

# PHY480/580: Coastal and Estuarine Systems

## Course Syllabus

Spring, 2026 (3 Credits)

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**Zoom link:** <https://uncw.zoom.us/my/asuanda>

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Class meetings: T/Th 2:00 - 3:15 pm (**Sync**)

Class location: Deloach Hall 213

Office Hours: Th 3:15 - 4:30 pm CE 1112\*

## Course Description

This course is an introduction to the physical processes operating within coastal and estuarine systems. Coastal environments are the primary regions with which humanity interacts with and experiences the ocean. Therefore, many interdisciplinary issues arise at the intersection of earth and life sciences, conservation policy, and engineering. Here, we focus on the physical realm through hydrodynamical descriptions of topics such as gravity waves, surf zone currents, storm surge, tides and estuarine circulation. Interdisciplinary applications are introduced and used as motivation but mostly left for further exploration. As a student, you are expected to actively engage with this material. There will be many resources made available beyond those *required* to pass this class. The more you put in, the more you will get in return.

## 1 Learning Goals

By the end of the course, students are expected to:

1. Have a broad understanding of hydrodynamic processes in coastal and estuarine regions and the research methods used to study them.
2. Be knowledgeable of the basic equations governing different coastal regions and be able to utilize them quantitatively.
3. Know where and how to access oceanographic data from local observational programs, conduct basic analysis and present these data.
4. Be able to synthesize and critically understand results from primary coastal and estuarine oceanographic scientific literature.

## 2 Course Logistics

### Guidelines

This course is delivered in the **synchronous face-to-face** format. It is expected that students will be on-time and present during class time and *participate* in class discussions. You are responsible for knowing the content covered in class. Do supplemental reading, work with your classmates and ask the instructor for clarifications as you need them. **Canvas** will be used to post assignments and communicate with the class.

To maintain a respectful and distraction-free learning environment, as well as protect faculty copyright and intellectual property, audio or video recording of class sessions is prohibited unless prior permission is obtained from the instructor or required as part of an approved accommodation through the Office of Disability Services.

### Software

You must have access to and be comfortable with Canvas, Zoom (including screen-share capability), and MATLAB software on a personal computer. If you have any concerns, difficulties or questions about their usage, please contact the instructor as soon as possible.

### Reference Books

There is no required textbook for this class. However, the following useful references are available at UNCW Randall Library:

1. Masselink, Gerd, Michael Hughes, and Jasper Knight (2014) *Introduction to Coastal Processes and Geomorphology*, 2nd ed., Routledge. ***ebook available through Randall Library***
2. Brink, Kenneth H. (2023) *Physical oceanography of continental shelves* Princeton University Press.
3. Open University (1999): *Waves, Tides and Shallow-Water Processes*, Gulf Professional Pubsh.
4. Dyer, Keith R. (1998): *Estuaries: A Physical Introduction*, Wiley.
5. Komar, Paul D. (1998): *Beach Processes and Sedimentation*, Prentice Hall.

### Prerequisites

- Required: University Physics (PHY101/102 or PHY201/202), University Calculus (MAT151, or MAT161)
- Suggested: Physical Oceanography (PHY475)

## 3 Assignments and Grading

### Assignments

- Assignments will be announced in class and posted on Canvas.

- Homework assignments will include reading, online video review, essay questions, calculations using equations presented in class and MATLAB-based plots/visualization.
- Written assignments are to be submitted as a **single** document in .pdf or .doc format and due by **5 pm** on the due-date scheduled.
- Late assignments will be docked 10% per day after the due-date unless the instructor grants an extension.
- Requests for extensions must be made at least **3 days** before the assignment is due.
- Students are welcome and encouraged to work together on homework assignments. However, each student must submit **their own** individual work in accordance with UNCW honor code policies.
- Assistance with assignments is available during office hours. Please schedule an appointment ahead of time for homework help. If the office hours listed above do not work, you may request an alternate meeting time. Assistance is **NOT** available on the due-date of the assignment.
- PHY580 students will also be required to attend additional sessions to support, plan, and report results from the field research program (**March dates - see schedule**).

## Grading Policy

Your final grade for this course will be based on the following proportions:

|                                                                                  | PHY480 | PHY580 |
|----------------------------------------------------------------------------------|--------|--------|
| Homework assignments                                                             | 35%    | 30%    |
| Midterm exam                                                                     | 30%    | 30%    |
| Final research project                                                           | 25%    | 15%    |
| Field plan and report                                                            | -      | 15%    |
| In-class participation<br>(e.g., ocean weather report and regional presentation) | 10%    | 10%    |

## Grading Scale

Your course grade is converted from 100-Point System to A± System using the following table:

|           |         |           |         |           |         |
|-----------|---------|-----------|---------|-----------|---------|
| <b>A</b>  | ≥ 90    | <b>B-</b> | 78 - 80 | <b>D+</b> | 66 - 68 |
| <b>A-</b> | 87 - 89 | <b>C+</b> | 75 - 77 | <b>D</b>  | 63 - 65 |
| <b>B+</b> | 84 - 86 | <b>C</b>  | 72 - 74 | <b>D-</b> | 60 - 62 |
| <b>B</b>  | 81 - 83 | <b>C-</b> | 69 - 71 | <b>F</b>  | < 60    |

## 4 General course policies

### Academic Integrity and Honesty

All members of the UNCW community are expected to follow the academic Honor Code. Please read the [UNCW Honor Code](#) carefully. Academic dishonesty and plagiarism will not be tolerated in this class. Don't cheat. When in doubt, cite your references and acknowledge class-mates or external sources.

