ENVIRONMENTAL SCIENCE, B.S.

Contact Information
Environment, Ecology, and Energy Program
Visit Program Website (https://e3p.unc.edu/)
3202 Murray Hall, CB# 3275
(919) 962-1270

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This major is designed for students focusing on such topics as how material and energy are moved and transformed in complex environmental systems, the role of society in perturbing those processes, and scientific techniques that might be used to improve environmental quality. The program provides interdisciplinary preparation for graduate or professional training as well as for jobs in government, consulting, and industry. There are two tracks available. Interested students should contact Dr. Amy Cooke (amycooke@unc.edu) to discuss which track best fits their interests and career goals.

Department Programs

Majors
- Environmental Studies, B.A. (http://catalog.unc.edu/undergraduate/programs-study/environmental-studies-major-ba/)
- Environmental Science, B.S. (p. 1)
- Dual Bachelor's-Master's Degree Programs (http://catalog.unc.edu/undergraduate/programs-study/environmental-studies-major-ba/#dualdegreetext)

Minors
- Environmental Science and Studies Minor (http://catalog.unc.edu/undergraduate/programs-study/environmental-science-studies-minor/)
- Food Studies Minor (http://catalog.unc.edu/undergraduate/programs-study/food-studies-minor/)
- Sustainability Studies Minor (http://catalog.unc.edu/undergraduate/programs-study/sustainability-studies-minor/)

Graduate Programs
- Doctor of Philosophy (http://catalog.unc.edu/graduate/schools-departments/environment-ecology/#programtext)
- Master of Science (http://catalog.unc.edu/graduate/schools-departments/environment-ecology/#programtext)
- Master of Arts (http://catalog.unc.edu/graduate/schools-departments/environment-ecology/#programtext)

Student Learning Outcomes
Upon completion of the environmental sciences program (B.S.), students should be able to:
- Demonstrate knowledge in the connections in social and/or natural sciences through an understanding of major concepts, theoretical reasoning, and empirical findings in environmental studies
- Demonstrate knowledge of a marketable skill (e.g. GIS, communication, statistics) to enhance their ability to apply concepts from the program in the real world
- Demonstrate mastery of research and problem-solving skills through individual or team-based projects working for a researcher or client in a social or natural science

Requirements
The environmental science program provides two options:
- Environmental Science, B.S. (p. 1) (with several concentration areas)
- Environmental Science, B.S.–Quantitative Energy Systems Track (p. 4)

Environmental Science, B.S.
In addition to the program requirements, students must
- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirementstext).

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<tr>
<th>Code</th>
<th>Title</th>
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<tr>
<td>ENEC 201</td>
<td>Introduction to Environment and Society</td>
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<tr>
<td>ENEC 203</td>
<td>Introduction to Environmental Science Problem Solving</td>
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<tr>
<td>or ENEC 415</td>
<td>Environmental Systems Modeling</td>
<td></td>
</tr>
<tr>
<td>or MATH 528</td>
<td>Mathematical Methods for the Physical Sciences I</td>
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<tr>
<td>or MATH 564</td>
<td>Mathematical Modeling in the Life Sciences</td>
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<td>ENEC 698</td>
<td>Capstone: Analysis and Solution of Environmental Problems</td>
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<tr>
<td>or ENEC 694H</td>
<td>Honors Project in Environmental Sciences and Studies</td>
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<tr>
<td>BIOL 201</td>
<td>Ecology and Evolution</td>
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<td>Introduction to the Environmental Sciences</td>
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<td>ENEC 222</td>
<td>Estuarine and Coastal Marine Science</td>
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<td>ENEC 489</td>
<td>Ecological Processes in Environmental Systems</td>
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<tr>
<td>ENEC/MASC 448</td>
<td>Coastal and Estuarine Ecology</td>
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</table>
ENEC/ENV 403 Environmental Chemistry Processes

ENEC 324 & 324L Water in Our World: Introduction to Hydrologic Science and Environmental Problems and Water in Our World Laboratory

GEOL 324 & 324L Water in Our World: Introduction to Hydrologic Science and Environmental Problems and Water in Our World Laboratory

GEOL 315 Energy Resources

Two courses from one analytical skills option: 6-7

Applied Math:
- MATH 233 Calculus of Functions of Several Variables
- MATH 383 First Course in Differential Equations

GIS and Remote Sensing:
- ANTH 419 Anthropological Application of GIS
- ENEC 479 Landscape Analysis
- GEOG 370 Introduction to Geographic Information
- GEOG 456 Geovisualizing Change
- GEOG 477 Introduction to Remote Sensing of the Environment
- GEOG 491 Introduction to GIS
- GEOG 577 Advanced Remote Sensing
- GEOG 591 Applied Issues in Geographic Information Systems
- GEOL/MASC 483 Geologic and Oceanographic Applications of Geographical Information Systems

