The Ocean Environment – ATSC4320 and ATSC5320 Instructor: Jeff Snider (x2637 - jsnider@uwyo.edu) MWF, 1:10-2:00; EN 6060 Office Hours, MWF 11:00 to 12:00 Web Site: <u>http://www-das.uwyo.edu/~jsnider/atsc4320</u>

BRIEF DESCRIPTION:

This course focuses on the ocean as a system. Development of an understanding of marine processes from a physical, geochemical and a biological perspective is an overarching theme.

PREREQUISITES:

MATH2310, PHYS1310, CHEM1030 and BIO1010 (or equivalents)

GRADING:

Midterm = 25%, Final=25%, Homework=30% and Quiz and =20%

TEXTBOOK:

1 - Knauss, John A., *Introduction to Physical Oceanography*, Prentice Hall, 1997 (http://www.allbookstores.com/browse/subjects) (This is the course textbook)

2 – Stewart, R., Introduction to Physical Oceanography (<u>http://oceanworld.tamu.edu/ocean410/</u>)

3 - Bryson, B., A Short History of Nearly Everything, Broadway Books, New York, 2003

(I will provide copies of selected readings)

COURSE OUTLINE:

- 1) Introduction to the Ocean Environment
 - a) Water, salt and oceanic currents
 - b) Ocean basins, hypsographic curve, ocean floor topography, water masses
 - c) Vertical structure light attenuation, density profile, isopycnal motion
 - d) Ficks law, molecular and turbulent diffusion
 - e) Double diffusion instability
 - f) Radiative forcing, sea ice formation, constitutional supercooling
 - g) The thermohaline circulation
- 2) The Physical Environment
 - a) Seasonal changes of the mixed layer
 - b) The seawater equation of state density and stability
 - c) The seawater equation of state T/S diagram
 - d) Isopycnal mixing instability
 - e) The salinity conservation equation
 - f) The salinity conservation equation, Part 2
 - g) Dynamics, pressure gradient force, Coriolis force, geostrophic flow, gyres
 - h) Geostrophy
 - i) Geosptrophy, Part 2
 - j) Inertial flow
 - k) Inertial flow, Part 2
 - l) Ekman flow
 - m) Ekman flow, Part 2
 - n) The Gibraltar current Box model description of exchange with the Atlantic

3) Midterm

4) Challenges to Life in the Ocean

- a) Drag on a sphere
- b) Challenge #1 Settling
- c) Osmotic Pressure
- d) Challenge #2 Osmotic pressure variation due to variable salinity
- e) Predator-Prey
- f) Challenge #3 Predation
- 5) Interplay of Dynamics, Biology and Geochemistry
 - a) Light-to-Biomass Energetics Photosynthesis and respiration
 - b) Spatial Distribution of Phytoplankton
 - c) Carbon Biogeochemistry Introduction
 - d) Henry's law Solubility of Gases
 - e) Alkalinity
 - f) Carbonate Calculator, Part 1
 - g) Carbonate Calculator, Part 2
 - h) Two layer model of the ocean/atmosphere carbon biogeochemical cycle
 - i) Two layer model of the ocean/atmosphere carbon biogeochemical cycle Geoengineering

6) Final

General Course Policy:

1) Homework is an essential part of this class. While I encourage you to study collaboratively, I will insist that your homework be unique. When I grade the homework I will look to see that your solution is unique. If it is not, I will return the homework ungraded.

2) All homework should begin with a statement of the problem; if this statement is not present, I will return the homework ungraded.

3) Class handouts are important! I am insisting that you organize the handouts, and bring the collection to class.

Plus/Minus Grading:

I will use a plus/minus scale when assigning grades for this class (UW Regulation 6-722).

Disability Statement:

If you have a physical, learning, or psychological disability and require accommodations, please me know as soon as possible. You must register with, and provide documentation of your disability to University Disability Support Services (UDSS) in Student Educational Opportunity office, room 330 Knight Hall. More information can be found at: http://www.uwyo.edu/udss/

Academic Honesty:

UW Bulletin: "The University of Wyoming is built upon a strong foundation of integrity, respect and trust. All members of the university community have a responsibility to be honest and the right to expect honesty from others. Any form of academic dishonesty is unacceptable to our community and will not be tolerated." Students should report suspected violations of standards of academic honesty to the instructor, department head, or dean. Other University regulations can be found at: http://www.uwyo.edu/generalcounsel/new-regulatory-structure/academic-policy.html