### Copyright and intellectual property

Any dissemination of class notes, lecture slides, recordings, handouts, copies of exams, or any other course materials without permission of the instructor is prohibited by UNCW policy. [UNCW Copyright Use and Ownership Policy](#) specifies that class notes and related materials are considered derivative of original intellectual property of the course instructor. Therefore, the instructor (not the student) owns the copyright and must provide specific permission to distribute and/or reuse those materials for anything other than personal use and scholarship by the student. Commercial use, display, or dissemination of such notes, copies, or recordings—as well as posting to websites—will generally constitute an infringement of copyright and the Honor Code. Materials that qualify as student-owned are listed in the policy.

### Accommodation

The University of North Carolina Wilmington is committed to complying with all federal, state, and local requirements of nondiscrimination. UNCW supports the right of enrolled students to a full and equal educational opportunity and is committed to reasonable accommodations for individuals with documented disabilities or who are impacted by Title IX concerns. UNCW is committed to providing accessible learning environments and equal opportunity to individuals with disabilities in accordance with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. Individuals needing reasonable accommodations should contact the [Disability Resource Center](#) (910-962-7555, [DRC@uncw.edu](mailto:DRC@uncw.edu)). Once established, responsibility for disability-related accommodations and access is shared by DRC, faculty and the student.

### Non-discrimination

Individuals who wish to report any form of gender-based discrimination or sexual misconduct/harassment—and those requesting related accommodations—should contact [UNCW's Title IX Office](#). Students may also report incidents of misconduct to the faculty; however, be aware that faculty are mandatory reporters and are required by law to notify the Title IX office.

If students wish to seek confidential resources without reporting an incident, three departments at UNCW are exempt from mandatory reporting requirements: CARE: Interpersonal Violence Prevention & Response, University Counseling Center, and Abrons Student Health Center.

### Violence and Harrasment policy

Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and will not be tolerated.

There is a zero-tolerance policy for any kind of violent or harassing behavior at UNCW. If you are experiencing an emergency of this type contact the police at **911** or for resources **UNCW CARE (910-962-2273)**.

### **Seahawk Respect**

The **UNCW Seahawk Respect Compact** affirms our commitment to a civil community characterized by mutual respect. Individuals wanting more information about the Seahawk Respect Compact can contact the Office of Institutional Diversity and Inclusion, Alderman Hall, Suite 217 **910-962-7104**.

## 5 Weekly course schedule

The following schedule of topics is tentative and subject to change. Student assignments are marked in **red**. Students are responsible for completing and submitting assignments by these dates.

| Week | Date           | Topic                                                                                                                |
|------|----------------|----------------------------------------------------------------------------------------------------------------------|
| 1    | 01/13<br>01/15 | - Course introduction and preliminary material<br>- <b>AS Away, NO CLASS</b>                                         |
| 2    | 01/20<br>01/22 | <b>Waves</b><br>- Parameters and dispersion relation<br>- Wave groups, spectra, energy ( <b>Nearshore pres</b> )     |
| 3    | 01/27<br>01/29 | - Conservation of wave energy flux<br>- Wave-averaged properties ( <b>HW1 due</b> )                                  |
| 4    | 02/03<br>02/05 | - <b>Wave lab at CE</b><br>- Nearshore hydrodynamics (I)                                                             |
| 5    | 02/10<br>02/12 | <b>Tides</b><br>- Nearshore hydrodynamics (II)<br>- Equilibrium theory of tides ( <b>HW2 due</b> )                   |
| 6    | 02/17<br>02/19 | - Dynamic theory of tides<br>- Tidal currents and tidal mixing                                                       |
| 7    | 02/24<br>02/26 | - <b>AS Away*</b><br>- <b>AS Away*</b>                                                                               |
| 9    | 03/03<br>03/05 | - <b>Spring Break, NO CLASS</b><br>- <b>Spring Break, NO CLASS</b>                                                   |
| 8    | 03/10<br>03/12 | <b>Estuaries</b><br>- Classification of estuarine systems<br>- <b>Estuarine cruise I (HW3 due)</b>                   |
| 10   | 03/17<br>03/19 | - <b>Midterm</b><br>- <b>Estuarine cruise II</b>                                                                     |
| 11   | 03/24<br>03/26 | - Stratification, internal tides and waves<br>- Estuarine salinity and Knudsen's relation                            |
| 12   | 03/31<br>04/02 | - Estuarine flushing, residence time and mixing<br>- <b>Easter Break, NO CLASS</b>                                   |
| 13   | 04/07<br>04/09 | <b>Shelf</b><br>- Introduction to Shelf systems ( <b>HW4 due</b> )<br>- Geostrophic balance and wind-driven currents |
| 14   | 04/14<br>04/16 | - Upwelling and downwelling<br>- Western Boundary Currents and coastal oceans                                        |
| 15   | 04/21<br>04/23 | - Coastal bio-physical interactions<br>- Coastal ocean modeling overview                                             |
| 16   | 04/28<br>04/30 | - Dispersion in the coastal ocean ( <b>HW5 due</b> )<br>- <b>Reading Day, NO CLASS</b>                               |

**Final research reports:** due Friday, May 1, 5pm

**Note green:** Stay tuned, these activities will not take place in DeLoach Hall.