University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

Physics of Marine and Estuarine Environments

MEES 661

Course Objectives / Overview

This course will provide a general introduction to physical oceanography and the equations of motion, with emphasis on coastal and estuarine processes. The course is intended to provide a physical context for students working on cross disciplinary studies where the movement of water influences their work.

1. Students will be able to analyze what aspects of the physical environment influence conditions at a new oceanographic study site.
2. Students will be able to determine which are the key physical processes they need to understand in their research.
3. Students will have sufficient general survey information in physical oceanography to enable them to self-learn topics of relevance to their research.
4. Students will be prepared to pass a comprehensive written and oral examination in physical oceanography.

MEES 661 assumes a background in at least Calculus I (differential calculus); Calculus II (integral calculus) is not required, though it is preferable. We will review all math skills needed for this course, but it will be up to individual students to catch up on their own if necessary. Some online resources are provided below.

Expected Learning Outcomes

Upon successful completion of the course, students should be able to:

1. Be prepared for more coursework in physical oceanography.
2. Be able to apply physical oceanographic concepts to their research.
3. Understand the instruments and methods used to observe the ocean.
4. Be able to interpret the physical meaning of terms in the equations of motion.
5. Understand how the oceans are connected to and drive major Earth processes, such as atmospheric and oceanic circulation and climate and weather.
6. Describe the principles involved in the generation of waves and tides and evaluate their effects on coastal and estuarine processes and marine ecosystems.

Course Assessment / Grading

Homework 10%, midterm 45%, final 45%, the final covers only the second half of the course.

The homework problems are essential to understanding this material. Although the homeworks comprise only 10% of the final grade, performance on the exams is usually correlated with effort on the homework problems. Homework will be assigned on Monday, due the

INSTRUCTOR DETAILS:

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CLASS MEETING DETAILS:

Dates:
Times:
Originating Site:
IVN bridge number: (*******)
Phone call in number: (***)
Room phone number:(*****)

COURSE TYPE:

Check all that apply

☐ Foundation
☐ Professional Development
☐ Issue Study Group
☐ Seminar
☒ Elective

Prerequisites

Calculus I; Calculus II preferred but not required

Teaching Assistant

TB

next Monday, with discussion during the Friday recitation session.

List of Topics

- Course Logistics, Global wind system, Heat transports in ocean & atmosphere
- GFD and Geostrophy
- Ekman layer (Geostrophy + friction) and hurricanes
- Bottom Boundary Layer
- Surface Mixed Layer
- Coastal and Equatorial upwelling
- Geostrophy + stratification: Gulf Stream & River plumes
- Vorticity & Lee Rossby waves,
- Western boundary currents
- Continental shelf waves
- Coastal & Equatorial Kelvin waves
- Waves
- Tides
- Turbulence and boundary layers
- Estuarine Circulation

Required textbooks, reading and/or software or computer needs

Texts: (not required)

- *Descriptive Physical Oceanography, Sixth Edition: An Introduction* Talley et al.
- *Shallow-Water Processes (2nd Edition) by the Open University Course Team*
- http://oceanworld.tamu.edu/resources/ocng_textbook/contents.html

Course Communication

We will distribute all assignments, tests, and course information through the MOODLE internet site, which may be accessed through https://moodle.cbl.umces.edu. Contacting the TA and/or the instructors via email or in person is encouraged. Instructors and TA's are available for student questions at any time during working hours. In order of preference: face to face, email, phone.

Resources

The University System of Maryland has recently joined the EdX Consortium, which offers many free online courses; https://www.edx.org/. Khan Academy also provides a wealth of online video tutorials for a number of mathematical subjects: http://www.khanacademy.org/.

Campus Policies

The University of Maryland Center for Environmental Science has drafted and approved of various academic and research-related policies by which all students and faculty must abide.

Please visit http://www.umces.edu/consolidated-usm-and-umces-policies-and-procedures for a full list of campus-wide academic policies.

Course-Specific Policies and Expectations

Students are encouraged to work together on homework, but must work on their own on exams.

This classroom is a place where all individuals will be treated with respect, and individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences - are welcome. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.