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MARN3060
Coastal Circulation and Sediment Transport
Department of Marine Sciences
University of Connecticut

Fall 2025 Syllabus
v1.3, September 5, 2025

Excluding materials for purchase, this syllabus may change in the course of the semester. The most up-to-date version will be available on HuskyCT.

Course information and intructor

Course title: Coastal Circulation and Sediment Transport
Credits: 3
Modality: In-person
Prerequisites: recommended: MATH 1132Q and a year of general physics
Course times and location: Tuesdays and Thursdays, 9:30-10:45 am at LWB 122.

Instructor: Dr. Shuwen Tan, Assistant Professor of Marine Sciences. I use she/her pronoun, and I prefer that you call me by my first name. My office is Room 191 in the Lowell P. Weicker Jr. building (aka Marine Sciences building), and my email is shuwen.tan@uconn.edu.

Office hours: Tuesdays and Thursday 10:45 am - 11:30 am, other times by appointment.

Course materials

Course Web site: I will keep the most up-to-date class schedule, including the assignment and suggested reading for each week, on HuskyCT.

Textbooks:

The students are recommended to refer to *Introduction to Coastal Processes and Geomorphology* by Davidson-Arnott et al.. A physical copy and a digital copy of the text book are reserved at the library. The digital might be an easier option but please remember to close the chapter or file on your computer when you're done reading, so the book can be available to the next student. I also have a physical copy to circle around

the class. I will assign readings from some papers and other sources. I will be presenting the required material in lecture format with reading as supplemental to your knowledge. You will not be required to know material from the textbook that was not discussed in class or presented as homework.

Supplementary reading:

- *Coastal Dynamics* by Bosboom and Stive.
- *The Physical Oceanography of Continental Shelves* by K. H. Brink
- *Beach Processes and Sedimentation* by P. D. Komar
- *PennState Earth 107N - Coastal Processes, Hazards, and Society*
- Introduction to Oceanography by Paul Webb

Course description

This undergraduate lecture, offered bi-annually by the Department of Marine Sciences, provides an overview of coastal ocean dynamics, sedimentation, and emerging challenges. The course is structured into two main sections:

Part I: Water Dynamics – Exploring ocean waves, tides, wind-driven circulation, coastal upwelling, boundary layers, and sea-level change.

Part II: Sediment Dynamics – Covering bedload transport, suspended sediment transport, sediment suspension and deposition, and overall coastal geomorphological processes.

Each week's lecture will be around a core ocean physics concept or a coastal ocean phenomenon, accompanied by a set of targeted learning goals. Each lecture will include several learning modules, such as short videos, class discussions centered on real-world examples, "chalk time" for conceptual exploration, and data visualizations drawn from scientific research. There will be pre-lecture and post-lecture activities that are separate from assignments, designed to enhance learning outcomes. For example, a class discussion may be based on a pre-lecture reading material. This course will include components of data visulization and research computing. The class notes are designed to be interactive, presented as a webpage that incorporates responsive data visualizations, executable code snippets, and curated resource links. You are required to review the class notes and "run" the executable code snippets after class. Assignments may involve some light coding, but there will be ample examples provided in the class notes, along with additional coding examples included in the assignments.

One field work day is expected. Safety training will be provided before the field trip.

Course objectives

By the end of this course, students will be able to:

1. Describe the coastal zone in terms of geomorphology and hydrodynamics, and identify the factors that control coastal evolution and morphology.
2. Identify and describe the characteristics of ocean waves, tides, and winds, and explain their roles in shaping coastal circulation and influencing sea level.
3. Understand key physical processes and their forcings in various coastal regions, including the surf zone, inner shelf, and outer shelf environments.
4. Explain sediment transport mechanisms, including bedload transport, resuspension, and deposition, and how they interact with hydrodynamic processes.
5. Understand the impacts of coastal processes on humans, including sea-level rise, storm surge, rip currents, coastal erosion, and related hazards.
6. Become familiar with coding and data analysis tools to process, visualize, and interpret coastal oceanographic datasets in support of understanding coastal processes.
7. Conduct field observations and interpret data related to coastal circulation and sediment transport. Collaborate on a scientific project, integrating field data and external datasets to explore a coastal oceanographic question and communicate findings effectively.
8. Evaluate the implications of coastal processes for coastal management and engineering.

Course schedule

Below is a weekly program. The most up-to-date program is available on HuskyCT.

