The Environmental Science Program combines both geological and biological perspectives to give students an interdisciplinary approach to the subject. It is the only undergraduate Bachelor of Science degree program addressing environmental issues at WSU. In keeping with the mission of the university, this program distinguishes itself from other programs in the state by focusing on the urban environment and urban impacts on the environment. Consequently, the program addresses environmental issues and examples from Southeastern Michigan.

The Environmental Science Program prepares students for graduate study or careers in various areas of environmental science including environmental impact assessment, wetlands, water quality, regulatory compliance and remediation. Environmental Science graduates are needed by local, state and federal governments, by environmental consulting firms, and by construction and civil engineering companies. In many cases, employers favor masters-level graduates, so an important objective of this program is to provide graduates with the prerequisites for admission to M.S. programs in Environmental Sciences. This major also serves education students seeking to become science teachers certified in Environmental Science.

Environmental science is a field that continues to grow. Greater public recognition of environmental problems coupled with recent concerns about global warming and national security are creating a demand for environmental scientists and a need for an environmental science resource to serve the Detroit metropolitan area. This program provides a visible focus for environmental research at WSU. Its emphasis on geological and biological aspects of environmental science complements the existing focus on human health and chemical toxicology in the WSU Institute of Environmental Health Sciences.

Director: Lawrence D. Lemke
0224 Old Main 313-577-6412 ldlemke@wayne.edu

Faculty Steering Committee:
Mark Baskaran, Professor, Geology
Sarah Brownlee, Assistant Professor, Geology
Tom Dowling, Professor, Biological Sciences
D. Carl Freeman, Professor, Biological Sciences
Jeffrey Howard, Associate Professor, Geology
Dan Kashian, Associate Professor, Biological Sciences
Donna Kashian, Assistant Professor, Biological Sciences
Lawrence D. Lemke, Associate Professor, Geology
Chris Steiner, Assistant Professor, Biological Sciences
Edmond van Hees, Assistant Professor, Geology

B.S. in Environmental Sciences p.1
Admission Requirements for this program are satisfied by the requirements for general undergraduate admission to the University.

Degree Requirements: Candidates for the B.S. in Environmental Science must complete at least 120 credits in course work including satisfaction of the College Group Requirements and the University General Education Requirements, as well as the major requirements listed below. All course work must be completed in accordance with the academic procedures of the University and the College of Science governing undergraduate scholarship and degrees. Students must receive a grade of ‘C-minus’ or better in all Major and Cognate required courses. An overall grade point average of 2.0 (‘C’) in all coursework is required for graduation.

Major Requirements: B.S. candidates in Environmental Science must complete 36 credits of required courses including GEL 1010, GEL 2130, GEL 3100, GEL 5150, GEL 5510, BIO 1500, BIO 1510, BIO 4130, and BIO 5100 or BIO 5440; plus three science or engineering electives (9 to 12 credits) from the approved list (see next page).

Cognate Requirements: B.S. candidates in Environmental Science must take MAT 1800, MAT 2010, PHY 2130 (or PHY 2170), PHY 2131 (or PHY 2171), PHY 2140 (or PHY 2180), PHY 2141 (or PHY 2181), CHM 1220, CHM 1230, CHM 1240 and CHM 1250. Majors should take the Department of Mathematics placement examination as soon as possible during their freshman year.

Major Requirements: (effective Jan 1, 2011)
B.S. candidates in Environmental Science must take

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<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<td>GEL 1010</td>
<td>Geology: The Science of the Earth</td>
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<td>GEL 2130</td>
<td>Mineralogy</td>
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<td>GEL 3100</td>
<td>Environmental Systems Analysis</td>
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<tr>
<td>GEL 5150</td>
<td>Soils and Soil Pollution</td>
<td>4</td>
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<td>GEL 5510</td>
<td>Contaminant Fate and Transport</td>
<td>4</td>
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<tr>
<td>BIO 1500</td>
<td>Basic Life Diversity</td>
<td>4</td>
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<tr>
<td>BIO 1510</td>
<td>Basic Life Mechanisms</td>
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<td>BIO 4130</td>
<td>Ecology (WI)</td>
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<td>BIO 5440</td>
<td>Terrestrial Ecology</td>
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<td>3 approved electives</td>
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Cognate Requirements:
B.S. candidates in Environmental Science must take

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<tr>
<td>MAT 1800</td>
<td>Elementary Functions</td>
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<td>MAT 2010</td>
<td>Calculus I</td>
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<td>PHY 2130</td>
<td>General Physics (or PHY 2170)</td>
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<td>PHY 2131</td>
<td>General Physics Laboratory (or PHY 2171)</td>
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<td>PHY 2140</td>
<td>General Physics (or PHY 2180)</td>
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<td>PHY 2141</td>
<td>General Physics Laboratory (or PHY 2181)</td>
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<tr>
<td>CHM 1220</td>
<td>Chemical Structure, Bonding and Reactivity</td>
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<tr>
<td>CHM 1230</td>
<td>Chemical Principles in the Laboratory</td>
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<tr>
<td>CHM 1240</td>
<td>Principles of General /Organic Chemistry</td>
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</tr>
<tr>
<td>CHM 1250</td>
<td>General /Organic Chemistry Laboratory</td>
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</tr>
<tr>
<td>Total</td>
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ELECTIVE COURSES
[Note: This list is current as of Winter 2014. Consult the Environmental Science director for updates]

