

Ocean Waves I, Linear

OCP6165 Section: 19016

Class Periods: T,R | Period 2 (8:30 AM - 9:20 AM), T | Period 3 (9:35 AM - 10:25 AM)

Location: WEIM 2056

Academic Term: Fall 2019

Instructor

Maitane Olabarrieta

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Office hours

Drop-in hours are given below. At other times voice mail or email messages might be left. Appointments outside the office may be made when I am available. Please call me or email me for appointments.

DROP-IN HOURS
Thursday: 9:35-10:25

Course Description

Ocean wave classification, solution of the linearized boundary value problem; simple harmonic waves; shoaling effects; internal waves.

Course Pre-Requisites / Co-Requisites

Prereq: MAP 2302, EGN 3353C (or CWR 3201).

Students are expected to have experience using a computer to graph data and perform simple analyses and calculations, e.g. MATLAB, python.

Course Objectives

This course will consider the mechanics of ocean waves, and in particular the linear wave theory. The main goal is to learn and review fundamentals of linear wave mechanics:

- To become familiar with the different types of waves in the ocean.
- To learn the linear or Airy wave theory.
- Governing equations and main assumptions.
- Solutions for progressive and standing waves.
- Difference between shallow/ intermediate/ deep water waves.
- Velocity and pressure fields characterizing linear waves.
- Energy field associated with linear waves.
- Dispersion relation.
- To understand the processes of coastal wave transformation, and the effects of these transformations on the.

Recommended Materials

- Dean and Dalrymple, 1991. Water Wave Mechanics for Engineers & Scientists (Advanced Series on Ocean Engineering-Vol2).
- Mei, C.C., 1989. The applied dynamics of Ocean Surface Waves. Advanced series in Coastal engineering. Vol. 1. World Scientific.

- Massel, S.R., 1996. Ocean surface waves: Their physics and prediction. Advanced Series in Coastal Engineering. Vol. 11. World Scientific.
- U.S. Army Corps of Engineers, 1984. Shore protection Manual Coastal Engineering Research Center, Washington, D.C.
- Basic Coastal Engineering, R.M. Sorensen, 2006 (Third Edition).

Course Schedule

- I. **INTRODUCTION** (Week 1)
 - a. Oscillatory movement.
 - b. Wave characteristics.
 - c. Dimensionless parameters.
 - d. Wave regimes and theories.

- II. **ELEMENTARY FLUID MECHANICS** (Weeks 2 and 3)
 - a. Flux definition
 - b. Mass conservation
 - i. Continuity equation, Eulerian representation.
 - ii. Continuity equation, Lagrangian representation.
 - iii. Incompressibility.
 - c. Momentum conservation equation (Euler's equation)
 - i. Momentum equation.
 - ii. Rotation and vorticity.
 - iii. Bernoulli equation.
 - d. Irrotational flows of incompressible fluids.

- III. **GOVERNING EQUATIONS FOR WATER WAVES** (Weeks 4 and 5)
 - a. Differential equations.
 - b. Boundary conditions.
 - i. Kinematic boundary condition.
 - ii. Dynamic boundary condition.
 - iii. Governing equations for water waves.

- IV. **LINEAR WAVE THEORY** (Weeks 6, 7, and 8)
 - a. Introduction
 - b. Progressive wave solution.
 - i. Laplace equation.
 - ii. Kinematic bottom boundary condition.
 - iii. Surface boundary conditions.
 - iv. Waves propagating in 3 dimensions.
 - c. Flow under a linear wave.
 - d. Pressure field under a linear wave.
 - e. Streamlines, stream functions and potential function.

- V. **LINEAR COMBINATION OF WAVES** (Weeks 9 and 10)
 - a. Reflection.
 - b. Short crested waves.
 - c. Wave groups.

- d. Deep and shallow water approximation.
- e. Conservation of waves.
 - i. Irrotational wave field.
 - ii. Wave conservation.

VI. **ENERGY CONSERVATION** (Week 11, 12 and 13)

- a. Energy equation.
- b. Instantaneous form of energy balance.
- c. Average energy and energy flux.
 - i. Time averaged Energy Flux.
- d. Energy Conservation for slowly modulated linear waves.
- e. Simple applications of the energy conservation equation.

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is a requirement. If any student is not attending class, the student needs to inform previously the teacher. It is the students' responsibility to catch up with the classes and homework assignments. Missed homework, quizzes and exam will require excused absences consistent with university policies in the Graduate Catalog.

Cell phone use and texting is not allowed in class; anyone using cell-phones in class will be requested to leave the class. Tardiness is not allowed: students arriving late to class should not enter the class, unless there is a justification consistent with the university policies in the Graduate Catalog.

Excused absences must be consistent with university policies in the Graduate Catalog

(<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation. Additional information can be found here:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (6)	100 each	40%
Quizzes + participation in class	100 each	10%
Midterm Exam	100	20%
Final Exam	100	20%
Oral presentation	100	10%
		100%

There will be 6 homework assignments, an oral presentation and two exams. The first exam will be the 17th of October (1 hour) and the final exam (2 hours) will be the 3th of December. Frequent in-class quizzes will be done (with no previous notice).

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00

78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual

violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](mailto:title-ix@ufl.edu), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.