

# Geology and Environmental Science

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Norwich University, in the middle of the Green Mountain State, is ideally situated for unhurried and unhampered studies of our natural environment. Both the Bachelor of Science in Geology and the Bachelor of Science in Environmental Science degree programs are designed to take advantage of this location.

The Geology degree provides a broad background in the physical sciences with a strong focus on geology and its pivotal role in understanding our environment. In addition to the solid foundation in geology and supportive sciences, students often use their ten free electives to develop an additional concentration. Geology graduates are prepared for a variety of possible careers, such as to begin work in industry, consulting, state and federal surveys, or teaching, or to go on to graduate school.

The Bachelor of Science in Environmental Science is a highly interdisciplinary degree designed to provide an education for students with interests and career goals related to the environment. Environment Science majors start their curriculum with the development of a firm base in the sciences and mathematics in their first two semesters. Each student must develop an area of specialization by selecting a Concentration from one of the two Options defined below. Selection of an Option I Concentration leads to a heavier emphasis in science and engineering, whereas selection of an Option II Concentration results in a stronger emphasis in the social sciences, humanities and business.

Environmental Science students have access to the facilities and equipment of the Department of Geology and Environmental Science as well as of the primary departments of their Concentration. The ten selected Environmental Science Concentrations provide an education that is rigorous and makes graduates widely marketable within industry, graduate education, and the military.

All Geology courses and Environmental Science courses except ES 251/GL 251, GL 260, ES 450/GL 450, and ES 451/GL 451 are designed to meet the General Education requirements by providing a basic level of literacy in current scientific knowledge and theories, and developing an appreciation of the natural world.

## B. S. in Geology – Curriculum Map

### First Year

Fall	Credits	Spring	Credits
GL 110 Introduction to Geology	4	GL 156 Historical Geology	4
EN 101 Composition and Literature I	3	EN 102 Composition and Literature II	3
MA 107 Precalculus Mathematics	4	MA 108 Applied Calculus	4
CH 103 General Chemistry I	4	CH 104 General Chemistry II	4
	<b>15</b>		<b>15</b>

### Second Year

Fall	Credits	Spring	Credits
GL 2XX Elective <sup>1</sup>	3-4	GL 2XX Elective <sup>1</sup>	3-4
EN 201 World Literature I	3	EN 202 World Literature II	3
PS 201 General Physics I	4	PS 202 General Physics II	4
Social Science Elective <sup>2</sup>	3	Arts & Humanities Elective	3
Elective	3-4	Elective	3-4
GL 251 Sophomore Seminar in Geology	1		
	<b>17-19</b>		<b>16-18</b>

## B. S. in Environmental Science – Curriculum Map

### For Those Pursuing Option I

Students electing Environmental Biology, Environmental Chemistry, Environmental Geology, Environmental Engineering or Climate Science as the Concentration will share a common curriculum as upperclassmen that draws heavily from the sciences. Graduates in this Option will have broad interdisciplinary training with a strong science background. Their strength will be in this breadth as well as in the specific focus in which they concentrate their studies.

#### First Year

Fall	Credits	Spring	Credits
EN 101 Composition and Literature I	3	EN 102 Composition and Literature II	3
MA 107 Precalculus Mathematics	4	MA 108 Applied Calculus <sup>2</sup>	4
BI 101 Principles of Biology I <sup>1</sup>	4	BI 102 Principles of Biology II <sup>1</sup>	4
GL 110 Introduction to Geology	4	GL 111 Oceanography	4
	<b>15</b>		<b>15</b>

#### Third Year

Fall	Credits	Spring	Credits
GL 2XX Elective <sup>1</sup>	3-4	GL 2XX Elective <sup>1</sup>	3-4
Tech Elective <sup>3</sup>	3-4	Tech Elective <sup>3</sup>	3-4
History Elective <sup>4</sup>	3	Ethics Elective <sup>5</sup>	3
MA 232 Elementary Statistics	3	Elective	3-4
Elective	3-4	Elective	3-4
	<b>15-18</b>		<b>15-19</b>

#### Fourth Year

Fall	Credits	Spring	Credits
GL 2XX Elective <sup>1</sup>	3-4	GL 2XX Elective <sup>1</sup>	3-4
GL 450 Directed Study in Geology	4	GL 451 Geology Seminar	3
Tech Elective <sup>3</sup>	3-4	Tech Elective <sup>3</sup>	3-4
Elective	3-4	Elective	3-4
Elective	3-4	Elective	3-4
	<b>16-20</b>		<b>15-19</b>

Total Credits: 124-143

<sup>1</sup> These six electives must include Sedimentation (GL 257), Structural Geology (GL 262), and Mineralogy (GL 263).

<sup>2</sup> Sociology, Psychology, Political Science, or Economics.

<sup>3</sup> Technical Electives for this degree include Science, Mathematics (above MA 103 College Algebra I), Engineering or Information Systems (above IS 120 Business Applications & Problem Solving Techniques) courses.