Statistics:
- BIOL/ENEC 562 Statistics for Environmental Scientists
- BIOS 511 Introduction to Statistical Computing and Data Management
- BIOS 650 Basic Elements of Probability and Statistical Inference
- GEOL 520 Data Analysis in the Earth Sciences
- GEOL 525 Inverse Theory: Advanced Data Analysis and Geophysical Modeling
- STOR 455 Methods of Data Analysis
- STOR 556 Time Series Data Analysis

Basic Science:
- BIOL 202 Molecular Biology and Genetics
- CHEM 261 Introduction to Organic Chemistry I
- Informatics
- INLS 161 Tools for Information Literacy
- INLS 201 Foundations of Information Science
- INLS 382 Information Systems Analysis and Design
- INLS 523 Introduction to Database Concepts and Applications
- INLS 541 Information Visualization
- STOR 215 Foundations of Decision Sciences
- STOR 305 Introduction to Decision Analytics

Five courses chosen from one of the following concentrations 15-20

Additional Requirements
- CHEM 101 General Descriptive Chemistry I and Quantitative Chemistry Laboratory I
- CHEM 102 & 102L General Descriptive Chemistry II and Quantitative Chemistry Laboratory II
- COMP 110 Introduction to Programming and Data Science
- or COMP 116 Introduction to Scientific Programming
- MATH 231 Calculus of Functions of One Variable
- MATH 232 Calculus of Functions of One Variable II
- STOR 155 Introduction to Data Models and Inference
- or BIOS 600 Principles of Statistical Inference

Select one of the following: 8

- BIOL 101 Principles of Biology
- & BIOL 201 and Ecology and Evolution
- PHYS 118 Introductory Calculus-based Mechanics and Relativity
- & PHYS 119 Introductory Calculus-based Electromagnetism and Quanta
- PHYS 114 General Physics I: For Students of the Life Sciences
- & PHYS 115 General Physics II: For Students of the Life Sciences

Students are required to earn a minor in an allied science, such as biology, chemistry, computer science, geography, geographic information sciences, geology, information science, marine science, mathematics, physics, or statistics and analytics.

Enough free electives to accumulate minimum of 120 credit hours. Varies

Total Hours 120

Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

This course appears on a core requirement list as well as a concentration requirement list, but can only be counted toward one of the two.

Recommended courses are ECON 101; ENEC 202; one of the following PH courses: COMM 375/ENEC 375, ENEC 325, or ENEC 368/PHIL 368; and one of the following statistics courses: BIOS 511 or ENEC 562 or STOR 455.

Ecology and Natural Resources Concentration

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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>BIOL 201</td>
<td>Ecology and Evolution</td>
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<tr>
<td>BIOL/ENEC 272</td>
<td>Local Flora</td>
<td>4</td>
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<tr>
<td>BIOL 277</td>
<td>Vertebrate Field Zoology</td>
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<td>&amp; 277L</td>
<td>and Vertebrate Field Zoology Laboratory</td>
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<td>BIOL 402</td>
<td>Infectious Disease in the Developing World</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 463</td>
<td>Field Ecology</td>
<td>4</td>
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<td>BIOL 464</td>
<td>Global Change Ecology</td>
<td>3</td>
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<td>BIOL 465</td>
<td>Global Biodiversity and Macroecology</td>
<td>3</td>
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<td>BIOL 469</td>
<td>Behavioral Ecology</td>
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<td>BIOL 471</td>
<td>Evolutionary Mechanisms</td>
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<td>&amp; 471L</td>
<td>and Evolutionary Mechanisms Laboratory</td>
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<td>BIOL 476</td>
<td>Avian Biology</td>
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<td>&amp; 476L</td>
<td>and Avian Biology Laboratory</td>
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<td>BIOL 561</td>
<td>Ecological Plant Geography</td>
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<td>BIOL 565</td>
<td>Conservation Biology</td>
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<tr>
<td>BIOL 568</td>
<td>Disease Ecology and Evolution</td>
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Environmental Science, B.S.

