

Physics 3300

Intermediate Physical Oceanography

Instructor: Brad de Young

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Physics 3300 Introduction to Physical Oceanography deals with the physics of the processes in the ocean, providing an integrating view of the whole field of oceanography. The importance of physical processes to other aspects of oceanography is treated.

Our goal in this course is to learn how the ocean works. How does water move about the ocean and how long does it take? Why is the ocean stratified? How are the ocean and atmosphere coupled? What role does the ocean play in regulating the earth's climate? Is the ocean climate changing?

Activity:

Assignments (4)	25%
Term Paper	15%
Test	20%
Final Examination	40 %

Course outline:

- 1) Introduction, history, scaling the problem, some examples
- 2) Properties of seawater
 - Salinity, what is it and how to measure it
 - TS diagrams and the mixing of water
 - Equation of state, density, stability
- 3) Oceanic heat budget
 - Fluxes and processes
 - Geographic distributions
- 4) Equations of motion

- Dominant forces and coordinate system
 - Derivatives and momentum equation
 - Conservation equations
 - Fundamental solutions
- 5) Motion with viscosity
- Turbulence
 - Reynolds stresses
 - Mixing and stability
- 6) Wind in the ocean
- Inertial motion
 - Ekman dynamics
- 7) Geostrophic currents
- Balance of forces
 - Calculation of geostrophic forces
 - Current measurements
- 8) Wind Driven Ocean Circulation
- Sverdrup, Munk and Stommel
 - Western Boundary Currents
- 9) Climate dynamics
- Long time scales in the ocean
 - Linking across time scales
- 10) What don't we know? What's next?

Texts :

Robert H. Stewart, Introduction to Physical Oceanography, Robert H. Stewart – available either in the bookstore bound or on the web (see <https://open.umn.edu/opentextbooks/textbooks/introduction-to-physical-oceanography>) or on the course web site.

The course web page will offer assignments, solutions and special readings for the course.

Schedule –

Assignments will be set out roughly every two weeks and due ten to twelve days later:

Assignment 1 – Out 14 January
Due 23 January

Assignment 2– Out 28 January
Due 6 February

Assignment 3 – Out 11 February
Due 25 February

MidTerm Test – 27 February 2020

Assignment 4 – Out 5 March
Due 17 March

Term Paper– 2 April 2018 (last class) (Outline (worth 2%) due 17March)