

# OCEAN ENGINEERING (OE)

# Course numbers with the # symbol included (e.g. #400) have not been taught in the last 3 years.

## 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

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. Prereq: General Physics I; Differential Equations, and Multi-Dimensional Calculus.

**Equivalent(s):** EOS 854

## 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.)

**Equivalent(s):** CIE 857, 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 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. Prereq: MATH 426.

**Equivalent(s):** ESCI 864

## 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.)

**Equivalent(s):** 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.

**Equivalent(s):** ESCI 874

## 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 Common Law of the Sea (UNCLOS). Prereq: OE874/ESCI 874, two terms each of college calculus and physics. Pre- or Co-req: MATH 831 or equivalent material.

**Equivalent(s):** ESCI 875

## 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.

**Repeat Rule:** May be repeated for a maximum of 6 credits.

**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.

**Repeat Rule:** May be repeated for a maximum of 9 credits.

**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.)

**Equivalent(s):** 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.)

**Equivalent(s):** 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.

**Repeat Rule:** 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.