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 the 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, graduate certificates in ocean mapping and acoustics are offered.

Admission Requirements

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

https://ceps.unh.edu/ocean-engineering/academics

Programs

- Ocean Engineering (Ph.D.)
- Ocean Engineering (M.Eng.)
- Ocean Engineering (M.S.)
- Ocean Engineering: Ocean Mapping (M.S.)
- Acoustics (Graduate Certificate)
- Ocean Mapping (Graduate Certificate)

Courses

Ocean Engineering (OE)

OE 817 - Marine Robotics and Applications
Credits: 3
This course covers (lecture/lab format) the broad spectrum of marine vehicles and applications, as well as what is involved in designing and building robotic vehicles for specific missions. Course topics include: marine applications, sensors for marine environments, vehicle subsystems, ocean and open water environment, dynamic modeling and control, and design/fabrication/testing. Various invited speakers (both scientists and engineers) provide learning modules on various marine robotic related topics. Graduate students will be assigned extra project work.
Equivalent(s): ME 817
Grade Mode: Letter Grading

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.
Prerequisite(s): MATH 527 with a minimum grade of D- and (CEE 650 with a minimum grade of D- or ME 608 with a minimum grade of D-).
Grade Mode: Letter Grading

OE 854 - Ocean Waves and Tides
Credits: 4
Small amplitude, linear wave theory, standing and propagating waves, wave energy, refraction, diffraction, transformation in shallow water, statistics of random seas, spectral energy density, generating eave time series using the random phase methods forces on structures, Froude scaling of wave tank experiments, nonlinear effects. Description of tides as long waves, equilibrium tide, mathematical modeling including friction, nonlinear effects, and Coriolis forces, tidal analysis, the Great Bay Estuarine System as a case study. Requires knowledge of calculus-based physics and differential equations.
Equivalent(s): EOS 854
Grade Mode: Letter Grading

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. Requires knowledge of fluid dynamics.
Grade Mode: Letter Grading

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. Requires knowledge of mechanics of materials, fluid mechanics, differential equations, and ocean waves and tides.
Grade Mode: Letter Grading

OE 864 - Spectral Analysis of Geophysical Time Series Data
Credits: 4
This course considers basic exploratory techniques and in-depth spectral analysis for estimation with geophysical time series data, including calculations of confidence intervals and significance testing. This course prepares students for interpreting time series data with science and engineering applications. Topics include sampling theory, filtering, statistics, probability, spectral analysis, and empirical orthogonal functions. Students gain experience in code-writing for the analysis of time series data. Students enrolled at the 800 level provide data for analysis. One year of calculus is required.
Equivalent(s): ESCI 864
Grade Mode: Letter Grading

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. Requires knowledge of differential equations and college physics.
Grade Mode: Letter Grading

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. Requires knowledge of calculus and college physics.
Equivalent(s): ESCI 871
Grade Mode: Letter Grading

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.
Equivalent(s): ESCI 874
Grade Mode: Letter Grading

OE 875 - Advanced Topics in Ocean Mapping
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: 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 Convention for the Law of the Sea (UNCLOS).
Prerequisite(s): (OE 874 with a minimum grade of D- or ESCI 874 with a minimum grade of D-) and MATH 831 (may be taken concurrently) with a minimum grade of D-.
Equivalent(s): ESCI 875
Grade Mode: Letter Grading

OE 892 - Master's Project
Credits: 3
The student works with a faculty member during one or two semesters on a well-defined research and/or original design project. A written report and seminar are presented. IA (continuous grading).
Grade Mode: Graduate Credit/Fail grading

OE 895 - Special Topics
Credits: 1-4
New or specialized courses and/or independent study. May be repeated barring duplication of subject.
Repeat Rule: May be repeated up to unlimited times.
Grade Mode: Letter Grading

OE 899 - Master's Thesis
Credits: 1-6
Master's Thesis.
Repeat Rule: May be repeated for a maximum of 6 credits.
Grade Mode: Graduate Credit/Fail grading

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.
Prerequisite(s): OE 765 with a minimum grade of D- or OE 865 with a minimum grade of D-.
Repeat Rule: May be repeated for a maximum of 9 credits.
Grade Mode: Letter Grading

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).
Prerequisite(s): OE 875 with a minimum grade of D- and OE 871 with a minimum grade of D-.
Equivalent(s): ESCI 972
Grade Mode: Letter Grading

OE 990 - Ocean Seminars I
Credits: 1
Various topics, including marine systems design, marine vehicle operation, data collecting and processing, and marine law.
Grade Mode: Graduate Credit/Fail grading

OE 991 - Ocean Seminars II
Credits: 1
Various topics, including marine systems design, marine vehicle operation, data collecting and processing, and marine law.
Grade Mode: Graduate Credit/Fail grading

OE 995 - Graduate Special Topics
Credits: 1-4
Investigation of graduate-level problems or topics in ocean engineering.
Repeat Rule: May be repeated for a maximum of 16 credits.
Grade Mode: Letter Grading

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.
Grade Mode: Letter Grading

OE 999 - Doctoral Research
Credits: 0
Doctoral Research.
Grade Mode: Graduate Credit/Fail grading
Special Fee: Yes

Faculty

See https://ceps.unh.edu/ocean-engineering/faculty-staff-directory for faculty.