Coastal Storms: processes and impacts
EOC 6934 Section: 0001
Class hours: TR 3rd period (9:35 AM– 10:25 AM) and R 4th period (10:40 AM – 11:30 AM)
Office hours: Tuesdays 3:00-4:00 pm
Location: WEIM 1064 (T) and MAT 009(R)
Academic Term: Spring 2025

Instructor

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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 email me previously for appointments.

DROP-IN HOURS
Tuesdays 3:00-4:00 pm

Course Description

Extreme water levels and waves caused by coastal storms rank among the most significant hazards threatening coastal communities. This hands-on course explores storm-independent water level components, such as astronomical tides and mean water levels, and storm-induced components, including storm surge, rainfall-driven water levels, and wave runup. Students select a historical tropical cyclone that impacted the Florida coast and analyze the different contributions to total water levels.

Course Pre-Requisites / Co-Requisites

Understanding of basic wave mechanics and data analysis techniques. Programming experience in Python and/or MATLAB.

Course Objectives

The goals of this course are:

- To identify different types of extreme storms.
- To define total water levels.
- To evaluate the hydrodynamic processes affecting coastal total water levels:
    - Wave runup
    - Storm surge and compound floods

    - Meteotsunamis
    - Astronomic tides
    - Mean water levels
- To analyze water level measurements from NOAA tide gauges and USGS gauges.
- To learn how wind-waves develop and propagate in extreme storms, including:
    - Derive and interpret the wave action balance equation.
    - Analyze NDBC buoy data.
    - Interpret the evolution of the different wave bulk parameters.
    - Interpret the evolution of the directional wave spectra.
- Evaluate possible types of impacts of coastal extreme storms.

Recommended Materials

- Title: Coastal Storms: Processes and Impacts.
- Author: Paolo Ciavola and Giovanni Coco,
- Publication date and edition: Wiley Blackwell, 2017
- ISBN number: 978-1-118-93710-5

Course Schedule

I. **INTRODUCTION** (Module 1, week 1)
   a. Introduction to coastal extreme storms.
   b. General nomenclature.

II. **REVIEW OF LINEAR WAVE THEORY** (Module 2, week 2)
   a. Linear wave dispersion relation.
   b. Wave shoaling and refraction.

   Assignment 1 (due in two weeks)

III. **REVIEW OF WAVE ANALYSIS** (Module 3, week 3)
   a. Introduction.
   b. Statistical analysis.
   c. Spectral analysis.

   Assignment 2 (due in two weeks)

IV. **TOTAL WATER LEVEL DEFINITION** (Module 4, week 4)
   a. Sallenger's coastal impact regimes
   b. Total water level definitions:
      i. Storm-induced components:

1. Storm surge
2. Rain-induce water levels and compound floods
3. Meteotsunamis
4. Wave runup

ii. Non-Storm induced components:

1. Mean water level
2. Astronomic tides

Assignment 4 (due in two weeks)

V. **WAVE-RUNUP I: wave set-up** (Module 5, week 5)
   a. Wave set-up and set down.
   b. Wave runup parameterizations.
   c. How to compute wave runup from National Buoy Center observations

Assignment 5 (due in two weeks)

VI. **WAVE-RUNUP II: Infragravity waves** (Module 6, week 6)
   a. Infragravity waves

VII. **WAVE-SWASH III: Wave swash** (Module 7, week 7)
   a. Wave swash

Assignment 6 (due in two weeks)

VIII. **STORM SURGE AND COMPUND FLOODS** (Module 8, week 8)
   a. Storm surge
   b. Rain-induced water levels and compound floods
   c. How to access and process USGS gauge information

Assignment 7 (due in two weeks)

IX. **METEOTSUNAMIS** (Module 9, week 9)
   a. Meteotsunamis
   b. How to access and process NOAA tide gauge information
   c. Atmospheric radar reflectivity analysis

Assignment 8 (due in two weeks)

X. **ASTRONOMIC TIDES AND MEAN WATER LEVEL** (Module 10, week 10)
   a. Mean water level
   b. Astronomic tides
   c. Analyzing storm independent water level components

Assignment 9 (due in two weeks)

XI. **Coastal storm impacts** (Module 11, weeks 11 and 12)
   a. Coastal erosion
   b. Impacts on infrastructure
   c. Water quality

   Assignment 10 (due in two weeks)

XII. **Finalizing the course project** (weeks 13 and 14)

XIII. **Project presentations** (week 15)

Critical Dates

Graduate School Academic Calendars < University of Florida (ufl.edu)

Classes Begin	**January 13**
Classes End	**April 23**
Degree Status Available (on ONE.UF[4])	**May 2 – 4**
Final Grades Available (transcript view, on ONE.UF[4])	**May 7**
Faculty Course Evaluations Available to Instructors (on GatorEvals[1])	**May 7**
Holidays (no classes)	**May 8**
	January 20: Martin Luther King Jr. Day
	March 17 - 22: Spring Break

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Assignments (10)	5 each (50 total)	50%
Final project report	25	25 %
Final project presentation	25	25 %
		100%

There will be 10 homework assignments and one final project, which will be defended during the week of April 26 to May 2.

