

# OCEANOGRAPHY

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Dept. Code: OCE

## Oceanography

The BSMAS in Oceanography is designed to give students a broad foundation in both the basic sciences (mathematics, physics, chemistry and biology) and the Ocean Sciences (physical, chemical and biological oceanography, and elements of Earth and atmospheric sciences), together with specialized knowledge in one or more of these subdisciplines. Students are encouraged, but not required, to complete a minor in chemistry, physics, biology, geological sciences, meteorology, mathematics, computer science or engineering.

### **OCE 503. Physical Oceanography. 3 Credit Hours.**

Introduction to properties of seawater, instruments and methods, heat budget, general ocean circulation, formation of water masses, dynamics of circulation, regional oceanography, waves, tides, and sea level. A mathematical and problem solving course for majors in MPO.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

### **OCE 506. Introduction to Ocean Remote Sensing. 3 Credit Hours.**

This course is intended to provide undergraduate and graduate students with a complete overview of the most important ocean remote sensing techniques using passive (radiometers, cameras) and active instruments (mostly radar) on space- and airborne platforms, towers, ships, and land. Successful completion of undergraduate courses on calculus, statistics, and physics is desirable.

Enrollment Condition: Senior Standing.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

### **OCE 508. Introduction to Ocean Systems Engineering. 3 Credit Hours.**

This course will provide a survey introduction to various aspects of ocean systems engineering. This is a required course for all students enrolled in the Master of Science (non-thesis) in Ocean Engineering Program. It is intended to be taught in the first term of their studies, before they have fully refined their courses. It could also be of interest to graduate students in OCE and upper level undergraduate engineering, marine science or mathematics majors who are seeking to inform themselves on the breadth of study in ocean engineering.

Requisite: Senior Standing and Prerequisites: MTH 211 and MTH 311 and PHY 102 or PHY 202 or PHY 206.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

### **OCE 509. Coastal Physics and Engineering. 3 Credit Hours.**

Course addresses linear wave theory, wave statistics, wave generation, tides, wind-driven currents, nearshore circulation, sediment transport by waves and currents, bedforms, bedload, and suspended load. Other topics include longshore and cross-shore transport, equilibrium beach profiles, coastal processes models, Pelnard-Considere model for shoreline change, and Escoffier model for inlet stability.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

### **OCE 511. Geophysical Fluid Dynamics I. 3 Credit Hours.**

The basic equations of state, continuity, and motion. Topics include wave motions, group velocity, theory of stratified fluids and internal waves turbulence.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

### **OCE 512. Marine Organic Geochemistry. 3 Credit Hours.**

Broad introduction to the chemical constituents comprising organic matter in marine environments. This course will address how biological origins, dietary and detrital reworking, and physical phase influence the distribution and fluxes of organic matter in the marine carbon cycle, on both short and long timescales. Topics will address both the water column and sediments, in open-ocean and coastal environments. Students may choose topics of specific interest to their research for presentations and writing assignments (subject to instructor approval). The first half of the course will focus on the chemistry and physical phases of organic matter; the second half will focus on discussing the application of organic geochemical tools to environmental questions via the primary literature.

Enrollment Condition: Senior Standing.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**OCE 522. Marine Microbial Dynamics. 3 Credit Hours.**

An overview of the function of microbes in the ocean from a chemical perspective, building a quantitative understanding of cellular needs and metabolic functions, and the role these microbial processes play in controlling chemical fluxes and biogeochemical cycles in the ocean.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**OCE 531. Ocean Data Analysis. 3 Credit Hours.**

Useful and widely used ocean data analysis techniques are discussed. Topics covered include: a review of statistical concepts and linear algebra; time series analysis; least squares and regression techniques; principal component analysis; optimization and inverse methods; and simple models of ocean processes. Computational methods are emphasized. Choice of the material covered is dictated in part by student interests.

Enrollment Condition: Senior Standing.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**OCE 536. Hurricanes. 3 Credit Hours.**

This course is intended to provide a broad overview of tropical cyclones, starting from the basic structure, dynamics and thermodynamics, then expanding through to observations, modeling, forecasting and impacts.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**OCE 537. Natural Hazards: Atmosphere and Ocean. 3 Credit Hours.**

This course is designed to provide students with an understanding of natural hazards in both the atmosphere and ocean. In the atmosphere, we will explore both weather events such as storms and hurricanes and tornadoes as well as longer term phenomena such as monsoons and excess rainfall in the tropics. Oceanographically, the course will address hazards such as storm surge and flooding, rogue waves, rip currents, and tsunamis that occur on short time scales as well as the longer term effects such as sea level rise and the impacts of El Niño and La Niña oceanographic conditions on weather conditions. Thus, the course focus is on hazards and their impacts around the globe.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**OCE 551. Applied Ocean Acoustics and Marine Mammals. 3 Credit Hours.**

The objective of this course is to provide a basis in the fundamental of sound in the sea and on the effects of sound on marine mammals.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**OCE 575. Fluid Mechanics. 3 Credit Hours.**

The equations governing the dynamics of homogeneous fluids are derived. The concepts of deformation rates, vorticity, stream function, and ideal fluid flow are introduced and demonstrated in applications describing flows in the marine environment. Semi-empirical methods for analyzing viscous flows, boundary layers, and turbulence are presented. Eddy viscosity and more advanced turbulence closure schemes are discussed in the context of coastal circulation, bottom boundary layers and sediment transport.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Fall.

**OCE 576. Wave Propagation in the Ocean Environment. 3 Credit Hours.**

Review of vector analysis, basic principles of fluid mechanics, equations of surface gravity waves, linear dispersion relation, phase and group velocity, wave dispersion, orbital motions, wave refraction, diffraction, reflection, ray tracing, frequency and wavenumber spectra, fundamentals of wave modeling, action balance equation, wave generation, wave dissipation, wave-wave interaction, wave-current interaction, Stokes drift, internal waves.

Enrollment Condition: Senior Standing.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Spring.

**OCE 582. Special Topics. 1-4 Credit Hours.**

Lectures, research projects or direct readings in special topics.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**OCE 583. Special Topics. 1-4 Credit Hours.**

Lectures, research projects or directed readings in special topics.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.

**OCE 584. Special Topics. 1-4 Credit Hours.**

Lectures, research projects or directed readings in special topics of Marine and Atmospheric Chemistry.

**Components:** LEC.

**Grading:** GRD.

**Typically Offered:** Offered by Announcement Only.