Environment and Health Concentration

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<td>BIOL 568</td>
<td>Disease Ecology and Evolution</td>
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<tr>
<td>CHEM 261</td>
<td>Introduction to Organic Chemistry ¹, H</td>
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<tr>
<td>ENEC 222</td>
<td>Estuarine and Coastal Marine Science ¹</td>
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<td>ENEC/ENVR 403</td>
<td>Environmental Chemistry Processes ¹</td>
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<tr>
<td>ENEC/ENVR 522</td>
<td>Environmental Change and Human Health</td>
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<tr>
<td>ENEC/GEOL 324</td>
<td>Water in Our World: Introduction to Hydrologic Science and Environmental Problems ¹</td>
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<tr>
<td>ENEC/MASC 444</td>
<td>Marine Phytoplankton</td>
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<td>ENVR 412</td>
<td>Ecological Microbiology</td>
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<tr>
<td>ENVR 413</td>
<td>Limnology</td>
<td>3</td>
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<td>ENVR 416</td>
<td>Aerosol Physics and Chemistry</td>
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<td>ENVR 419</td>
<td>Chemical Equilibria in Natural Waters</td>
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<td>ENVR 421</td>
<td>Environmental Health Microbiology</td>
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<td>ENVR 430</td>
<td>Health Effects of Environmental Agents</td>
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<td>ENVR 431</td>
<td>Techniques in Environmental Health Sciences</td>
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<td>ENVR 442</td>
<td>Biochemical Toxicology</td>
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<td>ENVR 451</td>
<td>Elements of Chemical Reactor Engineering</td>
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<td>ENVR 600</td>
<td>Environmental Health</td>
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<td>EPI 600</td>
<td>Principles of Epidemiology for Public Health</td>
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<td>MASC 443</td>
<td>Marine Microbiology</td>
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<td>PATH 128</td>
<td>Biology of Human Disease</td>
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Water and Climate Concentration

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<td>GEOL 403/</td>
<td></td>
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<td>MASC 401</td>
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<tr>
<td>ENEC 222</td>
<td>Estuarine and Coastal Marine Science ¹</td>
<td>4</td>
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<tr>
<td>ENEC/ENVR 403</td>
<td>Environmental Chemistry Processes ¹</td>
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<tr>
<td>ENEC/GEOL 253</td>
<td>Introduction to Atmospheric Processes</td>
<td>4</td>
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<tr>
<td>ENEC/GEOL 324</td>
<td>Water in Our World: Introduction to Hydrologic Science and Environmental Problems ¹</td>
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<td>ENEC/GEOL 417</td>
<td>Geomorphology</td>
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<td>ENEC/GEOL/</td>
<td>Oceanic Processes in Environmental Systems</td>
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<td>MASC 411</td>
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<td>ENEC/GEOL/</td>
<td>Environmental Systems Modeling</td>
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<td>MASC 415</td>
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<td>ENEC/GEOL/</td>
<td>Biogeochemical Processes</td>
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<td>MASC 450</td>
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<td>ENV 413</td>
<td>Limnology</td>
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<tr>
<td>ENV 416</td>
<td>Aerosol Physics and Chemistry</td>
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<tr>
<td>ENV 419</td>
<td>Chemical Equilibria in Natural Waters</td>
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<tr>
<td>ENV 453</td>
<td>Groundwater Hydrology</td>
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<tr>
<td>GEOG 370</td>
<td>Introduction to Geographic Information ¹</td>
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<tr>
<td>GEOG 412</td>
<td>Synoptic Meteorology</td>
<td>3</td>
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<tr>
<td>GEOG 414</td>
<td>Climate Change</td>
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<tr>
<td>GEOG 416</td>
<td>Applied Climatology: The Impacts of Climate and Weather on Environmental and Social Systems</td>
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<td>GEOG 440/</td>
<td>Earth Surface Processes</td>
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<td>GEOL 202</td>
<td>Earth Systems History</td>
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<td>GEOL 432</td>
<td>Paleoclimatology</td>
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<td>GEOL 435</td>
<td>Groundwater</td>
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<td>GEOL 436</td>
<td>Geochemistry of Natural Waters</td>
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<tr>
<td>GEOL/MASC 483</td>
<td>Geologic and Oceanographic Applications of Geographical Information Systems ¹</td>
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<tr>
<td>GEOL/MASC 503</td>
<td>Marine Geology</td>
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GEOL/MASC 506 Physical Oceanography 4
GEOL 508 Global Hydrology 3
MASC 312 From the Equator to the Poles: Case Studies in Global Environmental Change 3
MASC 314 Earth Systems in a Changing World 3
MASC 432 Major World Rivers and Global Change: From Mountains to the Sea 3
MASC 433 Wetland Hydrology 3
MASC 460 Fluid Dynamics of the Environment 3

This course appears on a core requirement list as well as a concentration requirement list, but can only be counted toward one of the two.

Environmental Science, B.S.–Quantitative Energy Systems Track

In addition to the program requirements, students must

- earn a minimum final cumulative GPA of 2.00
- complete a minimum of 45 academic credit hours earned at UNC–Chapel Hill
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.00 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/#degreerequirements).

This major is designed for students with a strong interest in water, energy, and sustainable natural resources, and interdisciplinary approaches to analytics, informatics, or business. The degree provides interdisciplinary preparation for graduate or professional training as well as for jobs in government, consulting, and industry.