The final project will involve selecting two storms that impacted the Florida East Coast and the West Coast and analyzing all the components that contributed to the total water levels. **The project report is due on April 18th. Project presentations will be done during April 26-May 2**, during the week of the final examinations. Deliverables include a project report and presentation. Evaluation based on clarity, accuracy, and adherence to the following rubric:

Rubric:

1. Project Report (25 points)

- **Introduction (5 points)**
  - Clear introduction of the two selected storms and their relevance. (2.5 points)
  - Context on why the Florida East Coast and West Coast were chosen for analysis. (2.5 points)
- **Data Collection and Methodology (5 points)**
  - Comprehensive description of the data sources used (e.g., tide gauges, atmospheric models, or historical records). (2.5 points)
  - Detailed explanation of the methods used to analyze the components contributing to total water levels. (2.5 points)
- **Analysis of Components (7.5 points)**
  - Accurate identification and discussion of the components contributing to total water levels (e.g., tides, storm surge, rainfall, wind-driven waves). (5 points)
  - Insightful analysis comparing the East and West Coast storms. (2.5 points)
- **Results and Discussion (5 points)**
  - Clear presentation of findings with graphs, charts, or tables. (2.5 points)
  - Discussion of the implications of the results, including differences between the two coasts. (2.5 points)
- **Conclusion and References (2.5 points)**
  - Concise conclusion summarizing key findings and their significance. (1.5 points)
  - Properly formatted references citing all data sources and literature. (1 points)

2. Presentation (25 points)

- **Creativity and Critical Thinking (10 points)**
  - Innovative approaches to analyzing and presenting the data. (5 points)
  - Demonstrated understanding of the complexities of total water levels and their components. (5 points)
- **Content and Organization (5 points)**
  - Logical structure with clear objectives, methods, results, and conclusions. (2.5 points)
  - Smooth transitions between sections and effective use of time. (2.5 points)
- **Delivery (10 points)**
  - Use of clear, professional, and engaging slides. (2.5 points)
  - Appropriate visuals such as graphs, charts, or maps to support the narrative. (2.5 points)
  - Confident and clear verbal delivery with good pacing. (2.5 points)
  - Effective engagement with the audience, including eye contact and voice projection. (2.5 points)

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:
UF Graduate Catalog
Grades and Grading Policies

Attendance Policy, Class Expectations, and Make-Up Policy
Appropriate classroom demeanor is expected of all students. A faculty member may remove any student from a class if the student exhibits uncivil conduct, which includes behavior that is disinterested, disengaged, disrespectful, disruptive, defiant, or disturbing. Cell phones and text messaging during class is not permitted. A student who is participating in this behavior during class will be asked to leave.

Excused absences must be consistent with university policies in the Graduate Catalog (https://catalog.ufl.edu/graduate/regulations) and require appropriate documentation. Additional information can be found here: https://gradcatalog.ufl.edu/graduate/regulations/

Late Submission Policy
Timely submission of assignments and projects is important for maintaining the flow of the course. However, we understand that emergencies and unforeseen circumstances can arise. The following guidelines apply to late submissions:

1. **Late Submission Without Penalty**
   - If you encounter an emergency or unforeseen circumstance that impacts your ability to submit on time, please notify the instructor as soon as possible, preferably before the due date, if feasible.
   - Documentation of the situation may be required to waive any penalties.
2. **Late Submission With Penalty**
   - Submissions made after the due date without documented emergencies will incur a **10% deduction per day**, up to a maximum of 5 days late.
   - Assignments submitted more than 5 days late will receive a score of zero unless prior arrangements have been made considering extenuating circumstances.
3. **Final Deadline for Submissions**
   - No assignments will be accepted beyond the final day of the semester unless explicitly outlined in an extended course policy.

4. **Special Considerations**
    - Students experiencing ongoing challenges are encouraged to reach out to the instructor and/or university support services for assistance. Our goal is to provide reasonable accommodations while ensuring academic integrity.

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting https://disability.ufl.edu/students/get-started/. It is important for students to share their accommodation letter with their instructor and discuss their access needs, 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/.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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/process/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 varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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
- HWCOE Human Resources, 352-392-0904, student-support-hr@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:
If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center:
Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center:
Call 352-392-1161 for 24/7 information to help you find the care you need or visit the Student Health Care Center website.

University Police Department:
Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

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.

UF Health Shands Emergency Room / Trauma Center:
For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

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

GatorWell Health Promotion Services:
For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273-4450.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.

Career Resource Center, Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support, Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

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

Student Complaints Campus*:* Visit the Student Honor Code and Student Conduct Code webpage for more information.

On-Line Students Complaints*:* View the Distance Learning Student Complaint Process