MAR 509: Foundations of Marine Science II: Physics of oceans, atmosphere and climate

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TEACHING ASSISTANT: TBA

Description: Introduction to principles of physics governing the patterns of ocean and atmospheric properties. Discussion of the theoretical basis for energy exchange between the two environments and how it governs the spatial and temporal scales of the fluid dynamics includes how these processes interact with climate.

Objectives:
☐ Recalling factual knowledge about physical sweater properties
☐ Demonstrate knowledge about methods for ocean observations.
☐ Understand basic concepts of ocean dynamics.
☐ Demonstrate knowledge about ocean circulation
☐ Understand the role of the ocean in climate change and variability
☐ Demonstrate understanding of costal dynamics and tides

Blackboard
The class schedule, homework assignments and other important information can be found on Blackboard (http://blackboard.sunysb.edu).

Textbooks
Ocean Circulation, 2nd Edition by Open University [2001]

Other books

ASSESSMENT GUIDELINES:
There will be two homework assignments (10%), five 2-page (single-spaced) summaries of selected chapters in the textbooks (20%), two midterms (40%), and cumulative final exam (30%). Identical reports/papers lead to downgrading!!
Questions in exams are based on lectures, textbooks, assigned readings, and Friday seminars. All exams are "closed book / closed notes."

NOTE:
It is instructor's responsibility to report behavior that interrupts the learning process, inhibits instructor’s ability to perform his/her duties, or compromises the safety of other students: “Stony Brook University expects students to maintain standards of personal integrity that are in harmony with the educational goals of the institution; to observe national, state, and local laws and University regulations; and to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, and/or inhibits students' ability to learn.
MAR 509 TEACHING SCHEDULE

**Topic**

Radiation balance & Water properties

**Lect 1:** CW: Radiation, Temperature: Attenuation of solar radiation in atmos., absorption of solar radiation in ocean, Jerlov's water types, diurnal and seasonal temperature cycles in the ocean

**Lect 2:** CW: Temperature, Salinity, Potential Temperature, conservative Temp, Absolute salinity

**Lect 3:** KL: TEOS of seawater, Density, stability

**Lect 4:** KL: Temp distribution, Salinity distribution,

**Lect 5:** KL: Mixing layers, Age of Ocean water, water masses

**Lect 6:** KL: Observational Methods in the ocean

**Lect 7:** KL: Global budgets of heat, water and salt: Heat budget, water budget, salt budget in the ocean

**Midterm I**

**Lect 8:** CW: Conservation of Volume, mass, and salt, Continuity

**Lect 9:** CW: Momentum balance, Pressure Gradient Force,

**Lect 10:** CW: Coriolis Effect, Geostrophic Balance

**Lect 11:** CW: Global Atmospheric Circulation:

**Lect 12:** CW: Ocean circulation I: Wind forcing, Ekman Transport

**Lect 13:** CW: Ocean circulation II: Vorticity and potential vorticity

**Lect 14:** CW: Ocean circulation III: Wind-driven circulation: Sverdrup balance

**Lect 15:** CW: Ocean circulation IV: turbulence, eddies

**Lect 16:** CW: Ocean circulation V: Ocean Meridional circulation

**Lect 17:** KL: Regional oceanography I: Atlantic Ocean

**Midterm II**

**Lect 18:** KL: Regional oceanography II: Pacific Ocean

**Lect 19:** KL: Regional oceanography III: Southern Ocean

**Lect 20:** KL: Regional oceanography IV: Indian Ocean

**Lect 21:** KL: Climate and Air/Sea Interactions I: El Niño, La Niña, and the Southern Oscillation, Pacific Decadal Oscillation, Indian Ocean DMI

**Lect 22:** CW: Climate and Air/Sea Interactions II: North Atlantic Oscillation, Arctic Oscillation, AMO, Southern Annular Mode

**Lect 23:** CW: Milankovitch cycles & other long-term changes

**Lect 24:** KL: Tides, Tsunami

**Lect 25:** KL: Coastal oceanography: Estuaries: types of estuaries; circulation; flushing time and coral reefs

**Lect 26:** KL: Coastal oceanography: Continental Shelf structure and dynamics

**FINALS**