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ENEC 201</td>
<td>Introduction to Environment and Society H</td>
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<tr>
<td>ENEC 203</td>
<td>Introduction to Environmental Science Problem Solving</td>
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</tr>
<tr>
<td>or ENEC 415</td>
<td>Environmental Systems Modeling</td>
<td>3</td>
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<tr>
<td>or MATH 528</td>
<td>Mathematical Methods for the Physical Sciences I</td>
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<td>ENEC 698</td>
<td>Capstone: Analysis and Solution of Environmental Problems</td>
<td>3</td>
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<tr>
<td>or ENEC 694H</td>
<td>Honors Project in Environmental Sciences and Studies</td>
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Two courses each from two of the following quantitative skills (4 courses total)

<table>
<thead>
<tr>
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<tr>
<td>INLS 161</td>
<td>Tools for Information Literacy</td>
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<tr>
<td>INLS 201</td>
<td>Foundations of Information Science</td>
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<tr>
<td>INLS 382</td>
<td>Information Systems Analysis and Design</td>
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<tr>
<td>INLS 523</td>
<td>Introduction to Database Concepts and Applications</td>
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<td>INLS 541</td>
<td>Information Visualization</td>
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<td>STOR 215</td>
<td>Foundations of Decision Sciences</td>
<td>3</td>
</tr>
<tr>
<td>STOR 305</td>
<td>Introduction to Decision Analytics</td>
<td>3</td>
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</table>

**Applied Mathematics**

MATH 347 | Linear Algebra for Applications | 3     |
MATH 381 | Discrete Mathematics H | 3     |
MATH 383 | First Course in Differential Equations H | 3     |
MATH 528 | Mathematical Methods for the Physical Sciences I | 3     |
MATH 535 | Introduction to Probability | 3     |
MATH 564 | Mathematical Modeling in the Life Sciences | 3     |
PHYS 331 | Numerical Techniques for the Sciences I 1 | 3     |

**Statistics**

BIOS 511 | Introduction to Statistical Computing and Data Management | 3     |
ENEC 562 | Statistics for Environmental Scientists | 3     |
ENEC 563 | Statistical Analysis in Ecology and Evolution | 3     |
GEOL 520 | Data Analysis in the Earth Sciences | 3     |
GEOL 525 | Inverse Theory: Advanced Data Analysis and Geophysical Modeling | 3     |
STOR 455 | Methods of Data Analysis | 3     |
STOR 435 | Introduction to Probability | 3     |
STOR 556 | Time Series Data Analysis | 3     |

**Basic Science**

BIOL 101 | Principles of Biology 1,H | 3     |
BIOL 201 | Ecology and Evolution 1,H,H | 3     |
BIOL 271 | Plant Biology | 3     |
CHEM 261 | Introduction to Organic Chemistry I H | 3     |
PHYS 114 | General Physics I: For Students of the Life Sciences | 3     |
PHYS 115 | General Physics II: For Students of the Life Sciences | 3     |
PHYS 118 | Introductory Calculus-based Mechanics and Relativity | 3     |

**GIS and Remote Sensing**

ANTH 419 | Anthropological Application of GIS | 3     |
ENEC 479 | Landscape Analysis | 3     |
GEOG 370 | Introduction to Geographic Information | 3     |
GEOG 456 | Geovisualizing Change | 3     |
GEOG 477 | Introduction to Remote Sensing of the Environment | 3     |
GEOG 491 | Introduction to GIS | 3     |
GEOG 577 | Advanced Remote Sensing | 3     |
GEOG 591 | Applied Issues in Geographic Information Systems | 3     |
GEOG 592 | Geographic Information Science Programming | 3     |
GEOG/MASC 483 | Geologic and Oceanographic Applications of Geographical Information Systems | 3     |

