University Of California, Berkeley
Department of Mechanical Engineering

ME 245: Oceanic and Atmospheric Waves (3 units)

Graduate Course

Syllabus

CATALOG DESCRIPTION

Covers dynamics of the wave propagation in the ocean and the atmosphere. Specifically, formulation and properties of waves over the surface of a homogenous fluid, interfacial waves in a two-/multi-layer density stratified fluid and internal waves in a continuous stratification will be discussed.

FULL DESCRIPTION

Covers dynamics of the wave propagation in the ocean and the atmosphere. Specifically, formulation and properties of waves over the surface of a homogenous fluid, interfacial waves in a two-/multi-layer density stratified fluid and internal waves in a continuous stratification will be discussed. The aim is to present students with the analytical (and some numerical) background necessary to read through advanced scientific literature as well as to conduct state-of-the-art research in the area of ocean and atmosphere environment. Nonlinear aspects (wave-wave interactions, solitary waves, nonlinear Schrodinger equation) will be covered. Examples from nature and motivations from real life applications will be provided by videos, in-class experiments, photos and short presentations.

COURSE PREREQUISITES

241A, or 241B, or 260A, or CEE 200, or equivalent courses.

TEXTBOOK(S) AND/OR OTHER REQUIRED MATERIAL

No

COURSE OBJECTIVES

This course aims at providing an advanced understanding of different classes of waves that can propagate in the ocean and atmosphere, with students assumed to have introductory graduate background in ocean or fluid mechanics.

DESIRED COURSE OUTCOMES

By the conclusion of the course, students should be able to:

- Formulate governing equation for wave propagation in different parts of the ocean and the atmosphere
- Assess relative importance of each contributing factor and simplify equations accordingly
- Outline a general solution and find the dispersion relationship

- Analyze the energy balance

TOPICS COVERED

Review of surface-gravity waves. Interfacial waves, internal waves in a continuously stratified fluid. Shallow water wave dynamics. Wave interactions with the topography. Some Nonlinear Aspects. Solitary Waves and KdVequation.

CLASS/LABORATORY SCHEDULE

3 Hours of lecture and 1 hour of discussion.

CONTRIBUTION OF THE COURSE TO MEETING THE PROFESSIONAL COMPONENT

Students will be able to formulate, solve and discuss wave propagation problems that are of major importance in oceanic and atmospheric applications.

ASSESSMENT OF STUDENT PROGRESS TOWARD COURSE OBJECTIVES

30% Midterm exam
30% Final exam
40% Course project.

PERSON(S) WHO PREPARED THIS DESCRIPTION

Professor Reza Alam, 08/02/2012

ABBREVIATED TRANSCRIPT TITLE (19 SPACES MAXIMUM): Ocean Atmos Waves
TIE CODE: LECS
GRADING: Letter
SEMESTER OFFERED: Spring 2013
COURSES THAT WILL RESTRICT CREDIT: None
INSTRUCTORS: Alam, Staff
DURATION OF COURSE: 14 weeks
EST. TOTAL NUMBER OF REQUIRED HRS OF STUDENT WORK PER WEEK: 9
IS COURSE REPEATABLE FOR CREDIT? No.
CROSSLIST: