

Syllabus for PHY475/575
Principles of Physical Oceanography
DeLoach Hall 213 TR 08:00 - 09:15 am

Ever wonder why there is a Gulf Stream? Come on and find out!

A. Instructor: Professor John M. Morrison

Office: DeLoach 201 / Myrtle Grove 2331 (Primary)
Office Hours: DeLoach Hall: Tuesday and Thursday, 0930 - 1030
Myrtle Grove: Monday through Friday, 1100 - 1200
Office Phone: 910-962-2333
Email: morrisonj@uncw.edu

B. Resources: Liberal use of the Internet and external readings.

C. Course Prerequisites or Restrictive Statements: Prerequisite: PHY102 and MAT152
Restrictive Statements: Credit is not allowed for both PHY475 and MEA 575

D. Basic Studies Requirements: Not Applicable

E. Student Learning Outcome: By the end of this course, students will be able to:

- Explain why the environment is controlled to a large extent by the special properties of seawater;
- Explain why there is a Gulf Stream and its important in climate;
- Explain in simple terms how the general circulation of the ocean works;
- Explain how/why the circulation regimes in the various oceans differ;
- Explain why there is a need for heat to be redistributed over earth's surface.

E. Textbooks: The textbooks provide a guide and easily readable background for the material to be presented. In general, the course will go into considerably more depth on a number of specific topics.

- Seawater: Its Composition Properties and Behavior, 2nd Edition, Open University Course Team (Butterworth and Heinemann, 1995 --- ISBN0-7506-3715-3); Approximate Cost: \$39.99
- Ocean Circulation, 2nd Edition, Open University Course Team (Butterworth and Heinemann, 2001 --- ISBN 0-7506-5278-0); Approximate Cost: \$37.95

F. Course Organization and Scope:

Topics to be covered:

Book: "Seawater: Its composition, properties and behavior"

1. Introduction
2. Water:

Associative and dissociative properties of water; the hydrological cycle.

3. *Temperature:*
Solar radiation and oceanic heat budget; Distribution of temperature at the ocean surface and at depth.
4. *Salinity:*
Definition of salinity; Constancy of composition; Measurement of salinity; Salinity distributions.
5. *Density and Pressure in the Ocean:*
Depth (pressure), density and temperature; Water masses; T-S Diagrams; Stability and mixing processes in the ocean; Equation of state of seawater.
6. *Light and Sound in Seawater:*
Underwater light; Color in the sea; Scattering, absorption, reflection and diffraction of light and sound in the ocean.

Book: "Ocean Circulation"

7. *The Atmosphere and Ocean:*
Global wind system; Global heat balance; Ocean-atmosphere interaction
8. *Ocean Currents:*
Derivation of the equation of motion for fluid flow on a rotating earth; Winds effects (Ekman Solution); Effects of rotating earth (Inertial Solution, Geostrophic Solution); Divergences and convergences.
9. *Scales of Energy in the Ocean*
North Atlantic Gyre: The Gulf Stream The Subtropical Gyres; Modern observations and theories of the North Atlantic Gyre.
10. *Other Major Current Systems:*
Equatorial current systems; Monsoonal circulation; Role of Long Waves in Ocean Circulation: Kelvin waves; Rossby waves; Oceanic wave guides; El Nino - Southern Oscillation; High latitude current systems.
11. *Global Fluxes and Deep Circulation:*
Oceanic Heat Budget; Conservation of salt; Ocean Water Masses; Oceanic mixing and temperature-salinity diagrams; Non-Conservative and Artificial Tracers; Global Fluxes of Heat and Freshwater.

Time Permitting:

Book: "Waves, Tides and Shallow-Water Processes"

12. *Waves:*
What are Waves? Wave-Forms Wave-Dispersion and Group Speed; Wave Energy

13. Tides

Tide-Producing Forces - The Earth-Moon System; Tide-Producing Forces - The Earth-Sun System; Dynamic Theory of Tides; Types of Tides

F. Projected schedule of reading assignments: In order to keep up with the material to be presented it is necessary to the student to read along in the required texts. The textbooks will help the student to put the lectures into a broader perspective by providing a guide and easily readable background for the material to be presented. In general, the course will go into considerably more depth on a number of specific topics.

