

# 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 wave 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 considerations; 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. 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 884 - 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. One year of calculus is required.

**Equivalent(s):** ESCI 864

**Grade Mode:** Letter Grading

**OE 885 - 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 8871 - 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 8874 - 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 - Doctoral Research
Credits: 0
Doctoral Research.
Grade Mode: Graduate Credit/Fail grading
Special Fee: Yes