

OCEAN ENGINEERING (OE)

Degrees Offered: Ph.D., M.S., Graduate Certificate

This program is offered in Durham.

Ocean engineering (OE) offers programs leading to the master of science and doctor of philosophy degree in ocean engineering. Programs in OE are by definition interdisciplinary and require students to interact with the ocean science community, as well as the traditional engineering disciplines. Students are exposed to the broad-based issues of working engineering problems in the ocean environment, as well as discipline specifics. In these programs they will be trained to develop responsible solutions to problems that will lead to sustainable activity and life in the ocean.

A master of science in ocean engineering with an option in ocean mapping is available. This is a more structured path through this program, which is approved by the International Hydrographic Organization (IHO) and incorporates all aspects of hydrography as required by the IHO. Focus is on the engineering aspects of hydrography. The general purpose of these programs is to prepare engineering students for professional careers in ocean-related fields.

Additionally, a graduate certificate in ocean mapping is offered.

Admission Requirements

Applicants should have completed a baccalaureate degree in either chemical, civil, electrical, or mechanical engineering, or have an equivalent background.

<http://www.unh.edu/oe>

Programs

- Ocean Engineering (Ph.D.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/ocean-engineering/ocean-engineering-phd>)
- Ocean Engineering (M.S.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/ocean-engineering/ocean-engineering-ms>)
- Ocean Engineering: Ocean Mapping (M.S.) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/ocean-engineering/ocean-engineering-mapping-ms>)
- Ocean Mapping (Graduate Certificate) (<http://catalog.unh.edu/archives/2017-2018/graduate/programs-study/ocean-engineering/ocean-mapping-certificate>)

Courses

Ocean Engineering (OE)

OE 810 - Ocean Measurements Laboratory
Credits: 4

Measurements of fundamental ocean processes and parameters. Emphasis on understanding typical offshore measurements, their applications, and the use of the acquired data. The latter is in terms of the effects on structures and processes in the ocean.

OE 853 - Ocean Hydrodynamics
Credits: 3

Fundamental concepts of fluid mechanics as applied to the ocean; continuity; Euler and Navier-Stokes equations; Bernoulli equation; stream function, potential function; momentum theorem; turbulence and boundary layers are developed with ocean applications. Prereq: MATH 527; CIE 642 or ME 608.

OE 854 - Ocean Waves and Tides
Credits: 4

Introduction to waves: small-amplitude, linear wave theory, standing and propagating waves, transformation in shallow water, energy and forces on structures, generation by wind and specification of a random sea, long waves with rotation, and internal waves. Introduction to tides: description of tides in ocean tidal generation forces, equilibrium tide, and tidal analysis. Lab/project: field and lab measurements with computer analysis. Prereq: general physics; differential equations; or permission. Lab.

OE 856 - Principles of Naval Architecture and Model Testing
Credits: 4

Fundamentals of naval architecture presented including hydrostatics, basics of resistance and propulsion, sea keeping and scaling. Concepts applied in experiments utilizing the tow/wave tank and associated instrumentation. Prereq: fluid dynamics, mechanics III, or equivalent. Lab.

OE 857 - Coastal Engineering and Processes
Credits: 3

Introduction to small-amplitude and finite-amplitude wave theories. Wave forecasting by significant wave method and wave spectrum method. Coastal processes and shoreline protection. Wave forces and wave structure interaction. Introduction to mathematical and physical modeling. Prereq: fluid dynamics or permission. (Also offered as CIE 857 and ME 857.)

OE 858 - Design of Ocean Structures
Credits: 3

The foundational information necessary for the design of ocean structures. Topics include floating body, fixed body and moored line hydrostatics; wave forces on small and large bodies; dynamic response of floating bodies; and pile and gravity foundation geotechnics. Prereq: Mechanics of Materials; Fluid Mechanics; Dynamics; Differential Equations, Waves & Tides, or permission.

OE 865 - Underwater Acoustics
Credits: 3

An introduction to acoustics in the ocean. Fundamental acoustic concepts including the simple harmonic oscillator, waves on strings, and the acoustic wave equation; the sonar equation; sound generation and reception by underwater acoustic transducers and arrays; basics of sound propagation; reflection and scattering from ocean boundaries. Spring semester; offered every year; satisfies core course requirement in Ocean Engineering. Prereq: General physics and differential equations.

