ENVIRONMENTAL HEALTH SCIENCES MAJOR, B.S.P.H.

Contact Information
Department of Environmental Sciences and Engineering
www.sph.unc.edu/ese (http://www.sph.unc.edu/ese)
161 Rosenau Hall, CB# 7431
(919) 966-3844
Barbara J. Turpin, Chair
Louise Ball, Program Director
lmball@unc.edu
Wake Harper, Student Services
wbh@unc.edu

The undergraduate major in environmental health sciences is designed to develop a comprehensive understanding of the environmental factors that impact human health; the physical, chemical, and biological processes that underlie the impact of human activity on the environment and human health; methods used to assess the impact of human activity on the environment and human health; and science-based solutions for environmental problems. Students may choose to emphasize environmental chemistry, environmental health biology, or environmental physics by selecting those concentrations. Admission into the program requires satisfactory completion of coursework in basic sciences and mathematics. Recent graduates have entered graduate programs in environmental science, microbiology, marine science, applied mathematics, and environmental engineering. Students who pursued employment after completing the B.S.P.H. degree are working in environmental advocacy organizations, environmental consulting firms, industry, and investment banking firms.

Upon completion of the B.S. in environmental science and engineering, students should be able to:

- Demonstrate knowledge of the fundamental sciences
- Describe the relationship between public health and environmental sciences and engineering
- Identify major issues in environmental sciences and engineering
- Describe significant regulatory components that have shaped environmental policy
- Demonstrate written and oral communication skills related to environmental sciences and engineering issues within a public health context

Requirements
In addition to the program requirements listed below, students must

- attain a final cumulative GPA of at least 2.0
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major course requirements (courses and credit hours) at UNC–Chapel Hill.

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

Admission (http://catalog.unc.edu/undergraduate/schools-college/public-health) to the program is required. Students apply in the spring of their sophomore year. By the end of their sophomore year successful applicants should have earned a grade of C or better from UNC–Chapel Hill in at least one course per group in three of the following groups:

Group 1
BIOL 201 Ecology and Evolution H 4
BIOL 202 Molecular Biology and Genetics H 4

Group 2
CHEM 102 General Descriptive Chemistry II 4
& 102L and Quantitative Chemistry Laboratory II H 4
CHEM 261 Introduction to Organic Chemistry I H 3

Group 3
COMP 116 Introduction to Scientific Programming 3
or approved alternatives:
BIOL 201H Ecology and Evolution 4
BIOL/MATH 553 Mathematical and Computational Models in Biology 3
GEOG 597 Ecological Modeling 3

Group 4
MATH 231 Calculus of Functions of One Variable I 3-4
or MATH 241 BioCalculus I
MATH 232 Calculus of Functions of One Variable II 3-4
or MATH 283 BioCalculus II
MATH 233 Calculus of Functions of Several Variables H 4

Group 5
PHYS 114 General Physics I: For Students of the Life Sciences 4
PHYS 115 General Physics II: For Students of the Life Sciences 4
PHYS 118 Introductory Calculus-based Mechanics and Relativity 4
PHYS 119 Introductory Calculus-based Electromagnetism and Quanta 4

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

The major in environmental health sciences includes several concentrations:

- General (p. 2)
- Environmental Chemistry (p. 2)
- Environmental Health Biology (p. 2)
- Environmental Physics (p. 3)

Requirements for All Concentrations
Core Requirements
Public Health Core Courses:
BIOS 600 Principles of Statistical Inference 3
EPID 600 Principles of Epidemiology 3
HBEH 600 Social and Behavioral Sciences in Public Health 3
HPM 600 Introduction to Health Policy and Management 3

Other Core Courses:
ENVR 230  Environmental Health Issues  3
ENVR 430  Health Effects of Environmental Agents  3
One of the following:  3
ENVR 698  Senior Capstone Course (to be taken in the senior year)  3
ENVR 593  Undergraduate Practicum in Environmental Health Sciences (with approval)  3

