Marine Sciences (BS): Biological Oceanography Concentration

To see more about what you will learn in this program, visit the Learning Outcomes website (https://apps.oirp.ncsu.edu/pgas/).

The degree of Bachelor of Science in Marine Science may be obtained by selecting one of five concentrations: Biological Oceanography, Chemistry, Geology, Meteorology, or Physics.

The degree of Bachelor of Science in Natural Resources is available with a concentration in Marine and Coastal Resources.

Marine scientists explore all aspects of the seas and coastal regions, seeking to understand how the oceans, their biological communities, the solid earth and the atmosphere interact. As professionals with interdisciplinary training, marine scientists are needed to advise business, industry and governments on the potential impact of human activities and the wise use of marine resources. Marine scientists work for consulting firms; regulatory agencies; the mass media; business and industry; federal, state and local governments; academic laboratories; research and education organizations; and nonprofit environmental watchdog groups.

For more information about our marine science programs, visit our website (https://meas.sciences.ncsu.edu/undergraduate/programs/marine-science/) or contact:

Maggie Puryear, Associate Director of Undergraduate Programs
Email: mwpollar@ncsu.edu
Phone: 919-513-1093

Plan Requirements

Marine Sciences (BS): Biological Oceanography Concentration: 120 Total Units

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEA 100</td>
<td>Earth System Science: Exploring the Connections</td>
<td>4</td>
</tr>
<tr>
<td>MEA 200</td>
<td>Introduction to Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MEA 210</td>
<td>Oceanography Lab</td>
<td>1</td>
</tr>
<tr>
<td>MEA 250</td>
<td>Introduction to Coastal Environments</td>
<td>3</td>
</tr>
<tr>
<td>MEA 459</td>
<td>Field Investigation of Coastal Processes</td>
<td>5</td>
</tr>
<tr>
<td>MEA 460</td>
<td>Principles of Physical Oceanography</td>
<td>3</td>
</tr>
<tr>
<td>MEA 462</td>
<td>Observational Methods and Data Analysis in Marine Physics</td>
<td>3</td>
</tr>
<tr>
<td>MEA 495</td>
<td>Junior Seminar in the Marine, Earth, and Atmospheric Sciences</td>
<td>1</td>
</tr>
</tbody>
</table>

Biological Oceanography Concentration

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIO 181</td>
<td>Introductory Biology: Ecology, Evolution, and Biodiversity ¹</td>
<td>4</td>
</tr>
<tr>
<td>BIO 183</td>
<td>Introductory Biology: Cellular and Molecular Biology ¹</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following:

- CH 220 & CH 222: Introductory Organic Chemistry and Organic Chemistry I Lab
- CH 221 & CH 222: Organic Chemistry I and Organic Chemistry I Lab
- PB 200 or PB 250: Plant Life or Plant Biology
- Concentration Electives ²
- AEC 360: Ecology
- MEA 449: Principles of Biological Oceanography or MEA 549:
  Principles of Biological Oceanography
- ZO 350: Animal Phylogeny and Diversity

Basic Math & Sciences

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH 101</td>
<td>Chemistry - A Molecular Science ¹</td>
<td>3</td>
</tr>
<tr>
<td>CH 102</td>
<td>General Chemistry Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>CH 201</td>
<td>Chemistry - A Quantitative Science ¹</td>
<td>3</td>
</tr>
<tr>
<td>CH 202</td>
<td>Quantitative Chemistry Laboratory</td>
<td>1</td>
</tr>
</tbody>
</table>

Select one of the following: ¹

- PY 205 & PY 206: Physics for Engineers and Scientists I and II Laboratory
- PY 211: College Physics I

Select one of the following:

- PY 208 & PY 209: Physics for Engineers and Scientists II and II Laboratory
- PY 212: College Physics II

- MA 131: Calculus for Life and Management Sciences A ¹ | 3 |
- MA 141: Calculus I
- MA 231: Calculus for Life and Management Sciences B ¹ | 3 |
- MA 241: Calculus II

Statistics Elective (p.)

Select one of the following:

- CSC 111: Introduction to Computing: Python
- CSC 112: Introduction to Computing-FORTTRAN
- CSC 113: Introduction to Computing - MATLAB
- GIS 280: Introduction to GIS

College Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>COS 100</td>
<td>Science of Change</td>
<td>2</td>
</tr>
<tr>
<td>ENG 101</td>
<td>Academic Writing and Research ¹</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following: ³

- ENG 331: Communication for Engineering and Technology
- ENG 332: Communication for Business and Management
- ENG 333: Communication for Science and Research

GEP Courses

GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)
GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)

GEP U.S. Diversity (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/) (verify requirement)

GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)

Foreign Language Proficiency (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/) (verify requirement)

Total Hours 120

A grade of C- or higher is required.

