

The Oceans and Global Change

MSL F215

Instructor:

Dr. Andrew McDonnell

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Office: 231 Irving II

Office Hours: Tuesday & Thursday, 2-3 pm or by appointment

Class meeting times: MWF 2:15-3:15 pm

Location: 105 Murie

Prerequisite: MSL F111X, MSL F211, ATM F101X, ENVI F101, or GEOG F111X

3 credits

Course Description: Explores how global environmental changes are affecting Earth's oceans. Topics include climate change and ocean warming, sea level rise, coastal erosion, declining sea ice, changes in ocean circulation and ecosystems, oceanic uptake of carbon dioxide, ocean acidification, ocean pollution, dead zones, and climate engineering. The course will investigate the causes, effects, and implications of changes in the oceans.

Course Goals: The goal of this course is to gain an understanding of the ocean's role in global environmental change, and how these processes are influenced by and affect human activities.

Learning Objectives

- Understand how the oceans operate as part of the broader earth system
- Learn about how human activities impact the oceans
- Develop the ability to analyze, interpret, connect, and discuss earth system data as indicators of change
- Learn about uncertainty in global change science and how scientific inquiry can reduce uncertainties
- Evaluate the potential societal, economic, security, and cultural implications of our changing oceans
- Understand the role of oceanic changes in the context of current events
- Assess the feasibility of deliberate actions to mitigate global change and its impacts

Instructional methods: This course will achieve the intended learning outcomes through the use of lectures, demonstrations, group discussions, and homework assignments. There will be an emphasis on active learning, and as such, your participation in class is very important.

Reading Assignments: The course will rely on a variety of readings and resources depending on the subject matter being covered (see end of syllabus for some of the core references). Readings will be assigned regularly from various sources that are available on the internet, as free electronic resources from the UAF Library, or distributed by the instructor. Reading assignments are essential for realizing the course's learning objectives, your participation in class, and your performance on the quizzes, homework, and exams.

Homework Assignments: The homework assignments are essential to meeting the course learning objectives. Assignments will focus on both a conceptual, quantitative, and applied understanding of the subject material. Students are encouraged to utilize the instructor's scheduled office hours if assistance is needed to complete the assignments. Each homework assignment is worth 100 points. A total of 3 assignments will be given, making for a total of 300 points possible in the Homework grading category.

These points will be weighted to account for 20% of the total grade. Late submissions of homework will be penalized 20 points for each day after the specified deadline.

Quizzes: Approximately 10 short quizzes will be administered at unannounced times during the lectures. The Quizzes will evaluate your basic understanding of the key concepts presented in the lectures and the readings. You are allowed to use any notes you have made. Quizzes cannot be made up at a later time (unless you have notified the instructor of an excused absence ahead before the class session in which the quiz is administered). For this reason it is important that you attend all class sessions, take good notes, and pay attention to the material we cover during class. Your lowest quiz score will be dropped. Quizzes will be weighted to account for 10% of the total grade.

Current Event Presentations: Each student will be responsible for making TWO short presentations about current events of relevance to the course material. The presentation should draw from a news article or recent scientific finding. Schedule your presentation with the instructor 1 week in advance, after you have selected a current event topic. Your first presentation should be completed before October 15, so do not wait until the last minute.

Midterm Exams: Two Midterm Exams will be given during class period (see calendar). Exams are closed book. Each Mid-Term Exam is worth 100 points, and each exam will be weighted to account for 20% of your total course grade.

Final Exam: A written final exam will be administered during the assigned final exam period. It will focus on evaluating your conceptual understanding of the topics covered in the course and demonstrating your ability to quantitatively interpret earth system data. The exam is closed book. The exam will be worth 10 points and will be weighted to account for 25% of your total course grade.

Grading: Points totals from each of the following categories will be weighted according to the following scale in order to obtain an overall percentage course grade.

- 10% Quizzes
- 5% Current Event Presentation
- 20% Homework Assignments
- 20% Mid Term Exam 1
- 20% Mid Term Exam 2
- 25% Final Exam (Comprehensive)

After weighting the total scores from each category according to the weights specified above, total grade percentages will be rounded to the nearest whole percentage point and letter grades will be assigned according to the following scale:

Total Grade Percentage	Letter Grade
94-100	A
90-93	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C
70-72	C-
67-69	D+
63-66	D
60-62	D-
<60	F

Course Policies: All students are expected to adhere to the Code of Conduct and other policies described in the University of Alaska Fairbanks Catalogue. Infractions related to the Code of Conduct may result in a grading penalty or disciplinary action.

Support Services: Students are encouraged to visit the instructor's office hours for additional help with course concepts, assignments, and exam preparation.

Disability Services: At UAF, the Office of Disability Services (203 WHIT; 474-5655; TTY 474-1827; fydso@uaf.edu) ensures that students with physical or learning disabilities have equal access to the campus and course materials. If you have specialized needs, please contact this office or the instructor to make arrangements.

Class Calendar

Week	Topics	Assignments	Reading
1	Introduction, course overview		Syllabus
2	Oceans as part of the Earth system		Vallis p. 15-34
3	Natural variability in climate	Homework 1 Assigned	Vallis Chpt. 2
4	Global climate change		IPCC: AR5 SPM
5	Global climate change	Homework 1 Due	
6	Ocean warming	Mid-Term 1	
7	Ocean influence on storms and precipitation		Stewart
8	Sea level rise, coastal erosion		Stewart: Coastal Erosion
9	Changes in ocean circulation	Homework 2 Assigned	Handout: Changes in ocean circulation
10	Carbon dioxide and ocean acidification		Seattle Times: Sea Change
11	Effects on Ecosystems and Fisheries	Homework 2 Due	Handout: Effects on Ecosystems and Fisheries
12	Nutrient pollution and dead zones	Mid-Term 2	
13	Climate Engineering		Handout: Climate Engineering
14	Ocean pollution, oil and mineral extraction from the oceans	Homework 3 Assigned	Handout: Ocean pollution, oil and mineral extraction from the oceans
15	Societal, economic, security, and cultural considerations	Homework 3 Due	
Finals	TBD	Final Exam	

Resources:

- Climate and the Oceans, Vallis, Geoffrey K. 2011.
- Intergovernmental Panel on Climate Change: Fifth Assessment Report
<http://www.ipcc.ch/report/ar5/>
- Stewart, Robert. Our Ocean Planet Oceanography in the 21st Century, Online textbook:
<http://oceanworld.tamu.edu/resources/oceanography-book/contents.htm>

- <http://apps.seattletimes.com/reports/sea-change/2013/sep/11/pacific-ocean-perilous-turn-overview/?prmid=4749>