

# Environmental Science

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The environmental science program is multidisciplinary in its approach to environmental problems. The philosophy of the program is that environmental problems are best solved through careful scientific investigation within the context of social, political, and ethical structures. To prepare individuals to achieve this goal, the environmental science major is multidisciplinary in its structure. Required coursework in general and advanced science gives students a solid foundation for scientific investigations. Courses in the humanities and social sciences broaden students' perspective and allow them to analyze problems for unique solutions. Students have the opportunity to develop field skills in near-by aquatic and terrestrial ecosystems. This combination of courses and field experience provides students with a broad background to understand environmental problems and a strong scientific approach to find answers to those problems.

The environmental science major has been designed to provide students with the background to pursue careers in the environmental field. Students have the flexibility to focus their studies in a specific area such as biology, chemistry, education, public policy, or communications by obtaining a minor in that area. Students could pursue graduate programs in environmental science, environmental law, or education. They may also choose to prepare for careers in environmental monitoring or testing, environmental communications, watershed management, or environmental education.

Environmental science at Saint Vincent College builds on the strength of our liberal arts tradition. Students in this major will be challenged to think critically about environmental problems. They will be able to express themselves clearly in both their written work and through oral communication. They will understand and be able to apply scientific principles to environmental issues and demonstrate this ability in their senior research project. To accomplish these goals the environmental science major has the following components:

- A strong foundation in math and natural science with at least 40 credits in this area including advanced environmental science courses.
- A multidisciplinary approach with required credits from seven different departments in the natural sciences, social sciences, and humanities.
- A flexible schedule. Students have 28 elective credits to tailor their education to fit their career goals.
- A strong emphasis in laboratory and field work. Students are required to complete 300 hours of laboratory work. Several courses offer extensive opportunities for field studies in many unique ecosystems near campus.
- Opportunities to expand class work through internships, summer research, and programming at the Saint Vincent College Environmental Education Center.
- An emphasis on writing throughout the program. Many of the required courses are "writing designated" indicating participation by the professor in the College's Interdisciplinary Writing Program. Through this program students learn to write within their disciplines following a campus-wide model for good writing.
- All students are required to complete a senior research project, which serves as a "capstone experience." In the Spring semester of their junior year students prepare a proposal for original research.

Students then conduct their research and write a senior thesis under the guidance of an environmental science faculty mem-

ber. The research project provides the student with first-hand experience investigating and reporting on an environmental problem.

## Requirements for Environmental Chemistry:

See Chemistry Department.

## Requirements for Environmental Affairs

See McKenna School.

## Requirements for Certification in Environmental Education K-12, and elementary certification with Environmental Science majors:

See the Education Department for teacher certification requirements in Secondary or Elementary Education. Interested students must contact the Chairperson of the Education Department and confer with their academic advisor. All programs begin in the sophomore year by registering for ED 100 Foundations of Education.

## Environmental Science (B.S.)

### Requirements for a Bachelor of Science Degree in Environmental Science

(See Core Curriculum requirements.)

#### Environmental Science Major Requirements (60 credits):

ES 150-152	Earth Systems Science and Lab	4
MA 109-110	Calculus I and II*	8
CH 101-104	General Chemistry I and II and Labs*	8
CH 216, 218	Quantitative Analysis and Lab	4
BL 150-153	General Biology I and II and Labs	8
BL 232, 233	Ecology and Lab	4
PH 111, 113	General Physics I and Lab	4
Humanities:	Choose at least two:	6
EL 111	Green Writing: Literature and the Environment*	
HI 226	Society and the Environment: the American Experience*	
PL 217	Environmental Ethics*	
Social Science:	Choose at least two:*	6
PS 390	Environmental Law and Policy	
SO 161	Environmental Sociology	
BA 275	Introduction to GIS	
Advanced Environmental Courses		
	(choose 1 lecture/lab)	4 or 5
CH 276, 277	Advanced Environmental Chemistry and Methods of Environmental Analysis	
BL 236, 237	Environmental Disturbances and Lab	
BL 228, 229	Wildlife Biology and Lab	
BL 248, 249	Environmental Microbiology and Lab	
ES 301	Senior Research	2
ES 300, 302	Junior and Senior Seminars	2

\* Fulfill Core requirements

#### Electives: 27 - 28 credits

Those students interested in pursuing graduate degrees should carefully choose electives to meet basic requirements for their chosen program. Students should consult with their academic advisor early in their bachelor's program.

