ENVIRONMENTAL SCIENCE (BS)

Director: Katie Costanzo, PhD

Introduction
The Environmental Science major provides both theoretical and applied knowledge for students interested in professional careers in the environmental sciences, e.g., environmental consulting, environmental regulation and monitoring, environmental conservation, environmental health sciences (toxicology, occupational health, health physics, industrial hygiene, water quality industry) and the ecological sciences. In addition, the curriculum facilitates entry into graduate programs in the ecological, environmental health and environmental sciences.

The Environmental Science program has an interdisciplinary focus with required and recommended courses in the areas of biology, chemistry, geology, philosophy and social sciences. In addition, it is designed to provide job experiences through the completion of two required internships. For students interested in graduate study in the environmental sciences, one internship may be replaced with independent research in the environmental sciences.

For a more detailed description of the faculty, facilities, academic and co-curricular opportunities please visit the Environmental Science website (https://www.canisius.edu/academics/programs/environmental-science).

Qualifications
Students must maintain a 2.0 GPA in their major and support courses and a 2.0 overall average to graduate with a degree in Environmental Science.

Advisement
All students should have an advisor in the major and should contact the department directly to have an advisor assigned if they do not already have one. Meetings with academic advisors are required prior to students receiving their PIN for course registration each semester. All majors should work closely with their advisor in discussing career expectations, choosing their major electives, developing their entire academic program and planning their co-curricular or supplemental academic experiences.

The advisor may be changed at the student’s request.

Double Majors
Students who wish to expand their educational opportunities may decide to declare a double major. The decision may be based on career goals or planned graduate studies. Before a student declares a double major, it is important to meet with the appropriate academic departments for advisement. Some double major combinations can be completed within the minimum 120 credit hour degree requirement, but in some cases additional course work may be required. In order to declare a double major, the student must complete the appropriate double major request form and get the signature of each department chairperson and the appropriate associate dean. Please note that students will receive only one degree, regardless of the number of majors they complete.

Your advisor will be able to assist with course planning to facilitate a second major, so please let your advisor know if you are considering a dual major.

Minors in Other Disciplines
Minors provide students the opportunity to pursue additional interests but generally do not require as many courses as a major. Minors generally range from five to eight required courses. The minors page (http://catalog.canisius.edu/undergraduate/minors) provides a complete list of minors and provides links to each minor. Some majors and minors can be completed within the minimum 120 credit hour degree requirement, but in some cases additional coursework may be required. Students must complete the appropriate minor request form.

Major Experiences
All environmental science majors must complete two internship experiences. Recent internships have included Ecology and Environment, New York State Department of Environmental Conservation, U.S. Fish and Wildlife Service, TestAmerica Laboratories, Student Conservation Association of AmeriCorps, Penn Dixie Paleontological and Outdoor Education Center, Tifft Nature Preserve, and the Buffalo Museum of Science. We encourage students to work with any faculty member in the program to find internships that will best meet their goals and needs.

Curriculum
An Ignatian Foundation
All undergraduate students must complete either the Canisius Core Curriculum (http://catalog.canisius.edu/undergraduate/academics/curricular-information/core-curriculum) or the All-College Honors Curriculum (http://catalog.canisius.edu/undergraduate/academics/curricular-information/all-college-honors-program). Many schools refer to their college-wide undergraduate requirements as “general education” requirements. We believe that the core curriculum and the honors curriculum are more than a series of required classes; they provide the basis for a Jesuit education both with content and with required knowledge and skills attributes that are central to our mission.

Free Electives
Students may graduate with more but not less than 120 credit hours. Free electives are courses in addition to the Core Curriculum or Honors Curriculum and major requirements sufficient to reach the minimum of 120 credit hours required for graduation.

Major Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIO 111</td>
<td>Introductory Biology I and Introductory Biology Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>BIO 112</td>
<td>Introductory Biology II and Introductory Biology Laboratory II</td>
<td>4</td>
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<tr>
<td>BIO 211</td>
<td>Biochemistry and Cell Biology I and Biochemistry and Cell Biology Lab I</td>
<td>4</td>
</tr>
<tr>
<td>CHM 111</td>
<td>General Chemistry I and General Chemistry I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>CHM 112</td>
<td>General Chemistry II and General Chemistry II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>CHM 227</td>
<td>Organic Chemistry I and Organic Chemistry I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>PSY 201</td>
<td>Basic Statistics for Behavioral Sciences or MAT 141</td>
<td>3-4</td>
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<tr>
<td>MAT 111</td>
<td>Calculus I or PSY 401</td>
<td>3-4</td>
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<tr>
<td></td>
<td>Advanced Statistics Seminar</td>
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</tbody>
</table>
The advisement guide will be used to indicate which courses students in advisement guide each semester to see which classes are being offered.

