

**Environmental Science (ESCI)**

College of Arts and Sciences, Interdisciplinary Program  
O'Shaughnessy Science Hall (OSS) 117, (651) 962-5241

Hickson (GEOL), program director; Environmental Science Committee: Emms (BIOL), Wammer (CHEM), and Amel (PSYC and ENVR program director, advisory)

Environmental science is an interdisciplinary science program focused on solving environmental problems that lie at the interface between biology, chemistry, and geology. Students participate in one of three concentrations (biology, chemistry, or geology) leading to the Bachelor of Science degree, each of which contains substantial coursework from each of these disciplines. This program provides excellent preparation for students wishing to pursue graduate degrees in conservation biology, environmental science, earth system science, or other environmentally-focused programs of study in the sciences. It also provides solid preparation for students planning other types of environmental careers, such as environmental consulting, law, policy, or research.

Students entering this program should contact the program director or a committee member. Each student will be assigned an adviser appropriate to the concentration that they choose for their course of study.

**Major in Environmental Science: Concentration in Biology (B.S.)**

ESCI 310 Environmental Problem Solving (4 credits)

ESCI 390 Senior Research Seminar (4 credits)

*Biology courses (24 credits):*

BIOL 201 Diversity and Adaptation (4 credits)

BIOL 202 Genetics, Evolution, and Ecology (4 credits)

BIOL 204 Cellular and Molecular Biology (4 credits)

BIOL 333 Ecology (4 credits)

BIOL 435 Aquatic Biology (4 credits) *or* BIOL 486 Environmental Physiology (4 credits)

*Plus:*

Four additional BIOL credits at the 300-level, selected in consultation with the academic adviser. BIOL 211, or Individual Study or Research courses in biology, may be substituted for this requirement with prior approval of the academic adviser.

*Engineering course (4 credits):*

ENGR 123 Energy and the Environment (4 credits)

*Geology courses (8 credits):*

GEOL 113 Earth's Record of Climate (4 credits) *or* GEOL 115 Environmental Geology (4 credits)

GEOL 211 Earth Materials (4 credits) *or* GEOL 252 Geomorphology (4 credits)

*Chemistry courses (8-12 credits):*

CHEM 111 General Chemistry I (4 credits) *and* CHEM 112 General Chemistry II (4 credits)

*or* CHEM 115 Accelerated General Chemistry (4 credits)

CHEM 201 Organic Chemistry I (4 credits)

*Mathematics courses (4-8 credits):*

MATH 108 Calculus with Review I (4 credits) *and* MATH 109 Calculus with Review II (4 credits)

*or*

MATH 113 Calculus I (4 credits)

*Statistics course (4 credits):*

IDTH 220 Statistics I (4 credits) *or* MATH 303 Statistics for the Applied Sciences (4 credits)

*Humanities and Policy/Economics courses (choose two of the following)(8 credits):*

ECON 370 Environmental and Natural Resource Economics (4 credits)

ENVR 212 Social Dynamics and the Environment (4 credits)

ENVR 301 Environmental Ethics (4 credits) *or* PHIL 358 Environmental Ethics (4 credits)

ENVR 351 Environmental Policy (4 credits) *or* POLS 316 Environmental Policy (4 credits)

*NOTE:* Additional coursework in geographic information systems, environmental policy, economics, law, etc would lead to an even stronger degree program. ESCI and ENVR affiliated faculty can provide suggestions for additional courses, co-majors, and/or minors that might be applicable. Students pursuing graduate degrees in environmental science are strongly encouraged to take introductory physics courses (PHYS 111 and 112).