<sup>4</sup> Except HI 209 Historical Methods.

<sup>5</sup> PH 323 Environmental Ethics strongly recommended.

**Second Year**

Fall	Credits	Spring	Credits
CH 103 General Chemistry I	4	CH 104 General Chemistry II	4
PH 323 Environmental Ethics (or Arts & Humanities Elective)	3	ES 130 Introduction to Environmental Law (or Literature Elective)	3
ES 251 Sophomores Seminar Environmental Science	1	MA 232 Elementary Statistics	3
Concentration Elective	3-4	Concentration Elective	3-4
ES 270 Fundamentals of Environmental Science (or Elective) <sup>3</sup>	3-4	Elective <sup>3</sup>	3-4
<b>14-16</b>		<b>16-18</b>	

**Third Year**

Fall	Credits	Spring	Credits
ES 270 Fundamentals of Environmental Science (or Elective) <sup>3</sup>	4	PS 202 General Physics II	4
PS 201 General Physics I	4	ES 130 Introduction to Environmental Law (or Literature Elective)	3
PH 323 Environmental Ethics (or Arts & Humanities Elective)	3	Concentration Elective	3-4
Concentration Elective	3-4	Elective <sup>3</sup>	3-4
EC 201 Principles of Economics (Macro) or 202 Principles of Economics (Micro)	3		
<b>17-18</b>		<b>13-15</b>	

**Fourth Year**

Fall	Credits	Spring	Credits
ES 450 Directed Study in Environmental Science	4	ES 451 Environmental Seminar	3
BI 405 Ecology	4	History Elective <sup>4</sup>	3
CE 433 Groundwater Hydrology	3	Concentration Elective	3-4
Concentration Elective	3-4	Elective <sup>3</sup>	3-4
<b>14-15</b>		<b>12-14</b>	

Total Credits: 116-126

- <sup>1</sup> EnvCH and EnvEG concentrations students take CH 103 and CH 104 as freshmen, and BI 101 and BI 102 in the second year.
- <sup>2</sup> Or equivalent, especially if needed as a prerequisite for Concentration courses.
- <sup>3</sup> Can be used out of sequence and to take more than one concentration elective concurrently.
- <sup>4</sup> Except HI 209 Historical Methods.

## Available Concentrations – Option I

### Environmental Biology

BI 275	Environmental Biology	4
BI 316	Plant Taxonomy	4
or BI 351	Dendrology and Silvics	
BI 326	Natural History of the Vertebrates	4
or BI 424	Woodland Ecology and Management	
BI 220	Introductory Microbiology	4
or BI 240	Environmental and Food Microbiology	
GL 261	Field Geology	4
CH elective: CH204 or above, 3-4 cr. options only		3-4
Total Credits		23-24

### Environmental Geology

GL 253	Geomorphology	4
GL 257	Sedimentation	4
GL 261	Field Geology	4
GL 263	Mineralogy	4
GL 2XX Elective or EG 203 Materials Science		3-4
CH elective: CH204 or above, 3-4 cr. options only		3-4
Total Credits		22-24

### Environmental Chemistry

CH 204	Quantitative Analysis	4
CH 205	Survey of Organic Chemistry	4
GL 263	Mineralogy	4
BI 240	Environmental and Food Microbiology	4
Two of the following:		4-7
GL 261	Field Geology	4
CH 314	Instrumental Methods	3-1
or CH 315	Analysis Laboratory	
EG 203	Materials Science	3
Total Credits		20-23

### Environmental Engineering

EG 109	Introduction to Engineering i	3
CE 211	Surveying	3
EG 203	Materials Science	3
AP 221	Site Development and Design	3
GL 253	Geomorphology	4
One of the following:		3-4
GL 261	Field Geology	4
BI 275	Environmental Biology	4
MA 241	Mathematical Computation and Modeling	3
CH elective: CH 204 or above, 3-4 cr. options only		3-4
Total Credits		19-20

### Climate Science

CH elective: (CH 204 Quant. Analysis recommended) (must be CH 204 or above, 3-4 cr. options only)		3-4
GL 265	Glacial Geology	4
GL 253	Geomorphology	4
PS 207	Meteorology and Climatology	4
MA 241	Mathematical Computation and Modeling	3
One of the following:		3
PO 215	International Relations	3
PO 305	Geopolitics (recommended)	3
PO 415	International Law	3
Total Credits		21-22

### For those pursuing Option II

Students pursuing Concentrations in Environmental Policy and Management, Environmental Law and Protection, Environmental Writing, Green Design, or Education share a curriculum during their last three years that has a strong emphasis on social sciences, business, and humanities with less emphasis in the pure sciences. These students will be prepared to enter careers in which social responsibility toward the environment is emphasized.

