earth and Life Through Time (4)
- \* 240 Hydrogeology (4)

Mathematics (9 S.H.)

- \* 150 \*155 Math for Earth & Life Science I, II (6)
- \* 305 Biometry (3)

Note: Calculus I, II (160, 165) may be submitted for MATH 150, 155.

Physics (8 S.H.)

- \*201, \*202 General Physics (8)

Note: University Physics I, II (221, 222) may be submitted for General

Physics I, II

Two of the following three courses (6 S.H.)

- BUSA 451 Environmental Law (3)
- ECON 315 Environmental and Natural Resources (3)
- \* POLS 340 Environmental Policy (3)

One of the following five courses (3-4 S.H.)

- \* CHEM 425 Analytical Chemistry I (4)
- CHEM 436 Topics in Environmental Chemistry (3)
- \* GEOS 225 Environmental Geoscience (3)
- GEOS 310 Non-Renewal Natural Resources (3)
- GEOS 315 Surficial Processes and Soils (4)
- GEOS 420 Applied Hydrogeology (4)

B.S. MAJOR CHEMISTRY -  
ENVIRONMENTAL SCIENCE OPTION  
92-93 S.H.

CHEMISTRY CORE COURSES (29 S.H.)

- 212 Principles of Chemistry I (4)
- 213 Principles of Chemistry II (4)

- 350 Principles of Organic Chemistry I (4)
- 351 Principles of Organic Chemistry II (5)
- 412 Physical Chemistry I (3)
- 413 Physical Chemistry I Lab (1)
- \* 425 Analytical Chemistry I (4)
- 426 Analytical Chemistry II (4)

#### ENVIRONMENTAL SCIENCE OPTION

##### REQUIREMENTS (10 S.H.)

- \* 320 Environmental Chemistry (4)
- 436 Topics in Environmental Chemistry (3)
- 475 Chemistry Seminar (1)

##### ENVIRONMENTAL SCIENCE OPTION ELECTIVES (4 S.H.)

- 400 Biochemistry I (4)
- 401 Biochemistry II (3)
- 410 Polymer Chemistry (2)
- 414 Physical Chemistry II (3)
- 415 Physical Chemistry Lab II (2)
- 420 Topics in Industrial Chemistry (2)
- 427 Topics in Instrumental Chemistry (2)
- 428 Chemical Separations (3)
- 450 Advanced Organic Chemistry (2)
- 470 Isotope, Nuclear and Radiochemistry (2)
- 475 Seminar in Chemistry (1) OR other advanced chemistry electives as approved by the Chemistry Department

#### OTHER REQUIRED COURSES (49-50 S.H.)

##### Biology (12 S.H.)

- \* 241 Basics of Life (4)
- \* 242 Organismal Diversity (4)
- 312,313 General Ecology lecture and lab (4)

##### Geoscience (12 S.H.)

- \* 120 Dynamic Earth (4)
- \* 130 Earth and Life through Time (4)
- \* 240 Hydrogeology (4)

##### Mathematics (8 S.H.)

- \* 160, \*165 Calculus I, II (8)

##### Physics (8 S.H.)

- \* 221, \*222 University Physics I, II (8)

##### Two of the following three courses (6 S.H.)

- BUSA 451 Environmental Law (3)
- ECON 315 Environmental and Natural Resources (3)
- \* POLS 340 Environmental Policy (3)

##### One of the following eight courses (3-4 S.H.)

- BIOL 315 Environmental Biology (3)
- BIOL 335 Plant Ecology (4)
- BIOL 360 Entomology (4)
- BIOL 415 Ecology of Large Rivers (4)
- BIOL 420 Limnology (4)
- \* GEOS 225 Environmental Geoscience (3)
- GEOS 310 Non-Renewable Natural Resources (3)
- GEOS 315 Surficial Processes and Soils (4)
- GEOS 370 GIS and Imaging Techniques (3)
- GEOS 420 Applied Hydrogeology (4)

B.S. MAJOR - GEOSCIENCE:  
ENVIRONMENTAL SCIENCE OPTION  
92 - 96 S.H. (No Minor Required)

GEOSCIENCE CORE COURSES (23 S.H.)

- \* 120 Dynamic Earth (4)
- \* 130 Earth & Life through Time (4)
- 220 Minerals & Rocks (4) |
- 280 Field & Analytical Methods I (2)
- 330 Structural Geology (4)
- 340 Sedimentology & Stratigraphy (4)
- 475 Geoscience Seminar (1)

Note: Majors in all options are urged to take a geology summer field course prior to graduation. This can satisfy the requirement GEOS 480, or an upper-division elective.

ENVIRONMENTAL SCIENCE OPTION  
REQUIREMENTS (20-21 S.H.)

- \* 225 Environmental Geoscience (3)
- \* 240 Hydrogeology (4)
- 315 Surficial Processes & Soils (4)
- 370 GIS & Imaging Techniques (3)
- 420 Applied Hydrogeology (4)
- 400 Directed Research in Geoscience (2-3)

OTHER REQUIRED COURSES (43-44 S.H.)

Biology (12 S.H.)

- \* 241 Basics of Life (4)
- \* 242 Organismal Diversity (4)
- 312, 313 General Ecology, Ecology Lab (4)

Chemistry (12 S.H.)

- \* 212, \*213, Principles of Chemistry I, II (8)
- \* 320 Environmental Chemistry (4)

Mathematics (6 S.H.)

- \* 150, \*155 Math for Earth & Life Sciences I, II (6)

Physics (4 S.H.)

- \* 115 Conceptual Physics (4)

Two of the following three courses (6 S.H.)

- BUSA 451 Environmental Law (3)
- ECON 315 Environmental & Natural Resources Economics (3)
- \* POLS 340 Environmental Policy (3)

One of the following courses (3-4 S.H.)

- BIOL 315 Environmental Biology (3)
- BIOL 335 Plant Ecology (4)
- BIOL 360 Entomology (4)
- † BIOL 415 Ecology of Large Rivers (4) (See Note below.)
- BIOL 420 Limnology (4)
- \* CHEM 425 Analytical Chemistry I (4)
- CHEM 436 Topics in Environmental Chemistry (3)

† If students take BIOL 415 as their elective from this group of courses, they may not choose BIOL 415 as an elective course under "Environmental Science Option Electives for Geoscience" below.

ENVIRONMENTAL SCIENCE OPTION  
ELECTIVES FOR GEOSCIENCE (6-8 S.H.)  
(See Note below.)

Courses totaling 6-8 S.H. to be chosen from:

	GEOS	310	Non-renewable Natural Resources (3)
	GEOS	430	Chemistry & Physics of the Earth (3)
	GEOS	480	Field & Analytical Methods II (1)
	BIOL	415	Ecology of Large Rivers (4)
*	STAT	210	Statistics (3)
	BUSA	451	Environmental Law (3) OR
	ECON	315	Environmental & Natural Resources (3) OR
* POLS		340	Environmental Policy (3)

Note: The courses selected as "Environmental Science Option Electives" must not duplicate the courses selected under "Other Required Courses" above.