Additional Requirements
BIOL 101 & 101L  Principles of Biology and Introductory Biology Laboratory  4
BIOL 201  Ecology and Evolution  4
BIOL 202  Molecular Biology and Genetics  4
CHEM 101 & 101L  General Descriptive Chemistry I and Quantitative Chemistry Laboratory I  4
CHEM 102 & 102L  General Descriptive Chemistry II and Quantitative Chemistry Laboratory II  4
CHEM 261  Introduction to Organic Chemistry I  3
One of the following:  3-4
COMP 116  Introduction to Scientific Programming
BIOL 201H  Ecology and Evolution
BIOL/MATH 553  Mathematical and Computational Models in Biology
GEOG 597  Ecological Modeling
MATH 231 or MATH 241  Calculus of Functions of One Variable I  3-4
MATH 232 or MATH 283  Calculus of Functions of One Variable II  3-4
PHYS 118 or PHYS 114  Introductory Calculus-based Mechanics and Relativity  4
PHYS 119 or PHYS 115  Introductory Calculus-based Electromagnetism and Quanta  4

Students must satisfy the experiential education, global issues, U.S. diversity, and two additional Connections (http://catalog.unc.edu/undergraduate/general-education-curriculum-degree-requirements) requirements.

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1  Preferred

Environmental Chemistry Concentration

Environmental Health Electives
All students must complete four advanced (400-level or above) courses selected from:
ENVR 403  Environmental Chemistry Processes
ENVR 416  Aerosol Physics and Chemistry
ENVR 419  Chemical Equilibria in Natural Waters
ENVR 451  Elements of Chemical Reactor Engineering
ENVR 575  Global Climate Change: Science, Impacts, Solutions
ENVR 650  Principles of Chemical Carcinogenesis
ENVR 675  Air Pollution, Chemistry, and Physics

Additional Requirements
CHEM 481  Physical Chemistry I  3
MATH 233 or MATH 283  Calculus of Functions of Several Variables  4
MATH 383  First Course in Differential Equations  3
PHYS 118 or PHYS 114  Introductory Calculus-based Mechanics and Relativity  4
PHYS 119 or PHYS 115  Introductory Calculus-based Electromagnetism and Quanta  4

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Environmental Health Biology Concentration

Environmental Health Electives
All students must complete four advanced (400-level or above) courses selected from:
ENVR 411  Laboratory Techniques and Field Measurements
ENVR 412  Ecological Microbiology
ENVR 421  Environmental Health Microbiology
ENVR 423  Industrial Toxicology
ENVR 425  Introduction to Health Physics: Radiation and Radiation Protection
ENVR 433  Health Hazards of Industrial Operation
ENVR 442  Biochemical Toxicology
ENVR 468  Advanced Functions of Temporal GIS
ENVR 610  Global Perspectives on Environmental Health Inequalities
ENVR 630  Systems Biology in Environmental Health

1  At least two must be listed within the Department of Environmental Sciences and Engineering. This requirement is satisfied by any ENVR course (or course cross-listed with ENVR) that is at least two credit hours and numbered between 401 and 690, except for ENVR 593, ENVR 600, and ENVR 601. Other courses may be substituted with the approval of the director of undergraduate studies. These courses provide an overview of the principles of environmental science and their application to environmental problems. Environmental health sciences (ENHS) majors are not required to take ENVR 600. ENVR 430 meets the Gillings School of Global Public Health requirement for ENHS majors.

2  if placed out of MATH 231 and MATH 232
Environmental Health Sciences Major, B.S.P.H.

Environmental Health Electives
All students must complete four advanced (400-level or above) courses selected from the following list:

- ENVR 403 Environmental Chemistry Processes
- ENVR 416 Aerosol Physics and Chemistry
- ENVR 451 Elements of Chemical Reactor Engineering
- ENVR 452 Fluid Dynamics
- ENVR 453 Groundwater Hydrology
- ENVR 666 Numerical Methods
- ENVR 671 Environmental Physics I
- ENVR 472 Quantitative Risk Assessment in Environmental Health Microbiology
- ENVR 675 Air Pollution, Chemistry, and Physics

Additional Requirements
- MATH 233 Calculus of Functions of Several Variables H 4
- MATH 383 First Course in Differential Equations H 3