**First Year**

Fall	Credits	Spring	Credits
EN 101 Composition and Literature I	3	EN 102 Composition and Literature II	3
MA 107 Precalculus Mathematics	4	MA 108 Applied Calculus	4
BI 101 Principles of Biology I	4	BI 102 Principles of Biology II	4
GL 110 Introduction to Geology	4	GL 111 Oceanography	4
	<b>15</b>		<b>15</b>

**Second Year**

Fall	Credits	Spring	Credits
PH 323 Environmental Ethics or EN 203 Advanced Composition	3	ES 130 Introduction to Environmental Law (or Literature Elective)	3
ES 251 Sophomores Seminar Environmental Science	1	PY 211 Introduction to Psychology	3
PO Elective 1 <sup>1</sup>	3	PO Elective 2 <sup>1</sup>	3
Concentration Elective	3-4	MA 232 Elementary Statistics	3
ES 270 Fundamentals of Environmental Science, EC 201 Principles of Economics (Macro), or EC 202 Principles of Economics (Micro)	3-4	Concentration Elective	3-4
	<b>13-15</b>		<b>15-16</b>

**Third Year**

Fall	Credits	Spring	Credits
CH XXX Chemistry Elective	4	GL 253 Geomorphology (or Elective) <sup>2</sup>	3-4
EC 201 Principles of Economics (Macro), 202 Principles of Economics (Micro), or ES 270 Fundamentals of Environmental Science	3-4	ES 130 Introduction to Environmental Law (or Literature Elective)	3
SO 201 Introduction to Sociology	3	Concentration Elective	3-4
EN 203 Advanced Composition or PH 323 Environmental Ethics	3	History Elective <sup>3</sup>	3
Concentration Elective	3-4	Elective <sup>2</sup>	3-4
	<b>16-18</b>		<b>15-18</b>

**Fourth Year**

<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
ES 450 Directed Study in Environmental Science	4	ES 451 Environmental Seminar	3
BI 405 Ecology	4	GL 253 Geomorphology (or Elective) <sup>2</sup>	3-4
Concentration Elective	3-4	Concentration Elective	3-4
Arts & Humanities Elective	3-4	Elective <sup>2</sup>	3-4
		Elective <sup>2</sup>	3-4
	<b>14-16</b>		<b>15-19</b>
Total Credits: 118-132			

<sup>1</sup> Selected from PO 105 American Politics, PO 215 International Relations and PO 305 Geopolitics; Green Design concentration students take EG 109 Introduction to Engineering I and EG 110 Introduction to Engineering II.

<sup>2</sup> Can be used out of sequence and to take more than one concentration elective concurrently.

<sup>3</sup> Except HI 209 Historical Methods.

## Available Concentrations – Option II

### Environmental Policy and Management

MG 101	Introduction to Business	3
IS 120	Business Applications & Problem Solving Techniques	3
PO 314	The Legislative Process	3
PO 321	U.S. Constitutional Law	3
MG 309	Management of Organizations	3
MG 341	Business Law I	3
Total Credits		18

**Environmental Law and Protection**

CJ 101	Introduction to Criminal Justice	3
CJ 102	Substantive Criminal Law	3
CJ 402	Law and Society	3
Two of the following three:		6

PO 321	U.S. Constitutional Law	3
PO 314	The Legislative Process	3
PO 331	State and Local Politics	3
SO 202	Problems of Modern Society	3
Total Credits		18

**Environmental Writing**

EN Elective <sup>1</sup>		3
EN 251	Literature of the Sea	3
EN 306	Creative Writing	3
EN 320	Literature of the Third World	3
CM 109	Introduction to Mass Media	3
CM 209	Broadcast Writing	3
Total Credits		18

<sup>1</sup> English elective approved by the Environmental Science Program.

**Green Design**

AP 111	Fundamentals of Architecture	4
AP 118	Fundamentals of Architecture II	4
AP 221	Site Development and Design	3
AP 225	Introduction to Passive Environmental Systems	3
AP 325	Materials, Construction, and Design	3
One of the following three:		3
FA 201	History/Theory of Architecture I	3
FA 202	History/Theory of Architecture II	3
FA 308	History/Theory of Architectural III	3
Total Credits		20

**Education <sup>1</sup>**

PY 220	Developmental Psychology	3
PY 315	Exceptional Child I	3
ED 234	Learning and Teaching Strategies	4
ED 351	Methods of Teaching Science to Elementary Students	3
ED 360	Language Arts and Teaching Reading in the Elementary School	4
MA 360	Teaching Mathematics at the Elementary - Middle School Level	3
Total Credits		20

- <sup>1</sup> For Education concentration students seeking licensure, ED 232 substitutes for MA 232 Elementary Statistics, electives must be used to take PY 352 Learning and Memory and ED 425 Student Teaching, and the 1 credit courses ED 101 Foundations of Education I, ED 102 Foundations of Education II, ED 201 Foundations of Education III and ED 202 Foundations of Education IV must be taken as an overload.

## **Minor in Geology**

For a minor in Geology, the student must complete six geology courses with at least four at the 200-level or higher.

## **Environmental Science Courses**

## **Geology Courses**