At least one, and up to three, electives may be chosen from any of the following GEL or BIO courses:

**GEOLOGY**
- GEL 3160 Petrology
- GEL 3300 Structural Geology
- GEL 3400 Sedimentology and Stratigraphy
- GEL 3650 Field Geology (field course)
- GEL 4200 Geomorphology
- GEL 5000 Geological Site Assessment
- GEL 5120 Environmental Geochemistry
- GEL 5450 Hydrogeology
- GEL 5490 Glacial Geology of North America
- GEL 5600 Applied Geologic Mapping
- GEL 6400 Nuclear Geology
- GEL 6500 Economic Geology

**BIOLOGY**
- BIO 2200 Introductory Microbiology
- BIO 5040 Biometry
- BIO 5100 Aquatic Ecology (field course)
- BIO 5180 Field Investigations in Bio Sci (field course)
- BIO 5440 Terrestrial Ecology (field course)
- BIO 5490 Population and Community Ecology
- BIO 5540 Ecosystem and Landscape Ecology
- BIO 6190 Ecotoxicology
- BIO 6450 Aquatic Botany (field course)
- BIO 6640 Advanced Ecology (field course)

A maximum of two electives may be chosen from any of the following courses:
(Note: Any necessary prerequisite courses do not count as Environmental Science electives)

**CHEMICAL ENGINEERING**
- CHE 6610 Risk Assessment

**CIVIL AND ENVIRONMENTAL ENGINEERING**
- CE 3250 Applied Fluid Mechanics
- CE 4210 Introduction to Environmental Engineering
- CE 4220 Water Supply and Wastewater Engineering
- CE 5580 Land Disposal of Hazardous Waste
- CE 5590 Biological Methods of Waste Disposal
- CE 5595 River Assessment and Restoration (field course)
- CE 6190 Groundwater
- CE 6270 Environmental Management and Sustainable Development

**PSYCHOLOGY**
- HON 4220 Environment: Perception, Behavior and Health

**GEOGRAPHY and URBAN PLANNING**
- GPH 3600 Introduction to Geographic Information Systems
- GPH 4600 Advanced Geographic Information Systems
- UP 5999 Cities and Food
### Example 4-Year Program

(*does not have to be structured exactly this way*)

#### First Year

**Fall Semester**
- GEL 1010 (PS) – Physical Geology 4
- PHY 2130/2131 (PS) Gen Physics I Lec/Lab 4
- (CL) Computer Literacy course 3
- (OC) Oral Communication course 3

**Winter Semester**
- BIO 1510 (LS) – Basic Life Mechanisms 4
- CHM 1220 (PS) – General Chemistry I 4
- CHM 1230 – General Chemistry I Lab 1
- ENG 1020 (BC) – Intro College Writing 4

Total: 14

#### Second Year

**Fall Semester**
- GEL 2130 – Mineralogy 4
- MAT 1800 – Elementary Functions 4
- (SS) Social Sciences course 3-4
- ENG 3010 or 3050 (IC) English Writing 3

**Winter Semester**
- BIO 1500 – Basic Life Diversity 4
- MAT 2010 – Calculus I 4
- PHI 1050 (CT) – Critical Thinking 3
- (VP) Visual and Performing Arts course 3-4

Total: 14-15

**Spring/Summer Semester**
- (CS) Civilizations & Societies Course 3-4
- GEL 5150 – Soils and Soil Pollution 4

Total: 7-8

#### Third Year

**Fall Semester**
- GEL 3100 – Environmental Systems Anal 4
- PHY 2140/2141 Gen Physics II Lec/Lab 4
- Science or Engineering elective 3-4
- Language I 4

**Winter Semester**
- (WI) BIO 4130 – Ecology 4
- CHM 1240 – Organic Chemistry I 4
- CHM 1250 – Organic Chemistry I Lab 1
- (HS) Historical Studies course 3
- Language II 4

Total: 15-16

#### Fourth Year

**Fall Semester**
- BIO 5100 or 5450 Aquatic/Terrestrial Ecology 4
- Science or Engineering Elective 3-4
- (AI) Amer. Society & Inst. course 3-4
- Language III 4

**Winter Semester**
- GEL 5510 – Env Fate & Transport Pollutants 4
- Science or Engineering elective 3-4
- (SS) Social Science Course 3-4
- (PL) Philosophy and Letters course 3

Total: 14-16