Table 1: Weekly Course schedule

Week	Topic	Class Materials	Tasks
Week 1	Introduction and overview of coastal systems	Textbook chapter 2, BS 2.6 (optional BS chapter 1, 2)	

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Table 1: Weekly Course schedule (Continued)

Week	Topic	Class Materials	Tasks
Week 2	Water level - definition, short term and long term variations	Textbook chapter 3, skip 3.4.3-3.4.4 (optional BS 2.5)	Assignment 1
Week 3	Wind waves – description of waves, sea vs. swell, wave predictions	Textbook chapter 4, skip 4.3.2, optional 4.4.2	Assignment 2
Week 4	Wave dynamics – linear wave theory, wave groups and dispersion relation, deep vs shallow water waves, wave refraction, wave shoaling and breaking	Textbook 5.1, 5.2, 5.4.2, 5.4.1, 5.5	Assignment 3
Week 5	Surf zone circulation - wave-driven: Stoke's drift, wave-induced sea-level setup, undertow, and rip currents	Textbook 5.3.1, 6.1-6.3, skip 6.3.2 (optional: BS 5.5.7)	Assignment 4
Week 6	Estuary Dynamics and Freshwater outflows: example of CT river	BS 9.2	
Week 7	Mid-to-outer shelf circulation - Ekman transport and coastal upwelling/downwelling: e.g., upwelling off California	Brink 3.1, 3.2, 3.4, 3.6, 4.1	Assignment 5, form your final project group! Class on 10/7 is canceled and rescheduled to 10/31 for the field day!
Week 8	Inner shelf circulation – wave and wind driven: their relative importance depends on water depth	Lentz and Fewings, 2011 (optional: Brink, 6.1-6.2, 6.4)	
Week 9	Midterm summary & Special Topic		Assignment 6
Week 10	Sediment properties, movement, and bedform & Prep for the field day	BS 6.2-6.3	Field trip this Friday, 10/31 11:45 am - 2:15 pm
Week 11	Bedload and suspended load transport	BS 6.4-6.6	Assignment 7
Week 12	Coastal sediment transport	Textbook chapter 7	Assignment 8

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Table 1: Weekly Course schedule (Continued)

Week	Topic	Class Materials	Tasks
Week 13	Impacts of coastal circulation and sediment transport on people, ecosystems, and responses to a changing climate	EPA artical on climate change impacts on coasts, Coastal Futures: sea-level rise, Coastal Futures: eutrophication and hypoxia, BS chapter 10	Before class: Read class materials and discuss in class
Week 14	No class: Thanksgiving recess		
Week 15	Final's prep and Group presentation		20 minutes presentation + 10 minutes Q&A
Week 16	Final's exam		location, time, and format TBD

Course requirements and grading policy

Assessment
Students are required to *actively participate in the class* (10 pts), complete *8 assignments* (40 pts, equally weighted, there will be 8 bonus point for those who complete or partially complete grad student exercises), a *group project* (20 pts), and a final's (30 pts) exam. The table on the right shows the grading scale for the course.

Active participation involves presenting at class, completing pre and after-class readings and tasks (that are separate from assignments), engaging in in-class discussions, and paticipating in in-class surveys.

Assignments may range from problem sets to small computational projects related to the week's topic. Students are expected to attempt them independently, but are encouraged to help each other with coding difficulties or attend office hours for support. Undergraduates can earn bonus points by completing or partially completing the graduate student exercises.

Score rage	Letter grade
≥93.0	A
90.0–92.9	A-
87.0–89.9	B_+
83.0–86.9	B
80.0–82.9	B-
77.0–79.9	C_+
73.0–76.9	C
70.0–72.9	C-
67.0–66.9	D_+
63.0–66.9	D
60.0–62.9	D-
<60	F

The final exam will be an in-class comprehensive exam covering the entire semester's material. It is tentatively planned to be multiple choice, short answer, and graphing.

For the final group assignment, students will work in pairs or small groups to investigate a scientific topic related to the course. Students are expected to conduct quantitative analyses of oceanographic datasets, including observations collected during the field trip, and to integrate additional in-situ and remote observations (e.g., tidal gauges, Argo floats, GO-SHIP transects, moorings, satellites). They may also incorporate model or reanalysis products. Weekly assignments will provide practice and include example code for data analysis. Students should form their groups by Week 7 and present their final project in Week 15.

Tips for the assignments and final project: 1. Take advantage of office hours for those who are not familiar with coding - you will receive direct help from me and your peers. 2. Try to develop a project idea before the field trip so you can potentially design your own experiment. 3. Midterm is a good time to start working on your final project. 4. You can expand a homework assignment into a final project by adding more content and depth.

Grade Dispute Policy
Students who wish to dispute a grade on an assessment must do so within 1 week of the grade being posted. They must provide specific evidence for why they believe the grade should be reconsidered, for example by referencing the syllabus, assessment instructions and/or other course materials.

Due dates and late policy
All due dates will be identified on HuskyCT. Deadlines are 11:59 pm Eastern Standard Time. I may change dates as the semester progresses. All changes will be communicated at least one week prior to the new due date.