#### Requirements for Minor in Environmental Studies\*\*\*\* (18 credits)

ES 115	Introduction of Environmental Science	3
Or		
ES 150	Earth Systems Science	3
SO 161	Environmental Sociology	3
EL 111	Green Writing: Literature and the Environment	3
HI 226	Society and the Environment: the American Experience	3
PS 390	Environmental Law	3
PL 217	Environmental Ethics	3

### Requirements for Minor in Environmental Science\*\*\*\* (16-17 credits):

ES 150-152	Earth Systems Science and Lab	4
BL 232-233	Ecology and Lab***	4
CH 216, 218	Quantitative Analysis and Lab***	4

Choose one course with lab: (May not count toward major)

CH 276	Advanced Environmental Chemistry***	3
CH 277	Methods of Environmental Analysis (lab)***	2
BL 236-237	Environmental Disturbances and Lab***	4
BL 248, 249	Environmental Microbiology and Lab***	4

\*\*\* General Chemistry I and II and/or General Biology I and II are prerequisites for these courses.

\*\*\*\* Environmental Science and Environmental Chemistry majors may not minor in Environmental Science or Environmental Studies.

### Typical Freshman Year Schedule

#### Environmental Science (B.S.)

##### Fall Semester

CH 101	General Chemistry I	3
CH 103	General Chemistry I Laboratory	1
	Environmental Social Sciences	3
	Modern and Classical Language	3
EL 102	Language & Rhetoric	3
HI History		3
Total Fall		16

All students will take one three (3) credit course designated as a First-Year Seminar which will satisfy a Core Curriculum Requirement.

##### Spring Semester

CH 102	General Chemistry II	3
CH 104	General Chemistry II Laboratory	1
ES 150	Earth Systems Science	3
ES 152	Earth Systems Science Laboratory	1
	Modern and Classical Language	3
RS 119	Exploring Religious Meaning	3
Total Spring		14
Total Freshman Year		30

## Course Descriptions

### ES 111 The Science of Abandoned Mine Drainage

We will explore the science of coal mining and its aftermath mine drainage. The course will use field trips (museums, mines, streams, treatment sites), video, class discussions, computer models, Internet explorations, and recent publications to understand coal mine drainage. We will start with the history and geology of coal. Then, explore the technology of mining both past and present. We will use a groundwater model to understand how the mines interact with water. We will discuss the chemistry of mine drainage formation and see its effects on the biology of streams. We will see first hand how new technologies have been developed to treat mine drainage. Through the study of abandoned mine drainage we will examine the interrelationships in nature and see that by working together we can make a difference in our environment. This course does not require math skills beyond pre-algebra. Natural Science Tier I. Offered Fall semester. Three credits.

### ES 113 The Science of Abandoned Mine Drainage Laboratory

The laboratory will be integrated with the class. The lab explorations will include computer modeling, stream sampling, experiments on formation of mine drainage, its impacts on streams, and the efficiency of treatment methods. A final group project will examine a mine drainage site and develop a plan for remediation. Must be taken simultaneously with, or after successful completion of ES 111. Offered Fall semester. One credit.

### ES 115 Introduction to Environmental Science

This course is designed to introduce both science and non-science majors to the physical processes and interrelationships between air, water, soil, and biota. Issues such as over population, pollution, and risk assessment will be covered. Natural Science Tier 1 Course. Offered Fall semester. Three credits.

### ES 117 Introduction to Environmental Science Laboratory

Laboratory exercises are designed to physically illustrate the principles discussed in ES 115. Must be taken simultaneously with, or after successful completion of ES 115. Natural Science Tier 1 Course. Offered Fall semester. One credit.

### ES 150 Earth Systems Science

This course will explore the interconnections between the components of the Earth – the hydrosphere, the atmosphere, the lithosphere, and the biosphere. In doing this we will examine the systems that provide balance and stability to the Earth while at the same time explain processes of Earth's evolution. We will accomplish this through an interdisciplinary approach that combines resources from geology, chemistry, biology, oceanography, and meteorology. Natural Science Tier II. Three credits.

### ES 152 Earth Systems Science Laboratory

This laboratory course is designed to illustrate and discover principles in Earth Systems Science. This will include computer simulations, physical models, and scientific investigations. Must be taken simultaneously with, or after successful completion of ES 150. Natural Science Tier II. One credit.

### ES 300 Research Seminar I

This course will introduce the student to the research experience and will include an orientation to the library and use of reference materials. Students will be assigned articles to read and discuss. An introduction to writing and presenting a research proposal will be included. Students will be introduced to the procedure for maintaining a laboratory research notebook. Outside speakers may present seminars on selected topics. Prerequisite: Junior standing. One credit.

### ES 301 Research Laboratory

Independent study or investigation involving intensive work with faculty guidance in the laboratory and library. This course includes an assessment of cumulative laboratory skills. Prerequisite: ES 300. Two credits.

### ES 302 Research Seminar II

Presentation of research work completed during the previous semester; the oral presentation is made after the thesis report has been written. Outside speakers may present seminars on selected topics. Prerequisite: ES 301. One credit.

### ES 350 Independent Study

Studies to be chosen and developed by the student with the guidance of the professor directing the study. May be repeated. Variable credit.

### ES 550 Cooperative Education – Environmental Internship

Work experience program extending the learning experience beyond the college into the world of work, through internships, field work and cooperative programs. Students may or may not be paid depending on the site. May be repeated. Variable credit.