OE 871 - Geodesy and Positioning for Ocean Mapping
Credits: 4

The science and technology of acquiring, managing, and displaying geographically referenced information; the size and shape of the earth, datums and projections; determination of precise positioning of points on the earth and the sea, including classical terrestrial-based methods and satellite-based methods; shoreline mapping, nautical charting and electronic charts. Prereq: one year of calculus and one year of college physics. (Also listed as ESCI 871.)

OE 874 - Integrated Seabed Mapping Systems

Credits: 4

Overview of typical applications that involve mapping the sediment-water interface in the ocean and adjacent waters. Emphasis on defining the task-specific resolution and accuracy requirements. Fundamentals of acoustics relevant to seabed mapping. Progressions through typical configurations involving single beam, sidescan, phase differing and multibeam systems. Integration of asynchronous 3D position, orientation and sound speed measurements with sonar-relative acoustic travel times and angles. Analysis of impact offsets, mis-alignments and latency in all integrated sensors.

OE 875 - Fundamentals of Ocean Mapping II

Credits: 4

The second of two courses covering the principles and practices of hydrography and ocean mapping. In this course the following topics are covered: Ancillary Sensor Integration, System Calibration, Verification and Field QA/QC, Water Levels (Tides); Mapping Standards; Survey Planning, Execution and Reporting; Terrain Analysis; Optical Remote Sensing; Data Presentation; Seafloor Characterization; Electronic Navigational Charts; Hydrography for Nautical Charting, Product Liability and Contracts; and the United Nations Common Law of the Sea (UNCLOS). Prereq: OE/ESCI 874. Pre- Coreq: MATH 896 Mathematics for mapping.

OE 895 - Special Topics

Credits: 1-4

New or specialized courses and/or independent study. May be repeated for credit.

OE 899 - Master's Thesis

Credits: 1-6

May be repeated up to a maximum of 6 credits. Cr/F.

OE 965 - Advanced Underwater Acoustics

Credits: 3

Focused topics varying from year to year depending on student interests and need. Topics may include one or more of the following: sonar systems engineering; underwater acoustic transducers; volume and surface scattering; underwater acoustic propagation; fisheries acoustics. Spring semester; offered every other year. Prereq: Underwater acoustics or permission.

OE 972 - Hydrographic Field Course

Credits: 4

A lecture, lab, and field course on the methods and procedures for the acquisition and processing of hydrographic and ocean mapping data. Practical experience in planning and conducting hydrographic surveys. Includes significant time underway (day trips and possible multi-day cruises) aboard survey vessel(s). Prereq: Fundamentals of Ocean Mapping, Geodesy and Positioning for Ocean Mapping; or permission. (Also listed as ESCI 972.)

OE 973 - Seafloor Characterization

Credits: 3

Remote characterization of seafloor properties using acoustic (echo sounders, sub-bottom profilers, side-scan, multi-beam and interferometric sonars) and optical (video and laser line-scanner) methods. Models of sound interaction with the seafloor will be explored as well as a range of possible geologic, geotechnical, morphologic, acoustic, and biologic descriptors. Prereq: permission. (Also listed as ESCI 973.)

OE 990 - Ocean Seminars I

Credits: 1

Various topics, including marine systems design, marine vehicle operation, data collecting and processing, and marine law. Cr/F.

OE 991 - Ocean Seminars II

Credits: 1

Various topics, including marine systems design, marine vehicle operation, data collecting and processing, and marine law. Cr/F.

OE 995 - Graduate Special Topics

Credits: 1-4

Investigation of graduate-level problems or topics in ocean engineering. May be repeated for a maximum of 16 credits.

OE 998 - Independent Study

Credits: 1-4

Independent theoretical and/or experimental investigation of an ocean engineering problem under the guidance of a faculty member.

OE 999 - Doctoral Research

Credits: 0

Cr/F.

Faculty

See <http://marine.unh.edu/faculty> for faculty.