**Major in Environmental Science: Concentration in Chemistry (B.S.)**

ESCI 310 Environmental Problem Solving (4 credits)

ESCI 390 Senior Research Seminar (4 credits)

*Chemistry courses (20-24 credits):*

CHEM 111 General Chemistry I (4 credits) *and* CHEM 112 General Chemistry II (4 credits)

*or* CHEM 115 Accelerated General Chemistry (4 credits)

## Environmental Science

CHEM 201 Organic Chemistry I (4 credits)  
CHEM 300 Quantitative analysis (4 credits)

*Plus eight credits from the following:*

CHEM 202 Organic Chemistry II (4 credits)  
CHEM 320 Instrumental Analysis (4 credits)  
CHEM 331 Chemical Thermodynamics and Reaction Dynamics (4 credits)  
CHEM 332 Quantum Chemistry and Molecular Spectroscopy (4 credits)  
CHEM 440 Biochemistry I (4 credits)

*Engineering course (4 credits):*

ENGR 123 Energy and the Environment (4 credits)

*Biology courses (8 credits):*

BIOL 201 Diversity and Adaptation (4 credits)  
BIOL 202 Genetics, Evolution, and Ecology (4 credits)

*Geology courses (8 credits):*

GEOL 113 Earth's Record of Climate (4 credits) *or* GEOL 115 Environmental Geology (4 credits)  
GEOL 211 Earth Materials (4 credits) *or* GEOL 252 Geomorphology (4 credits)

*Mathematics courses (4-8 credits):*

MATH 108 Calculus with Review I (4 credits) *and* MATH 109 Calculus with Review II (4 credits)  
*or*  
MATH 113 Calculus I (4 credits)

*Humanities and Policy/Economics courses (choose two of the following)(8 credits):*

ECON 370 Environmental and Natural Resource Economics (4 credits)  
ENVR 212 Social Dynamics and the Environment (4 credits)  
ENVR 301 Environmental Ethics (4 credits) *or* PHIL 358 Environmental Ethics (4 credits)  
ENVR 351 Environmental Policy (4 credits) *or* POLS 316 Environmental Policy (4 credits)

*Plus eight credits from the following (it is strongly recommended that one of these courses be a field-based course):*

BIOL 211 Introduction to field research (4 credits)  
BIOL 333 Ecology (4 credits)  
CHEM 491, 492 Research (4 credits)  
GEOL 260 Regional Geology and Geological Field Methods (4 credits)  
GEOL 310 Environmental Geochemistry (4 credits)  
GEOL 410 Hydrogeology (4 credits)  
IDTH 220 Statistics I (4 credits)

**NOTE:** PHYS 111 or 112 and MATH 114 are required for those who wish to take CHEM 331 or CHEM 332 as a part of their chemistry coursework. Additional coursework in geographic information systems, environmental policy, economics, law, etc would lead to an even stronger degree program. ESCI and ENVR affiliated faculty can provide suggestions for additional courses, co-majors, and/or minors that might be applicable. Students pursuing graduate degrees in environmental science are strongly encouraged to take introductory physics courses (PHYS 111 and 112).

### **Major in Environmental Science: Concentration in Geoscience (B.S.)**

ESCI 310 Environmental Problem Solving (4 credits)  
ESCI 390 Senior Research Seminar (4 credits)

*Geology courses (20 credits):*

GEOL 115 Environmental Geology (4 credits) *or* GEOL 113 Earth's Record of Climate (4 credits)  
GEOL 211 Earth materials (4 credits)  
GEOL 252 Geomorphology (4 credits)  
GEOL 310 Environmental Geochemistry (4 credits)  
GEOL 410 Hydrogeology (4 credits)

*Field course (4 credits):*

GEOL 260 Regional Geology and Geological Field Methods (4 credits)  
BIOL 211 Introduction to field research (4 credits)

*Biology courses (12 credits):*

BIOL 201 Diversity and Adaptation (4 credits)  
BIOL 202 Genetics, Evolution, and Ecology (4 credits)  
BIOL 333 Ecology (4 credits)

*Engineering course (4 credits):*

ENGR 123 Energy and the Environment (4 credits)

## Environmental Science – Environmental Studies

*Chemistry courses (4-8 credits):*

CHEM 111 General Chemistry I (4 credits) *and* CHEM 112 General Chemistry II (4 credits)

