# OCEANOGRAPHY (M.S.)

https://ceps.unh.edu/earth-sciences/program/ms/oceanography

## Description

The Oceanography (OCE) graduate program has a diverse set of faculty, staff, and students who examine ocean processes in broad fields of physical, biological, chemical, and geological oceanography and geophysics. Basic and applied research of an experimental, numerical, and analytical nature is conducted in oceanic settings that range from shallow nearshore and estuarine waters to the deep ocean and span all ocean basins on earth including the Arctic.

OCE offers programs leading to M.S. and Ph.D. degrees. These interdisciplinary programs prepare students for professional careers in ocean-related fields. In addition, students can also pursue an ocean mapping option within the Department of Earth Sciences and carried out within the Center for Coastal and Ocean Mapping.

## Research and Facilities

The oceanography graduate program within the Department of Earth Sciences and the School of Marine Science and Ocean Engineering (SMSOE) is enhanced by the ocean engineering and marine biology graduate programs, and by other departments and institutes at UNH, including the civil and mechanical engineering and biology departments; the Institute for the Study of Earth, Oceans, and Space (EOS); the Center for Coastal and Ocean Mapping (CCOM); and the Ocean Processes Laboratory (OPAL). Other related programs include the N.H. Sea Grant Program, the Center for Collaborative Science, and the Atlantic Marine Aquaculture Center, Coastal Response Research Center (CRRC), Northeast Consortium (NEC), and the Piscataqua Region Estuaries Partnership (PREP). Oceanographic laboratories at UNH include the Shoals Marine Laboratory (SML) on Appledore Island, the Coastal Marine Laboratory (CML) in Newcastle, the Jackson Estuarine Laboratory (JEL) at Adams Point on the Great Bay, and the Chase Ocean Engineering Laboratory (COEL) on the main UNH campus. Additional laboratories for the oceanography faculty are located on campus in James, Morse, Rudman, and Spaulding Halls. The SMSOE operates a marine support facility and two UNH research vessels moored in Portsmouth Harbor at the UNH pier, the R/V Gulf Challenger and the R/V Gulf Surveyor, as well as a number of small boats. The SMSOE also supports the UNH Diving Program and oversees a shared use Instrumentation Pool for student and faculty use.

## Admission Requirements

Applicants should have completed an undergraduate major related to one of the oceanography disciplines, including biology, chemistry, engineering, geology, physics, or mathematics, or an appropriate array of science and engineering courses within their major field. Applicants are expected to have completed one year each of calculus and chemistry and two semesters of physics and/or biology. It is not necessary to have had previous coursework in oceanography.

## Degree Requirements

### Students must complete a minimum of 30 credits for the thesis option or 34 credits for the non-thesis option.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESCI 997</td>
<td>Seminar in Earth Sciences</td>
<td>1</td>
</tr>
<tr>
<td>ESCI 998</td>
<td>Proposal Development</td>
<td>1</td>
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Select two of the following core courses: 6-8 credits

- BIOL 855: Biological Oceanography
- ESCI 852: Chemical Oceanography
- ESCI 858: Introduction to Physical Oceanography
- ESCI 899: Geological Oceanography

Select one of the following: 6 or 2 credits

- OCE 899: Master’s Thesis (acceptable to the thesis-examining committee and must pass a thesis defense)