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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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
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<tr>
<td><strong>Fall Semester</strong></td>
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<tr>
<td>MATH 231 or MATH 241</td>
<td>Calculus of Functions of One Variable I or BioCalculus I</td>
<td>3-4</td>
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<tr>
<td>BIOL 101 &amp; 101L</td>
<td>Principles of Biology and Introductory Biology Laboratory H</td>
<td>4</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>7-8</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>CHEM 101 &amp; 101L</td>
<td>General Descriptive Chemistry I and Quantitative Chemistry Laboratory I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 201</td>
<td>Ecology and Evolution H</td>
<td>4</td>
</tr>
<tr>
<td><strong>Hours</strong></td>
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<td>8</td>
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<tr>
<td><strong>Sophomore Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<tr>
<td>CHEM 102 &amp; 102L</td>
<td>General Descriptive Chemistry II and Quantitative Chemistry Laboratory II H</td>
<td>4</td>
</tr>
<tr>
<td>MATH 232</td>
<td>Calculus of Functions of One Variable II</td>
<td>4</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>8</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>PHYS 111</td>
<td>Introductory Calculus-based Mechanics and Relativity</td>
<td>4</td>
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<td>BIOL 202</td>
<td>Molecular Biology and Genetics H</td>
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<td>COMP 116</td>
<td>Introduction to Scientific Programming</td>
<td>3</td>
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<td><strong>Hours</strong></td>
<td></td>
<td>11</td>
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<tr>
<td><strong>Junior Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<td>ENVR 230</td>
<td>Environmental Health Issues</td>
<td>3</td>
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<td>CHEM 261</td>
<td>Introduction to Organic Chemistry I H</td>
<td>3</td>
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<tr>
<td>HPM 600</td>
<td>Introduction to Health Policy and Management</td>
<td>3</td>
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<tr>
<td><strong>Hours</strong></td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>PHYS 119</td>
<td>Introductory Calculus-based Electromagnetism and Quanta</td>
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<tr>
<td>HBEH 600</td>
<td>Social and Behavioral Sciences in Public Health</td>
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<td>ENVR 403</td>
<td>Environmental Chemistry Processes</td>
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<td>ENVR 695</td>
<td>Undergraduate Research</td>
<td>1-3</td>
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<td><strong>Hours</strong></td>
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<td>11-13</td>
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<tr>
<td><strong>Senior Year</strong></td>
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<td><strong>Fall Semester</strong></td>
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<tr>
<td>BIOS 600</td>
<td>Principles of Statistical Inference</td>
<td>3</td>
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<td>ENVR 412</td>
<td>Ecological Microbiology</td>
<td>3</td>
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<td>ENVR 430</td>
<td>Health Effects of Environmental Agents</td>
<td>3</td>
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<td>ENVR 593</td>
<td>Undergraduate Practicum in Environmental Health Sciences</td>
<td>1-3</td>
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<tr>
<td>ENVR 691H</td>
<td>Honors Research</td>
<td>3</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>13-15</td>
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<tr>
<td><strong>Spring Semester</strong></td>
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<tr>
<td>EPID 600</td>
<td>Principles of Epidemiology</td>
<td>3</td>
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<tr>
<td>ENVR 423</td>
<td>Industrial Toxicology</td>
<td>3</td>
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<tr>
<td>ENVR 470</td>
<td>Environmental Risk Assessment</td>
<td>3</td>
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<td>ENVR 692H</td>
<td>Honors Thesis</td>
<td>3</td>
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<tr>
<td><strong>Hours</strong></td>
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<td>12</td>
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<tr>
<td><strong>Total Hours</strong></td>
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<td>79-84</td>
</tr>
</tbody>
</table>

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Special Opportunities in Environmental Health Sciences

Honors in Environmental Health Sciences
Students who have a grade point average of 3.3 or higher are eligible to participate in honors research and to write an honors thesis.

Study Abroad
There are several opportunities for pursuing environmental study abroad, both through the department and through the UNC Study Abroad Office (http://studyabroad.unc.edu/studyabroad.cfm).

Undergraduate Research
Many undergraduate students participate in the research programs of the department. Students are encouraged to consult individual faculty members for information on opportunities.
members for opportunities to participate in such research. In addition, the department has information concerning fellowships and internships, some of which are combined with research opportunities in laboratories or field settings.