Students should consult their academic advisors to determine which courses fill this requirement.

Statistics Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUS 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>EC 351</td>
<td>Econometrics I</td>
<td>3</td>
</tr>
<tr>
<td>ST 305</td>
<td>Statistical Methods</td>
<td>4</td>
</tr>
<tr>
<td>ST 307</td>
<td>Introduction to Statistical Programming- SAS</td>
<td>1</td>
</tr>
<tr>
<td>ST 308</td>
<td>Introduction to Statistical Programming - R</td>
<td>1</td>
</tr>
<tr>
<td>ST 311</td>
<td>Introduction to Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ST 312</td>
<td>Introduction to Statistics II</td>
<td>3</td>
</tr>
<tr>
<td>ST 350</td>
<td>Economics and Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>ST 370</td>
<td>Probability and Statistics for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>ST 371</td>
<td>Introduction to Probability and Distribution Theory</td>
<td>3</td>
</tr>
<tr>
<td>ST 372</td>
<td>Introduction to Statistical Inference and Regression</td>
<td>3</td>
</tr>
<tr>
<td>ST 380</td>
<td>Probability and Statistics for the Physical Sciences</td>
<td>3</td>
</tr>
</tbody>
</table>

Semester Sequence

This is a sample.

Course Title Hours

First Year

Fall Semester

BIO 181 Introductory Biology: Ecology, Evolution, and Biodiversity 1 4

COS 100 Science of Change 2 2

GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/) 1

MA 131/MA 141 Calculus for Life and Management Sciences A (CP) 1 or Calculus I 3-4

MEA 100 Earth System Science: Exploring the Connections 2 4

Hours 14-15

Spring Semester

BIO 183 Introductory Biology: Cellular and Molecular Biology 3 4

ENG 101 Academic Writing and Research 1 4

MEA 200 Introduction to Oceanography (CP) 2 3

MEA 210 Oceanography Lab 2 1

MA 231 Calculus for Life and Management Sciences B 1 or Calculus II 3-4

Hours 15-16

Second Year

Fall Semester

Botany Elective 2 4

CH 101 Chemistry - A Molecular Science (CP) 1 3

CH 102 General Chemistry Laboratory 3 1

GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/) 3

Select one of the following: 4

PY 211 College Physics I 1

PY 205 Physics for Engineers and Scientists I

& PY 206 Physics for Engineers and Scientists I Laboratory

Hours 15

Spring Semester

ZO 350 Animal Phylogeny and Diversity 2 4

CH 201 Chemistry - A Quantitative Science 1 3

CH 202 Quantitative Chemistry Laboratory 3 1

MEA 250 Introduction to Coastal Environments 2 3

Select one of the following: 4

PY 212 College Physics II

PY 208 Physics for Engineers and Scientists II

& PY 209 Physics for Engineers and Scientists II Laboratory 3

Hours 15

Third Year

Fall Semester

Concentration Elective 2 4

Organic Chemistry Elective 2 3

CH 222 Organic Chemistry I Lab 1

MEA 449/549 Principles of Biological Oceanography 2 3

MEA 460 Principles of Physical Oceanography 2 3

Hours 14

Spring Semester

Concentration Elective 2 3

GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/) 3

GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/) 1

MEA 462 Observational Methods and Data Analysis in Marine Physics 2 3

MEA 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences 1

Statistical Science Option 3 3

Hours 14

Summer

MEA 459 Field Investigation of Coastal Processes 2 5

Hours 5
### Fourth Year

#### Fall Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Writing Elective</td>
<td>3</td>
</tr>
<tr>
<td>Concentration Elective ²</td>
<td>3</td>
</tr>
<tr>
<td>PB 360 Ecology</td>
<td>4</td>
</tr>
<tr>
<td>GEP Humanities (<a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a>)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Hours**: 13

#### Spring Semester

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration Elective ²</td>
<td>3</td>
</tr>
<tr>
<td>Concentration Elective ²</td>
<td>3</td>
</tr>
<tr>
<td>Computer Science Option Elective ³</td>
<td>3</td>
</tr>
<tr>
<td>GEP Additional Breadth (<a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a>)</td>
<td>3</td>
</tr>
</tbody>
</table>

**Hours**: 15

Total Hours: 120-122

1. A grade of C- or higher is required.
2. No more than one D will be accepted in MEA core courses and concentration courses.
3. No more than one D will be accepted in other basic math or science courses.

### Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society’s needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.