If you have a good reason (caregiving, illness, hardships), please do not hesitate to ask for an extension *prior to the deadline*. No late assignments will be accepted unless previously discussed with me. Students with learning disabilities are eligible for extended due dates and other accommodations through the Center for Students with Disabilities (see Students With Disabilities below).

Feedback
Anonymous feedback can be input here.

I will strive to provide feedback on your assignments within a week of the due date. I also commit to sharing mid-semester partial grades to help you plan for the second half of the term.

Weekly Time Commitment
This is a 3-credit course. According to the University of Connecticut's policy on credit hours, each credit corresponds to approximately one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work per week over the course of a semester. Therefore, you should expect to dedicate about 2.5 hours to

lecture time and at least 6 hours to out-of-class work each week for this course. This expectation is based on the various course activities, assignments, and assessments.

Academic Integrity, Intellectual Property, and Classroom Conduct
All students are expected to act in accordance with the UConn Student Code.

Students are expected to conduct themselves in a mature and professional manner while attending classes and labs and during all interactions with the instructor and other students inside and outside of class. It is important to be attentive in class and be respectful of the instructor and other students. Students engaging in disruptive, unsafe, and/or disrespectful behavior will be dealt with through disciplinary actions deemed appropriate by the instructor and the university.

In this course we will be following the UConn Student Code: Appendix A: Guidelines for Academic Integrity in Undergraduate Education on Scholarly Integrity and Misconduct. From Appendix A: "Academic misconduct is dishonest or unethical academic behavior that includes, but is not limited to, misrepresenting mastery in an academic area (e.g., cheating), failing to properly credit information, research, or ideas to their rightful originators or representing such information, research, or ideas as your own (e.g., plagiarism)."

Students are welcome to discuss coursework with one another and are encouraged to help each other understand class materials, explain concepts, and work through coding challenges. However, all work submitted must be your own, unless explicitly defined as a group assignment. Work submitted may be checked for plagiarism using SafeAssign, which checks the similarity of each assignment to existing text from web-based and institutional databases.

Plagiarism and AI usage
In this course we'll conduct ourselves as a community of scholars and writers, recognizing that academic study is both an intellectual and ethical enterprise. Please build on the ideas and texts of others–that's a vital part of academic life. You may certainly discuss readings and assignments outside of class, study in groups, share drafts with classmates or friends, and go to the Writing Center and Career Center with your drafts.

When you use or borrow or closely imitate another's ideas or language–or even syntax–you must formally acknowledge that debt by signaling it with a standard form of academic citation. This means documenting not just direct quotations but also paraphrases and summaries. In less formal writing, you may show your debt to a source (or classmate!) with a signal phrase ("According to Jose Calabra. . . ") or acknowledgement statement ("In this essay I got the_____ idea from Kayla during peer review.") If you have any questions about when and how to credit the work of others, please talk to me.

If you use any artificial intelligence (AI) software, including large language models (LLMs) and/or paraphrasing tools including but not limited to ChatGPT, Grammarly, and/or Google Gemini, to help you complete any work in this course (including for idea generation, to summarize text and/or to generate/revise/paraphrase text and/or media for your assignments), you must include an acknowledgement statement at the end of

the assignment that briefly shares 1) what tools were used 2) how you used them 3) whether the tools were helpful and if you had to make any corrections to the work of the AI tool and why. For example, "I used ChatGPT for suggestions when starting this assignment when I was having trouble refining my topic. I retained X and Y ideas and did further research on these topics, using references which I have cited above. All text is in my own words. The usage of ChatGPT was helpful because it allowed me to move past feeling stuck at the start of the assignment and made my project more focused. However, ChatGPT also suggested I discuss topic Z which was not consistent with the readings we discussed in class, so I did not include this in my assignment."

Keep in mind that many of our assignments will involve describing and assessing your skills, knowledge, and experience, developing plans for self-development, and constructively assessing content. Outsourcing these tasks to a computer program is likely to lead to a failing grade on the assignment as you will not have met the learning objectives.

Please also note that all large language models still tend to provide false content and fake citations. You will be responsible for any inaccurate, biased, offensive, or otherwise unethical content you submit, regardless of whether it originally comes from you or an AI tool. [These last two sentences are adapted from the course policies of Ryan S. Baker.pdf, University of Pennsylvania.]

If you engage in academic misconduct, whether plagiarizing or submitting the work of others or failing to acknowledge use of AI or other sources, you will fail not only that assignment but the course.

Appropriate usage of AI tools will be discussed at many points throughout the course. If you have any questions, please ask.