Four courses from one of the following concentrations 12-16

**Energy Management**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ENEC 395</td>
<td>Research in Environmental Sciences and Studies for Undergraduates ¹</td>
</tr>
<tr>
<td>or ENEC 396</td>
<td>Directed Readings</td>
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<tr>
<td>ENEC 407</td>
<td>Principles of Energy Conversion</td>
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<tr>
<td>ENEC 432</td>
<td>Environmental Life Cycle Assessment</td>
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<tr>
<td>ENEC 481</td>
<td>Energy Economics</td>
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<td>ENEC 482</td>
<td>Energy and the Environment: A Coastal Perspective</td>
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<tr>
<td>ENEC 693H</td>
<td>Honors Research in Environmental Sciences and Studies ¹</td>
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<td>Honors Project in Environmental Sciences and Studies</td>
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<tr>
<td>ENVR/ENEC 403</td>
<td>Environmental Chemistry Processes ¹</td>
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<td>GEOL 315</td>
<td>Energy Resources</td>
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<tr>
<td>PHYS 131</td>
<td>Energy, Physical Principles and the Quest for Alternatives to Dwindling Oil and Gas</td>
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<tr>
<td>PHYS 581</td>
<td>Renewable Electric Power Systems</td>
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<td>PHYS 582</td>
<td>Decarbonizing Fuels</td>
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<td>PLAN/ENEC 547</td>
<td>Energy, Transportation, and Land Use</td>
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<td>Introduction to the Environmental Sciences</td>
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<td>Mountain Biodiversity</td>
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<tr>
<td>ENEC 489</td>
<td>Ecological Processes in Environmental Systems</td>
</tr>
<tr>
<td>ENEC 693H</td>
<td>Honors Research in Environmental Sciences and Studies ¹</td>
</tr>
<tr>
<td>or ENEC 694</td>
<td>Honors Project in Environmental Sciences and Studies</td>
</tr>
<tr>
<td>ENV/ENEC 403</td>
<td>Environmental Chemistry Processes ¹</td>
</tr>
<tr>
<td>MASC 432</td>
<td>Major World Rivers and Global Change: From Mountains to the Sea</td>
</tr>
<tr>
<td>MASC 433</td>
<td>Wetland Hydrology</td>
</tr>
<tr>
<td>MASC 450</td>
<td>Biogeochemical Processes</td>
</tr>
<tr>
<td>MASC 460</td>
<td>Fluid Dynamics of the Environment</td>
</tr>
<tr>
<td>GEOL 435</td>
<td>Groundwater</td>
</tr>
<tr>
<td>GEOL 436</td>
<td>Geochemistry of Natural Waters</td>
</tr>
<tr>
<td>GEOL 508</td>
<td>Global Hydrology</td>
</tr>
<tr>
<td>GEOL 520</td>
<td>Data Analysis in the Earth Sciences</td>
</tr>
<tr>
<td>GEOL 525</td>
<td>Inverse Theory: Advanced Data Analysis and Geophysical Modeling</td>
</tr>
<tr>
<td>GEOG 410</td>
<td>Modeling of Environmental Systems</td>
</tr>
<tr>
<td>GEOG 412</td>
<td>Synoptic Meteorology</td>
</tr>
<tr>
<td>GEOG 414</td>
<td>Climate Change</td>
</tr>
<tr>
<td>GEOG 416</td>
<td>Applied Climatology: The Impacts of Climate and Weather on Environmental and Social Systems</td>
</tr>
<tr>
<td>GEOG 441</td>
<td>Introduction to Watershed Systems</td>
</tr>
<tr>
<td><strong>Smart Cities</strong></td>
<td></td>
</tr>
<tr>
<td>ENEC 350</td>
<td>Environmental Law and Policy</td>
</tr>
<tr>
<td>ENEC 351</td>
<td>Coastal Law and Policy</td>
</tr>
<tr>
<td>ENEC 325</td>
<td>Water Resource Management and Human Rights ¹</td>
</tr>
<tr>
<td>ENEC 380</td>
<td>Environmental Economics</td>
</tr>
<tr>
<td>ENEC 395</td>
<td>Research in Environmental Sciences and Studies for Undergraduates ¹</td>
</tr>
<tr>
<td>or ENEC 396</td>
<td>Directed Readings</td>
</tr>
<tr>
<td>ENEC/PLAN 420</td>
<td>Community Design and Green Architecture</td>
</tr>
<tr>
<td>ENEC 480</td>
<td>Environmental Decision Making</td>
</tr>
<tr>
<td>ENEC 485</td>
<td>Coastal Resource Economics and Policy</td>
</tr>
<tr>
<td>ENEC 492</td>
<td>Social Science Research Methods</td>
</tr>
<tr>
<td>ENEC 693H</td>
<td>Honors Research in Environmental Sciences and Studies ¹</td>
</tr>
<tr>
<td>or ENEC 694</td>
<td>Honors Project in Environmental Sciences and Studies</td>
</tr>
<tr>
<td>PLAN/ENEC 547</td>
<td>Energy, Transportation, and Land Use</td>
</tr>
<tr>
<td>PLAN 652</td>
<td>Site Planning and Urban Design</td>
</tr>
<tr>
<td>PLAN 672</td>
<td>Urban Data Analytics</td>
</tr>
<tr>
<td>PUBA 787</td>
<td>Applied Environmental Finance: How to Pay for Environmental Services</td>
</tr>
<tr>
<td>PLAN/ENEC 641</td>
<td>Watershed Planning</td>
</tr>
<tr>
<td>PLAN 636</td>
<td>Urban Transportation Planning</td>
</tr>
<tr>
<td>PLAN 637</td>
<td>Public Transportation</td>
</tr>
<tr>
<td>PLAN 638</td>
<td>Pedestrian and Bike Transportation</td>
</tr>
<tr>
<td>PLAN 651</td>
<td>Urban Form and the Design of Cities</td>
</tr>
<tr>
<td><strong>Additional Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>COMP 110</td>
<td>Introduction to Programming and Data Science ¹, ¹</td>
</tr>
<tr>
<td>or COMP 116</td>
<td>Introduction to Scientific Programming</td>
</tr>
<tr>
<td>or PHYS 331</td>
<td>Numerical Techniques for the Sciences I</td>
</tr>
<tr>
<td>CHEM 101</td>
<td>General Descriptive Chemistry I and Quantitative Chemistry Laboratory I (PX) ¹</td>
</tr>
<tr>
<td>&amp; 101L</td>
<td>General Physics I: For Students of the Life Sciences</td>
</tr>
<tr>
<td>or PHYS 114</td>
<td>Introductory Calculus-based Mechanics and Relativity</td>
</tr>
<tr>
<td>or PHYS 118</td>
<td>Principles of Biology</td>
</tr>
<tr>
<td>or BIOL 101 &amp; 101L</td>
<td>Introductory Biology Laboratory</td>
</tr>
<tr>
<td>or BIOL 102 &amp; 102L</td>
<td>General Descriptive Chemistry II and Quantitative Chemistry Laboratory II (PX) ¹</td>
</tr>
<tr>
<td>or PHYS 115</td>
<td>General Physics II: For Students of the Life Sciences</td>
</tr>
<tr>
<td>or PHYS 119</td>
<td>Introductory Calculus-based Electromagnetism and Quanta</td>
</tr>
<tr>
<td>or BIOL 201</td>
<td>Ecology and Evolution</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Functions of One Variable I (QR) ¹</td>
</tr>
<tr>
<td>MATH 232</td>
<td>Calculus of Functions of One Variable II (QI) ¹</td>
</tr>
<tr>
<td>MATH 233</td>
<td>Calculus of Functions of Several Variables (QI) ¹</td>
</tr>
<tr>
<td>STOR 155</td>
<td>Introduction to Data Models and Inference ¹</td>
</tr>
<tr>
<td>or BIOS 600</td>
<td>Principles of Statistical Inference</td>
</tr>
<tr>
<td><strong>Total Hours</strong></td>
<td>120</td>
</tr>
</tbody>
</table>

