

## Nearshore Processes

EOC 6934 Section: 25124

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

**Location:** FLG 0275

**Academic Term:** Spring 2020

### **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.

<b>DROP-IN HOURS</b>
Thursday: 9:35-10:25

### **Course Description**

This course will consider the nearshore circulation processes. The nearshore region is one of the most dynamic coastal regions. Currents and sediment transport processes in the surf zone are extremely dynamic and variable. These are relevant for sediment transport, erosion, flooding, swimming hazard and pollutant transport processes. In particular, we will study the processes by which rip-currents, longshore currents and undertows are formed in the nearshore region.

### **Course Pre-Requisites / Co-Requisites**

Students are required to have passed Linear Waves 1 and Data Analysis graduate courses. Students are required to have experience using computers to graph data and perform simple analyses and calculations, e.g. MATLAB, python.

### **Course Objectives**

The goals of this course are:

- To understand the processes of coastal wave transformation, and the effects of these transformations on the nearshore circulation.
- To become familiar with the wave breaking processes within the surf zone.
- To learn the governing equation for the derivation of:
  - Wave set-up and set-down.
  - Longshore currents.
  - Undertows.
  - Rip- currents.

## **Recommended Materials**

- Svendsen, 2006. Introduction to nearshore hydrodynamics. Advanced series on Ocean Engineering. World Scientific.
- Davidson-Arnott, 2010. Introduction to coastal processes and Geomorphology. Cambridge University Press.

## **Course Schedule**

- I. **INTRODUCTION** (Weeks 1 and 2)
  - a. Introduction to Nearshore Circulation.
  - b. Review of linear wave theory.
  - c. Linear wave dispersion relation in a media with currents.
  - d. Review of wave analysis.
  
- II. **ENERGY BALANCE EQUATION IN THE NEARSHORE** (Weeks 3, 4)
  - a. The energy equation.
  - b. The energy balance for periodic waves.
  - c. The general energy equation: Unsteady wave-current motion.
  - d. The wave action equation.
  
- III. **WAVE SHOALING AND BREAKING** (Weeks 5, 6)
  - a. Introduction.
  - b. Wave shoaling.
  - c. Wave breaking.
    - i. Types of breaking.
    - ii. Breaking criteria.
  - d. Wave evolution after breaking.
  
- IV. **DEPTH AND WAVE AVERAGED EQUATIONS** (Weeks 7, 8)
  - a. Notations and definitions.
  - b. Depth and wave period averaged equations.
  - c. Approximations for the terms of the averaged equations.
    - i. Radiation stress tensor.
    - ii. Bottom and surface shear stresses.
    - iii. Lateral mixing and Reynolds stresses.
  
- V. **GENERAL APPLICATIONS OF THE AVERAGED EQUATIONS** (Weeks 9 and 10)
  - a. Mean water level variations: set-up and set-down.
  - b. Longshore currents.
  - c. Rip currents.
  - d. Longshore currents with oblique incidence and longitudinal wave height gradients.
  
- VI. **3-DIMENSIONAL and 2DV WAVE AVERAGED EQUATIONS** (Weeks 11 and 12)
  - a. Introduction.
  - b. Undertow.
  
- VII. **CIRCULATION IN INLETS** (Week 13 and 14)
  - a. Introduction.

- b. Morphology of the ebb-tidal delta.
- c. Surf-zone induced circulation in inlets.

**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 (7)	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 7 homework assignments, an oral presentation and two exams. The first exam will be the 27<sup>th</sup> of February (1 hour) and the final exam (2 hours) will be the 21<sup>st</sup> of April. 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.aa.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.aa.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](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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](mailto: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**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto: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](mailto: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](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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