Students Responsibilities and Resources

UConn students are held to certain standards and academic policies. Please, review the following policies:

- The Student Code
  - Policy on Academic, Scholarly, and Professional Integrity and Misconduct
  - Academic Integrity specific to Undergraduate Education and Research
- People with Disabilities, Policy Statement
- Policy Against Discrimination, Harassment and Related Interpersonal Violence
- Academic Misconduct Procedures for Instructors
- Netiquette and Communication
- Absences from Final Examinations

- Class Attendance
- Credit Hour
- Adding or Dropping a Course
- Academic Calendar

Resources for Students Experiencing Distress

The University of Connecticut is committed to supporting students in their mental health, their psychological and social well-being, and their connection to their academic experience and overall wellness. The University believes that academic, personal, and professional development can flourish only when each member of our community is assured equitable access to mental health services. The University aims to make access to mental health attainable while fostering a community reflecting equity and diversity and understands that good mental health may lead to personal and professional growth, greater self-awareness, increased social engagement, enhanced academic success, and campus and community involvement.

Students who feel they may benefit from speaking with a mental health professional can find support and resources through the Student Health and Wellness-Mental Health (SHaW-MH) office. Through SHaW-MH, students can make an appointment with a mental health professional and engage in confidential conversations or seek recommendations or referrals for any mental health or psychological concern.

Mental health services are included as part of the university's student health insurance plan and also partially funded through university fees. If you do not have UConn's student health insurance plan, most major insurance plans are also accepted. Students can visit the **Student Health and Wellness-Mental Health located in Storrs on the main campus in the Arjona Building, 4th Floor**, or contact the office at **(860) 486-4700**, or https://studenthealth.uconn.edu for services or questions. Student Health and Wellness at Avery Point campus is located at **Branford House Room 306**, book an appointment at **(860) 486-4700**, select option 2.

Students with Disabilities

The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or csd.uconn.edu.

Accommodations for Illness or Extended Absences

If illness prevents you from completing coursework, please notify me as soon as possible. You do not need to disclose the nature of your illness, but we will need to work out how you will complete your coursework.

If life circumstances are affecting your ability to focus on courses and your UConn experience, students can email the Dean of Students at dos@uconn.edu to request support.

Software Requirements

Students can use either their own or a shared computer to access interactive class notes and complete assignments. The Avery Point Campus Library offers several computers for student use and also lends out laptops. You will also need a modern internet browser (preferably Google Chrome or Mozilla Firefox) to view the class notes. The class notes and assignments will include blocks of Python code that demonstrate data visualization and research computing. No prior programming experience is required. The intention is to provide you with ample examples in both the class notes and assignments so you can follow along.

If you use MacOS or Linux, you only need a terminal running bash. If you use Windows you may use (Windows terminal). You will be instructed to install different software and set up an "environment" on your laptop. Regardless of your operating system, If you don't have your own laptop, it is recommended to sign up for a Google account to access Google Colab, where you can run example Python scripts and complete assignments. This platform allows you to program directly in a web browser without requiring any local setup.

Minimum Technical Skills

This course will include components of data visualization and research computing. No prior computer programming experience is required. However, you will need access to a computer with a web browser and an internet connection. To follow along with the interactive class notes and complete the assignments, you should be able to install and open various software on your own computer, or alternatively, sign up for a Google account to access Google Colab. You should be able to download and manage class materials on your laptop, copy and paste text across different software (e.g., from browser to terminal), toggle between different tabs in the browser and terminal.

If you are unsure whether your technical skills are sufficient to succeed in this class, please contact me.

Help

If you have trouble accessing the course website and/or with the interactive class notes, please contact me. If you have difficulty accessing Avery Point Library Technology Services, contact the library staff by visiting in person or emailing averypoint.circulation@uconn.edu. If you have issues with HuskyCT or VPN, contact HuskyTech during regular business hours. For further assistance, contact Course Support, available 24/7.

Course Evaluation

Students are strongly encouraged to provide feedback on their course experience and instruction through the Student Evaluation of Teaching (SET), administered by the Office of Institutional Research and Effectiveness (OIRE). The SET is used for both formative (self-improvement) and summative (evaluation) purposes. UConn commits to supporting and enhancing teaching effectiveness and student learning using a variety of methods. The instructor will also conduct informal mid-semester formative surveys via HuskyCT.

** This syllabus contains some text adapted and/or paraphrased from the fall 2021 syllabus of MARN5895-N60, instructed by Prof. Cesar Rocha, and the spring 2025 syllabus of MARN5500, instructed by Prof. Cara Manning.*
*** This syllabus was developed using the template from UConn CETL. Sections on Academic Integrity, Intellectual Property, and Classroom Conduct as well as Plagiarism and AI usage contains some text adapted and/or paraphrased from UConn CETL.*
**** I used Microsoft Copilot for suggestions while constructing learning objectives. I ended up using the objectives I came up with and used Copilot to refine the wording.*