*or*

CHEM 115 Accelerated General Chemistry (4 credits)

*Mathematics courses (4-8 credits):*

MATH 108 Calculus with Review I (4 credits) *and* MATH 109 Calculus with Review II (4 credits)

*or*

MATH 113 Calculus I (4 credits)

*Statistics course (4 credits):*

IDTH 220 Statistics I (4 credits) *or* MATH 303 Statistics for the Applied Sciences (4 credits)

*Humanities and Policy/Economics courses (choose two of the following)(8 credits):*

ECON 370 Environmental and Natural Resource Economics (4 credits)

ENVR 212 Social Dynamics and the Environment (4 credits)

ENVR 301 Environmental Ethics (4 credits) *or* PHIL 358 Environmental Ethics (4 credits)

ENVR 351 Environmental Policy (4 credits) *or* POLS 316 Environmental Policy (4 credits)

*NOTE:* Additional coursework in geographic information systems, environmental policy, economics, law, etc would lead to an even stronger degree program. ESCI and ENVR affiliated faculty can provide suggestions for additional courses, co-majors, and/or minors that might be applicable. Students pursuing graduate degrees in environmental science are strongly encouraged to take introductory physics courses (PHYS 111 and 112).

### ESCI 310 Environmental Problem Solving (4 credits)

This course explores methods of solving environmental problems. These problems are by nature, interdisciplinary and are rarely addressed in a substantive fashion in traditional science textbooks. In this course, students and faculty work together to develop a working model of a critical earth system or biogeochemical cycle (i.e. the carbon or nitrogen cycle), and learn how to make calculations of human-induced changes to that system. Students from all concentrations of the environmental science major will work together on this interdisciplinary research project using modeling and systems analysis software to more fully understand specific environments and the quantitative methods of assessing challenges to those environments. This course should be taken by all ESCI students during their junior year. Prerequisite: Environmental Science majors should have completed BIOL 204, CHEM 201, or GEOL 211/252. Environmental Studies (ENVR) majors that wish to take this course should contact the ESCI program director or course instructor. ENVR majors with a social science, business, or humanities concentration may take this course after completion of their science sequence. ENVR majors with a science concentration must have completed their BIOL, CHEM, and GEOL requirements.

### ESCI 390 Senior Research Seminar (4 credits)

This course is designed to fulfill the senior capstone experience in Environmental Science as it brings together students from all of the environmental science concentrations (biology, chemistry, and geology) to complete interdisciplinary research projects. In the semester prior to the course offering, Environmental Science majors, in consultation with their faculty advisers and the course instructor, will develop a research project that they will complete as part of this course. Students may also choose to more fully develop a research project in which they have been participating or propose a service-learning or community-based project. Furthermore, groups of students could propose to perform an interdisciplinary project. The format of this research is intentionally open-ended because it is meant to provide flexibility and choice to the students and the course instructor. Student-led seminars on topics of the students' choosing will comprise most weekly meetings, along with updates on research progress and a final presentation to the St. Thomas community on the outcome of the student's research projects. This course should be completed in the final Spring semester prior to graduation.

Prerequisite: ESCI 310 or permission of instructor; at least one ENVR course.

## Environmental Studies (ENVR)

College of Arts and Sciences, Interdisciplinary Program

John Roach Center for the Liberal Arts (JRC) LL58, (651) 962-5046

Amel (PSYC), program director; Environmental Studies Committee: Emms (BIOL), George (ENGR), Degnan (PHIL), Hickson (GEOL), Hoffman (POLS), Lorah (GEOG), Wammer (CHEM)

The Environmental studies program provides students with a broad interdisciplinary background as well as a basis for career specialization and practical application and problem solving. The program is based upon an investigation both of the Earth's environment and the wide variety of human interactions with that environment. The program has three basic objectives:

1. to transmit an understanding of environmental problems and their complexities,
2. to motivate productive responses to those problems, both vocational and avocational, based on that understanding, and
3. to foster the development of critical, inquiring minds.