¹ Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.
Following courses are listed under multiple requirements in the major but can only be used to fulfill one requirement per course: ENEC 395, ENEC 415, ENEC 396, ENEC 693H, ENEC 694H, ENVR 403/ENEC 403, PHYS 114, PHYS 115, PHYS 118, PHYS 119, PHYS 331. Recommended courses are ENEC 202 (PX), ECON 101 (SS), and one of the following PH courses: ENEC 325, COMM 375/ENEC 375, or PHYS 368/ENEC 368.

Sample Plan of Study

Sample plans can be used as a guide to identify the courses required to complete the major and other requirements needed for degree completion within the expected eight semesters. The actual degree plan may differ depending on the course of study selected (second major, minor, etc.). Students should meet with their academic advisor to create a degree plan that is specific and unique to their interests. The sample plans represented in this catalog are intended for first-year students entering UNC—Chapel Hill in the fall term. Some courses may not be offered every term.

**Suggested Program of Study for B.S. Major**

**First Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 101</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 101L</td>
<td></td>
</tr>
<tr>
<td>ENEC 201</td>
<td>4</td>
</tr>
<tr>
<td>MATH 231</td>
<td>4</td>
</tr>
<tr>
<td>MATH 232</td>
<td>4</td>
</tr>
<tr>
<td>STOR 155</td>
<td>3</td>
</tr>
<tr>
<td>Language level 2 (FL)</td>
<td></td>
</tr>
<tr>
<td>Approaches</td>
<td>6</td>
</tr>
<tr>
<td>Total Hours</td>
<td>29</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 102</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 102L</td>
<td></td>
</tr>
<tr>
<td>ENEC 203 or ENEC 415 or MATH 528</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 564</td>
<td></td>
</tr>
<tr>
<td>One environmental concentration course</td>
<td>3</td>
</tr>
<tr>
<td>One earth system science core</td>
<td>3-4</td>
</tr>
<tr>
<td>PHYS 114 or PHYS 118</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 115 or PHYS 119</td>
<td>4</td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEC 698 or ENEC 694H or Honors Project in Environmental Sciences and Studies</td>
<td>3</td>
</tr>
<tr>
<td>Remaining environmental concentration core</td>
<td>3</td>
</tr>
<tr>
<td>Remaining minor field courses</td>
<td>9</td>
</tr>
<tr>
<td>Remaining Approaches (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) and Connections (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>)</td>
<td>3</td>
</tr>
<tr>
<td>Enough free electives to meet 120 academic hour minimum</td>
<td>13</td>
</tr>
<tr>
<td>Total Hours</td>
<td>30-31</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEC 698 or ENEC 694H or Honors Project in Environmental Sciences and Studies</td>
<td>3</td>
</tr>
<tr>
<td>Remaining environmental concentration core</td>
<td>3</td>
</tr>
<tr>
<td>Remaining minor field courses</td>
<td>9</td>
</tr>
<tr>
<td>Remaining Approaches (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) and Connections (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>)</td>
<td>3</td>
</tr>
<tr>
<td>Enough free electives to meet 120 academic hour minimum</td>
<td>13</td>
</tr>
<tr>
<td>Total Hours</td>
<td>120-121</td>
</tr>
</tbody>
</table>

