

EARTH SCI-5206 “Advanced Oceanography”

Instructors: Dr. Andréa G. Grottoli, Professor (Chemical and Biological Oceanography)
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Required Textbooks:

Oceanography: An Invitation to Marine Science (8th Ed) By Tom Garrison. Any edition is equally fine. A couple copies of older editions will be on reserve at the Orton Library

Prerequisites: One of EARTHSC 1100, 1105, 1121; or Grad standing; or permission of instructor.

OVERALL COURSE DESCRIPTION

This course is designed to provide an overview of oceanography. It is constructed such that students majoring in the sciences can learn about the oceans. The course will cover brief overviews of the four major areas of oceanography: marine chemistry (seawater chemistry and nutrient cycling), physical oceanography (ocean and atmospheric circulation, and waves), marine biology (marine ecosystems, reproductive biology, and behavioral ecology), and marine geology (plate tectonics, sediments, and coastal geology). The course will follow the concepts presented in the textbook, enhance those concepts with additional information and readings, and provide a framework for discussion about the larger implications and applications of those concepts.

The goals of this course are (1) Students will develop a foundation in oceanography for future study, (2) Students will understand how chemical, biological, physical and geological processes in the oceans interact and influence each other, (3) Students will be able to use the basic scientific method to evaluate oceanographic data, (4) Students will appreciate real world issues related to human interactions with the oceans, (5) Students will be able to understand and evaluate current ocean topics in scientific literature and media, and (6) Students will gain an appreciation for the complexity and beauty of the oceans.

The learning outcomes for the course follow:

- (1) Recall basic concepts in chemical, physical, biological, and geological oceanography.
- (2) Provide examples of the interdisciplinary nature of oceanography.
- (3) Analyze and evaluate scientific data to create conclusions about oceanographic processes.
- (4) Explain how physical, chemical, geological, and biological factors in the ocean affect the climate in the past, present and future.
- (5) Develop and communicate conceptual models of the ocean.
- (6) Discuss with peers recent scientific literature on current ocean topics.
- (7) Assess the accuracy and effectiveness of media on a current ocean topic.

The weekly lectures will be power point presentations of the various topics with some video clips, overheads, and other media. The major graphs and figures (as power point files) will be posted for each lecture on Canvas (<https://carmen.osu.edu/>) prior to each lecture. These files are lecture outlines or guides, and not complete notes for the lecture. Students should take notes directly on their electronic or printed copies of the lecture slides. We will also periodically upload additional readings on the Canvas site, as well as post messages, important calendar dates, and reminders.

Homework/assignments/activities will be assigned on a regular basis by each instructor. All homework/assignments/reports must be typed or neatly hand-written. There will be a 25% per day deduction for assignments turned in late.

GRADING

Grading Scheme

Exam 1 – chemical oceanography	18%
Exam 2 – physical oceanography	18%
Exam 3 – biological oceanography	18%
Exam 4 – geological oceanography	18%
Assignments	16%
Discussions & Fieldtrips	6%
Discussion & In-class activity	6%

The expected grading scheme for this course is:

Letter	Grade Range	Letter	Grade Range
A	90-100	C+	65-69.9
A-	85-89.9	C	60-64.9
B+	80-84.9	C-	55-59.9
B	75-79.9	D	50-54.9
B-	70-74.9	F	<50

Exams: There will be four exams. The exams are not cumulative.

EARTHSCI-5206 Class Schedule (subject to change)

Week	Topic	Chapter
1	Review of Syllabus Chemical Oceanography basics Dissolved gasses, carbonate system, and ocean acidification	6 7, p.404
2	Elemental and trace metal cycling Carbon cycle	533-545
3	Sources and composition of organic matter Readings and discussion in chemical oceanography, Assignment #1 due	13
4	Exam 1 Atmospheric circulation, Coriolis force, equations of motion, and the Ekman spiral	8.3, 9.2
5	Dynamic topography, geostrophic flows, and the subtropical gyres Variations on surface circulation – upwelling and El Nino/La Nina	9.2-9.3 9.4-9.5
6	Deepwater circulation Waves, Tides, Assignment #2 due	9.6 10, 11
7	Readings and discussion in physical oceanography Exam 2	
8	Primary productivity and pelagic communities <i>Fall break</i>	13, 14
9	Benthos Coral Reefs	15, p. 479-490
10	Nekton Fisheries	15 17.4
11	Marine Pollution Readings and discussion in biological oceanography Fieldtrip to Aquarium and Coral Farm	18 Required (8am-5pm)
12	Exam 3 Crust/lithosphere, hypsometric curve & isostasy; Assignment #3 due Fieldtrip to Shrimp Farm	3, 4 Required (8am – 2pm)
13	Plate tectonics – crust formation and aging Seafloor provinces & mid ocean ridges	3, 4 5
14	Marine sediments activity in class THANKSGIVING – NO CLASSES	5
15	Marine sediments & plate stratigraphy Paleoceanographic proxies & diagenesis; Assignment #4 due	5.8
16	Major events in Mesozoic/Cenozoic paleoceanography	5
FINALS	TUESDAY, Dec 11 2:00-3:45pm, Exam 4	