G. Grading:PHY475:

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| • Test 1: covers parts 1 - 6 in the Syllabus | 100 pts. |
| • Test 2: covers parts 7 - 9 in the Syllabus | 100 pts. |
| • Final: Comprehensive, but will focus on Parts 10 - 13 in the Syllabus | 100 pts |
| • 5 -page (single space) paper on topic of choice in physical oceanography | 100 pts |
| • Class Participation / Miscellaneous homework assignments will be given to Classes if the students are not following the material presented in class. | 100 pts |
| | _____ |

Total: 500pts

Grade for PHY 475 = percentage of 500 pts

PHY 575: (above plus + Term Projects) (Required for PHY575)

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| • Geostrophic Solution to the Equation of Motion (after topic 8 in the course outline) | 50pts |
| • Analysis and Interpretation of Hydrographic Data (after topic 10 in the course outline) | 50 pts. |
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Total: 600pts

Grade for PHY 475 = percentage of 600 pts

Final Grade Based on Percentage of 500 points for PHY475

Final Grade Based on Percentage of 600 points for PHY575

Final grades will be based on a plus/minus grading scale as follows: A = 93-100; A- = 90-92; B+ = 87-89; B = 83-86; B- = 80-82; C+ = 77-79; C = 73-76; C- = 70-72; D+ = 67-69; D = 63-66; D- = 60-62; and F < 60.

H. Late Assignments and Incomplete Grades: Extensions for late assignments will be granted individually in consultation with the professor under extenuating

circumstances. Incomplete grades will be issued in extenuating circumstances to students who are passing the course.

- I. Absences and Scheduling Makeup Work:** Attendance, while not required, is highly recommended as a portion of your grade will be determined from homework assignments and class participation.

Extensions will be granted on homework deadlines for students with excused absences. Partially completed work will be given partial credit. Absences from tests will result in a zero being registered for that test except for the case of illness documented with a note from a doctor or (when presented before the scheduled test) officially sanctioned university activities that conflict directly with the test time. If you miss a test in either manner, it will be the responsibility of the student to make arrangements with the professor for a makeup exam.

- J. Statement on Academic Integrity:** University Policy on Academic Integrity: The instructor of this course is committed to upholding the University policy on academic integrity, described in the Code of Student Conduct, which can be found at:

<http://www.uncw.edu/stuaff/doso/documents/HonorCode09.10.doc>

“As a student at The University of North Carolina Wilmington, I am committed to honesty and truthfulness in academic inquiry and in the pursuit of knowledge. I pledge to uphold and promote the UNCW Student Academic Honor Code.”

“It is the responsibility of every faculty member, student, administrator and staff member of the university community to uphold and maintain the highest academic standards and integrity of the university. Any member of the university community who has reasonable grounds to believe that an infraction of the Honor Code has occurred has an obligation to report the alleged violation to the faculty member teaching the class who, in turn, must report the allegation to the Office of the Dean of Students. This obligation is a core value of the Honor Code, and must be fulfilled by each and every member of the university.”

Faculty Expectation: Zero Tolerance.

- K. Statement for students with disabilities:** Students with disabilities are invited to schedule an appointment with the instructor to discuss any needed accommodations. Reasonable accommodations will be made for students with verifiable disabilities.

In order to take advantage of available accommodations, students must present documentation to Disability Services for Students at Westside Hall, First Floor, Phone: 910-962-7555 - Fax: 910-962-7556 - TDD: 910-962-3853.

<http://www.uncw.edu/stuaff/disability/contact.htm>

For more information on UNCW's policy on working with students with disabilities, please see

<http://www.uncw.edu/stuaff/disability/contact.htm>

L. Statement on laboratory safety or risk assumption: Any laboratory work associated with this course has no special risks that would make it less safe than any other classroom. The Department of Physics and Physical Oceanography is committed to maintaining an environment in which students can safely pursue their required laboratory assignments.

M. UNCW Policy on violence and harassment: UNCW practices a zero-tolerance policy for violence and harassment of any kind. For emergencies contact UNCW CARE at 962-2273, Campus Police at 962-3184, or Wilmington Police at 911.

For University or community resources visit:

<http://uncw.edu/wrc/crisis.htm>

N. Statement on extra expenses: There are no significant extra expenses.

O. Statement on transportation: There will be no additional transportation costs associated with this course.