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

**Suggested Program of Study for the Quantitative Energy Systems Track**

**First Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEC 201</td>
<td>4</td>
</tr>
<tr>
<td>STOR 155</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 101 &amp; 101L</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 102 &amp; 102L</td>
<td>4</td>
</tr>
<tr>
<td>MATH 231</td>
<td>4</td>
</tr>
<tr>
<td>MATH 232</td>
<td>4</td>
</tr>
<tr>
<td>Language levels 2 and 3</td>
<td>6</td>
</tr>
<tr>
<td>Lifetime fitness</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 105</td>
<td>3</td>
</tr>
<tr>
<td>Total Hours</td>
<td>33</td>
</tr>
</tbody>
</table>
Dual Bachelor’s–Master’s Degree Program

Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEC 203</td>
<td>Introduction to Environmental Science Problem Solving or Environmental Systems Modeling</td>
<td>3</td>
</tr>
<tr>
<td>ENEC 415</td>
<td>or Mathematical Methods for the Physical Sciences I</td>
<td></td>
</tr>
<tr>
<td>MATH 528</td>
<td>or Mathematical Modeling in the Life Sciences</td>
<td></td>
</tr>
<tr>
<td>MATH 564</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATH 233</td>
<td>Calculus of Functions of Several Variables H</td>
<td>4</td>
</tr>
<tr>
<td>COMP 110</td>
<td>Introduction to Programming and Data Science H</td>
<td>3</td>
</tr>
<tr>
<td>COMP 116</td>
<td>or Introduction to Scientific Programming</td>
<td></td>
</tr>
<tr>
<td>PHYS 331</td>
<td>or Numerical Techniques for the Sciences I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two courses from quantitative skills</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Approaches (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) and Connections (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) (4 courses)</td>
<td>12</td>
</tr>
<tr>
<td>Free elective course</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Hours</td>
<td></td>
<td>31</td>
</tr>
</tbody>
</table>

Junior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP 110</td>
<td>Introduction to Programming and Data Science H</td>
<td>3</td>
</tr>
<tr>
<td>COMP 116</td>
<td>or Introduction to Scientific Programming</td>
<td></td>
</tr>
<tr>
<td>PHYS 331</td>
<td>or Numerical Techniques for the Sciences I</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two courses from quantitative skills</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Approaches (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) and Connections (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) (3 courses)</td>
<td>9</td>
</tr>
<tr>
<td>Free elective courses</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Hours</td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEC 698</td>
<td>Capstone: Analysis and Solution of Environmental Problems or Honors Project in Environmental Sciences and Studies</td>
<td>3</td>
</tr>
<tr>
<td>ENEC 694H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remaining environmental concentration courses</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Remaining General Education (<a href="http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/">http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements/</a>) courses and free electives to reach at least 120 academic credit hours</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Hours</td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>Total Hours</td>
<td></td>
<td>120</td>
</tr>
</tbody>
</table>

H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

Environmental and science communication is a collaboration between the environment, ecology and energy program (E3P) and the School of Media and Journalism;

Environmental informatics is a collaboration between E3P and the School of Information and Library Science;

Environmental finance and leadership is a collaboration between E3P and the School of Government;

Each program is designed for students to earn their bachelor’s degree and complete a master’s degree in a professional school in as few as five years. The dual degree in environmental and science communication is approached through the bachelor’s of arts degree with a major in environmental studies, and students then complete a master’s degree in journalism. The dual degree in environmental informatics is approached through the bachelor’s of science degree with a major in environmental science, and students then complete a master’s in information sciences. The dual degree in environmental finance and leadership is approached through either the bachelor’s of science or the bachelor’s of arts in environment and ecology, and students then complete a master’s in public administration.