**Non-Thesis Option:**

- ESCI 898 or OCE 898: Directed Research

### Other Relevant Graduate Courses

- BIOL 828: Marine Bioacoustics
- CEE 822: Introduction to Marine Pollution and Control
- ESCI 861: Quantitative Methods in Earth Sciences
- ESCI 890: Ocean Measurements Lab
- ESCI 834: Geophysics
- ESCI 841: Geochemistry
- ESCI 845: Isotope Geochemistry
- ESCI 847: Aquatic Geochemistry
- ESCI 854: Sedimentology
- ESCI 856: Geotectonics
- ESCI 860: Paleooceanography
- ESCI 862: Glacial Geology
- ESCI 864: Spectral Analysis of Geophysical Time Series Data
- ESCI 865: Paleoclimatology
- ESCI 871: Geodesy and Positioning for Ocean Mapping
- ESCI 874: Integrated Seabed Mapping Systems
- ESCI 875: Advanced Topics in Ocean Mapping
- ESCI 895: Topics (Ocean Biogeochemistry)
- ESCI 896: Topics (Nearshore Processes)
- ESCI 972: Hydrographic Field Course
- ESCI 995: Advanced Topics (Geophysical Fluid Dynamics)
- ESCI 996: Advanced Topics (Ocean Modelling)
- ESCI 996: Advanced Topics (Nearshore Hydrodynamics)
- IAM 940: Asymptotic and Perturbation Methods
- MATH 835: Statistical Methods for Research
- MATH 839: Applied Regression Analysis
- MATH 845: Foundations of Applied Mathematics I
- MATH 846: Foundations of Applied Mathematics II
- MATH 853: Introduction to Numerical Methods
- ME 807: Analytical Fluid Dynamics
- ME 910: Turbulence
- ME 812: Waves in Flows
- MEFB 825: Marine Ecology
- MEFB 872: Fisheries Biology Conservation and Management
- NR 844: Biogeochemistry (or ESCI 896 Topics (Biogeochemistry))
- OE 853: Ocean Hydrodynamics
- OE 854: Ocean Waves and Tides
- OE 857: Coastal Engineering and Processes
- OE 865: Underwater Acoustics
- OE 995: Graduate Special Topics (Coastal Sediment Transport)
Accelerated Master's

This graduate program is approved to be taken on an accelerated basis in articulation with certain undergraduate degree programs.

General Accelerated Master's policy, note that some programs have additional requirements (e.g., higher grade expectations) compared to the policy.

Please see the Graduate School website and contact the department directly for more information.

Student Learning Outcomes

Students graduating with a MS in Oceanography should achieve the following learning outcomes:

Core Knowledge

- Demonstrate a foundation of knowledge in at least 2 of the main branches of oceanography: Geological, Biological, Physical, or Chemical.
- Geological Oceanography: An understanding of marine geology and geophysics, including major geological features and history of the world's oceans, processes of the ocean floor, composition and structure of the Earth, plate tectonic theory, marine sedimentology, and paleoceanography.
- Biological Oceanography: An understanding of marine ecosystems, primary and secondary productivity, trophodynamics, plankton diversity, zooplankton ecology, global ocean dynamics, and the physical and chemical processes that govern nutrient and light availability, the concept of food webs, role of microbes, and fisheries and anthropogenic interactions with fish stocks.
- Physical Oceanography: An understanding of the physics of the ocean, including general wind-driven and thermohaline circulation, geostrophic flow, upwelling, waves and tides, continental and nearshore processes. the effect of the earth's rotation on large scale global ocean circulation, and instrumentation and methods used in obtaining observations.
- Chemical Oceanography: An understanding of the physical and biogeochemical process that determine the composition of seawater, including biological effects on chemistry, ocean nutrient cycles, air-sea gas exchange, radiogenic and stable isotopes as tracers of ocean properties, sediment and trace metal chemistry.
- Demonstrate basic knowledge of how the processes within the main branches of oceanography interact with each other.
- Demonstrate specialized knowledge of a field within oceanography sufficient to conduct substantive supervised research.

Research Methods and Analysis

- Identify and demonstrate knowledge of a range of qualitative and quantitative methodologies typically used in geochemistry research.
- Discover and critically read published research in the Earth sciences and related fields of mathematics, statistics, physics, chemistry, and biology.
- Frame empirical research and/or theory guided by prior knowledge.

- Implement a rigorous study using appropriate methods, measures and techniques.
- Critically evaluate and systematically analyze data to reach appropriate findings and interpretations.

Scholarly Communication

- Structure a coherent argument that rigorously presents and evaluates evidence to support claims.
- Review and cogently synthesize relevant literature.
- Write at a level and in a style of English consistent with that found in leading academic journals.
- Understand and properly use styles of citing, referencing, and formatting found in leading academic journals.
- Clearly convey research findings through oral presentation supported by appropriate digital media.
- Cogently summarize research and its significance to non-specialist audiences.

Professionalism and Pedagogy

- Prepare manuscripts that meet the standards of academic and research journals and respond appropriately to recommendations for revision.
- Demonstrate collaboration, leadership and teamwork.
- Create a welcoming environment that is supportive, inclusive and equitable.
- Make effective contributions to university, community and professional service.
- Communicate effectively to groups in a lecture format.