**NOTE:** Students must complete four of the following (at least three with labs):

- **Major Electives**
  - **Code**
  - **Title**
  - **Credits**
  - **Prerequisite:**
  - **Offered:**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABEC 341</td>
<td>Urban Ecology</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 341L</td>
<td>Urban Ecology Lab (lab optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 212</td>
<td>Biochemistry and Cell Biology II &amp; Biochemistry and Cell Biology Lab II</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 212L</td>
<td>(lab required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 305</td>
<td>Medical Microbiology and its Ecological Basis &amp; Medical Microbiology</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 305L</td>
<td>and its Ecological Basis Lab (lab optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 307</td>
<td>Microbiology &amp; Microbiology Laboratory</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 307L</td>
<td>(lab optional)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIO 322</td>
<td>Conservation Biology</td>
<td>3</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>BIO 335</td>
<td>Plant Biology</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 335L</td>
<td>Plant Biology Lab (lab optional)</td>
<td></td>
<td></td>
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<tr>
<td>BIO 343</td>
<td>Entomology (lab required)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>BIO 366</td>
<td>Ornithology (lab required)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>BIO 370</td>
<td>Plant Morphology &amp; Plant Morphology Lab (lab required)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 370L</td>
<td>(lab required)</td>
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<td></td>
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<tr>
<td>BIO 375</td>
<td>Community Ecology &amp; Community Ecology Laboratory (lab optional)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 375L</td>
<td>(lab optional)</td>
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<tr>
<td>BIO 377</td>
<td>Freshwater Biology (lab required)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
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<tr>
<td>BIO 378</td>
<td>Wetlands &amp; Wetlands Laboratory (lab optional)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 378L</td>
<td>(lab optional)</td>
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<td></td>
</tr>
<tr>
<td>CHM 301</td>
<td>Fundamental Physical Chemistry &amp; Fundamental Physical Chemistry Lab</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 301L</td>
<td>(lab optional)</td>
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<tr>
<td>PHY 201</td>
<td>College Physics I &amp; College Physics I Laboratory (lab required)</td>
<td>4</td>
<td>MAT 109, MAT 110</td>
</tr>
<tr>
<td>&amp; 201L</td>
<td>(lab required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SOC 315</td>
<td>Geographical Information Systems (GIS) for the Social Sciences</td>
<td>3</td>
<td>MAT 109, MAT 110</td>
</tr>
</tbody>
</table>

**Total Credits:** 57-59

1. Students may use MAT 109 and MAT 110 to replace MAT 111.
2. Students may choose BIO 401 or ENV 401 in lieu of their second internship. This option is recommended for students considering graduate school or a career in research.

We encourage Environmental Science majors to take humanities classes that combine social and environmental issues like Environmental Ethics (PHI 244), Environment and Society (SOC 234), and Ecotheology (RST347).

### Learning Goals & Objectives

**Learning Goal 1**

Students will develop competency with respect to knowledge having a firm grasp of the basic concepts in environmental science.

Students will:
- Objective A: Demonstrate an understanding of general environmental concepts from ecology, geology, hydrology, and analytical chemistry;
- Objective B: Demonstrate detailed knowledge within at least two areas of environmental science;
- Objective C: Connect previously learned material with real-life environmental situations.

**Learning Goal 2**

Students will develop problem-solving skills being able to perform the following.

Students will:
- Objective A: Read and interpret data;
- Objective B: Design an experiment to address a specific hypothesis;
- Objective C: Critically analyze an article from the original scientific literature or a professional report.

**Learning Goal 3**

Students will demonstrate mastery with respect to technical skills.

Students will:
- Objective A: Effectively communicate scientific material in written form;
- Objective B: Draw a graph;
- Objective C: Design a table.

### Courses

#### Environmental Science Courses

- **ENV 100 Introduction to Environmental Science Seminar**
  - 1 Credit
  - Introduction to the field of environmental science. Information about a variety of careers is included. Required in freshman or sophomore year.
  - Offered: spring 2017.

- **ENV 200 Introductory Hydrology**
  - 4 Credits
  - Introduction to hydrologic processes, methods for quantifying hydrologic parameters and processes, and practical exposure to conducting and reporting hydrological studies. Lab required.
  - Prerequisite: GEOL 120 & GEOL 120L.
  - Offered: anticipated spring 2018.

- **ENV 352 Environmental Science Seminar II**
  - 1 Credit
  - Students attend scientific talks and present information relevant to their internship experiences. Career preparations also included.
  - Prerequisite: ENV 100
  - Offered: spring.
ENV 354 Environmental Science Seminar II 1 Credit
This course will provide information about a variety of careers in the field of environmental science. Students will also give presentations on their internship experiences. Required in junior or senior year.
Prerequisite: ENV 352.
Offered: spring of odd-numbered years.

ENV 401 Independent Research 1-3 Credits
Independent laboratory research in environmental science conducted under the supervision of a faculty member. Arrangements must be made prior to registration.
Prerequisite: written permission of faculty member & program director.
Offered: fall & spring.

ENV 498 Environmental Science Internship I 1-3 Credits
Practical experiences in the environmental sciences. Students must complete two internships in different areas of environmental sciences. Internships require an application and approval by the associate dean.
Prerequisite: junior or senior standing, minimum GPA of 2.0 in the major, a positive recommendation from a faculty member, & a completed & approved internship application.
Offered: fall & spring.

ENV 499 Environmental Science Internship II 1-3 Credits
Practical experiences in the environmental sciences. Students must complete two internships in different areas of environmental sciences. Internships require an application and approval by the associate dean.
Prerequisite: junior or senior standing, minimum GPA of 2.0 in the major, a positive recommendation from a faculty member, & a completed & approved internship application.
Offered: fall & spring.

Geology Course
GEOL 120 Introductory Geology 3 Credits
Basic concepts, including uniformitarianism, the rock cycle, the hydrologic cycle, tectonics and surface processes. Also covers how humans affect and are affected by their environment. Lab required. Students may not receive credit for both GEOL 120 and PHY 130.
Corequisite: GEOL 120L.
Fulfills College Core: Field 6 (Natural Sciences)
Offered: anticipated fall 2017.

GEOL 120L Introductory Geology Laboratory 1 Credit
Required lab for GEOL 120.
Corequisite: GEOL 120.