Students may begin taking courses for the graduate degree while in the undergraduate program, and a limited number of credit hours of approved graduate coursework may be transferred into the graduate degree program in mass communication (up to nine hours), information sciences (up to 12 hours) and public administration (up to 13 hours). Courses taken as an undergraduate for graduate credit may not be counted as part of the undergraduate degree if the intent is to transfer them to the graduate program. Early advising is essential to success in navigating these dual-degree programs. Advisors are available in both units to help students prepare and select courses appropriately to get the most from their education.

Applying for one of the dual-degree programs is a two-step process. It is highly recommend that interested first- and second-year students speak to an advisor early in their college program. Students must submit a conditional application to the program no later than their junior year to ensure that they will receive preference in registering for courses. Students must formally apply to the program through The Graduate School in their senior year. The GRE is not required for applications from current UNC–Chapel Hill students for the dual degree in environmental science and communication; for other dual degrees students should check with their advisors about GRE requirements. For complete information on the application process and curriculum requirements, please go to the specific Web site listed above for the dual-degree program of interest.

Special Opportunities in Environmental Science and Studies

Honors in Environmental Science or Studies

Students in either the B.S. or B.A. degree program may participate in honors research leading to graduation with honors or highest honors. This distinction is earned by participation in honors research (ENEC 693H) and culminates in ENEC 694H, thesis writing and defense. Students should follow the guidelines established by Honors Carolina and meet with the faculty honors advisor, Dr. Geoff Bell, to ensure that appropriate requirements are fulfilled. (Requirements can be found on the Honors Program website (http://honorscarolina.unc.edu/current-students/honors-thesis-and-undergraduate-research/honors-thesis/)). Honors students can use three credit hours of ENEC 693H (research).
Departmental Involvement

The Carolina Environmental Student Alliance (CESA) is an interdisciplinary organization dedicated to uniting the environmental interests of students across campus. Participation is open to all students and community members with an interest in the environment.

Experiential Education

Possibilities for experiential education include APPLES service-learning courses (ENEC 593), Coral Reef Ecology and Management (ENEC 259), Sierra Nevada Program (ENEC 208), internships (ENEC 393, ENEC 493), research (ENEC 395, ENEC 396, ENEC 698), and honors research (ENEC 693H, ENEC 694H). Additionally, a series of experiential education field sites is available in North Carolina and around the world where students may take coursework and conduct research for a semester. Fall semester field sites are offered in North Carolina at Highlands Biological Station (mountain/ ecology), the Institute for Marine Sciences (marine ecology/ geology), and the Coastal Studies Institute/Outer Banks (coastal policy and economics). Spring semester field sites are offered on the UNC campus (Sustainable Triangle field site) and in Thailand (energy and pollution). The Thailand field site experience incorporates part of the following summer as well. Summer programs are also offered in the Galapagos via UNC’s Center for Galapagos Studies. Contact our advisors about other opportunities. Faculty members often arrange Burch Program summer educational trips to such locations as Australia (conservation, restoration, and natural resource management), Siberia, Russia (ecology and anthropology), the Sierra Nevadas (ecology and physical geography), and northern Europe (energy, sustainability, and communication).

Internships

Students are encouraged to apply for paid or unpaid internships in local, state, national, and international environmental organizations. Internship opportunities can be found through the Ecostudio Internship Incubator website (https://ecostudio.unc.edu/). These internships provide valuable practical experience, and some may be conducted for academic credit. Students interested in academic credit should contact the director of undergraduate studies, Dr. Amy Cooke (amycooke@unc.edu), or the Ecostudio, to obtain the required application for credit before the term begins.

Study Abroad

Exchange and other study abroad programs are available through the UNC Study Abroad Office. At some locations students may take courses for UNC credit, such as some field sites listed above. Students may take courses at other universities during study abroad and apply for transfer credit as well. We encourage students to participate in study abroad during their career at Carolina.

Undergraduate Awards

Undergraduates may be considered for the Watts and Betsy Carr Awards, Mary and Watts Hill Jr. Awards, and Robert Alonzo Winston Scholarships.

Undergraduate Research

All students are encouraged (but not required) to complete an independent or team research project. Such projects introduce students to the tools needed for graduate study. They also provide an important opportunity for working directly with the world-class environmental faculty members and graduate students at UNC-Chapel Hill, as well as in the many environmental organizations in the Research Triangle. The Triangle area contains one of the largest collections of environmental organizations and expertise in the world, providing unique opportunities for students to conduct research on an immense range of topics from fundamental scientific research to policy applications. Students interested in obtaining course credit for research should speak with either Dr. Geoff Bell (honors advisor) or Dr. Amy Cooke (director of undergraduate studies) to ensure all the requirements and appropriate paperwork has been approved within the first week of classes.