

INTRODUCTION TO OCEANOGRAPHY

GEOL 18000

TUESDAY/FRIDAY, 14:10-15:25

HUNTER NORTH C002

CONTACT INFORMATION

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Office Hours: Tuesday-Friday 1:00 – 2:00 pm, *and by appointment.*

***Note:** The best way to contact me is through your **Hunter College** @myhunter email – (1) You must include **GEOL 18000** in your subject line, (2) sign your full name as it appears in CUNYfirst, and (3) send all email from your @myhunter email address. I do not respond to personal email addresses. I try to answer all emails within 24 hours during the week and 48 hours on the weekend.

COURSE DESCRIPTION

This course will offer an introduction to the subject of oceanography. We will discuss the physical, chemical, biological, and geological aspects of the oceans; learn about the structure and motion of the atmosphere and how they influence ocean circulation; and we will learn about waves, tides and tsunamis. The ocean, comprising 71% of the Earth's surface, is a crucial component of the Earth's climate system and its dynamics determine the cycling of carbon and the production of oxygen throughout the planet. The oceans' extreme environments host unusual forms of life, which are sensitive to anthropogenic influences. It is an important source of energy and economically valuable materials. Accordingly, the ocean has a profound influence on humans and civilization. In addition to providing a good introduction to aspects of the scientific world, it is a foundational course for Environmental Studies, Geography and BA/MA Earth Science Education majors.

The course has been divided into four units, each with a corresponding **INTEGRATING CASE STUDY** designed to achieve the expected **LEARNING OUTCOMES** listed below.

- Unit 1-Marine Geology
- Unit 2-Ocean Chemistry
- Unit 3-Ocean Dynamics
- Unit 4-The Ocean Environment

EXPECTED LEARNING OUTCOMES

An overall goal for this course is to have students (1) articulate and evaluate the empirical evidence supporting a scientific or formal theory, and (2) understand the scientific principles underlying matters of policy and public concern as they relate to the oceans by the end of the semester.

Specifically, by the end of the semester students would be expected to

1. Gather, interpret, and assess information from a variety of sources and points of view.
2. Evaluate evidence and arguments critically and analytically.
3. Produce well-reasoned written arguments using evidence to support conclusions.
4. Identify and apply the fundamental concepts of physics, chemistry, geology, biology, mathematics and engineering technologies to the study of modern oceanography.
5. Identify and contribute to modern ocean science, new discoveries discourse, current news and debates pertaining to the oceans.
6. Demonstrate knowledge of the Ocean's role within the broader Earth System.

CASE STUDIES

To support Expected Learning Outcomes and Unit 4: The Ocean Environment:

- In addition to traditional instruction, each **CASE STUDY** will require students to gather data from several marine databases (NOAA, USGS, NASA), relevant journal articles and white papers. Through class discussions students will learn to interpret the collected data as they pertain to the specific process(es) or problem(s) presented and will be guided to assess the implications of the data being used.
- For each **CASE STUDY** a series of analytical questions (4-6) will be formulated, designed to highlight different perspectives or points of view that may be derived from the data. Students then will be required to provide a substantial answer to each question evaluating these perspectives.
- For each **CASE STUDY** students will be required to construct a 'position paper' about any potential controversy surrounding the topic(s), and to show exactly (in the assigned chapters and journal articles, lectures, data) what supports their arguments. Guidelines for the position paper will be distributed separately.

INFORMED REGISTRATION STATEMENT

This is a **3-hr, 3.0-credit**, science-based course, which meets the Scientific World requirement of the Hunter Common Core and the GER 2E General Education Requirement.

RECOMENDED TEXT BOOKS

Essentials of Oceanography (12th Edition), Trujillo, A. P. and Thurman, H. V., 2017
ISBN 9780134073545, Pearson, retail \$180-\$200 (paper back).

Earlier editions are acceptable and ebook (\$49.99 - 79.99) options are available.

GRADING METHOD AND SCALE

Grades will be based on class participation, homework assignments, two mid-term exams, and one final exam. A detailed description of the Hunter College Grading System may be found in any undergraduate catalog . An itemized breakdown of the final grading rubric is provided below:

- Class participation: 10%
- Case Study Assignments: 30%
- Mid-term exam I: 20%
- Mid-term exam II: 20%
- Final exam: 20%

EXAM GUIDELINES AND POLICIES

Exams will be based on assigned textbook readings, journal articles, materials covered in class, and case studies. Dates are **CLEARLY** posted on the Course Calendar and Content.

Examinations are 1 hour and 15 minutes for the mid-term and 2 hours for the final exam. No electronic devices or reference materials will be permitted on the desk during exams unless specified. Make-up exams are **ONLY** available in extreme cases, and with medical (or other) forms that confirm the absence.

Exams are designed to evaluate a student's ability to master content, integrate themes and concepts between sub-disciplines in oceanography, understand the usefulness and limitations of oceanographic data for studying processes, and apply logical arguments to support perspectives.

CR/NCR POLICY

The CR/NCR option will be honored only if the conditions stated on the CR/NCR form are satisfied: all course work has been completed and you earned grades such that you accumulated at least 50 points total in the course. CR/NCR must be filled correctly and submitted **BEFORE** the final examination begins. Students on probation are ineligible. Here is a link to the college's page regarding the Credit/No Credit Policy: [HTTP://WWW.HUNTER.CUNY.EDU/ADVISING/HOW-TO/FILE-CREDIT-NO-CREDIT-CR-NC](http://www.hunter.cuny.edu/advising/how-to/file-credit-no-credit-cr-nc). You must give the completed form to your instructor before the beginning of the final exam.

PARTICIPATION AND CLASSROOM POLICIES

Class participation constitutes 10% of the final grade. Attendance is strongly encouraged at all lectures because students who do not attend lecture cannot participate in class discussions. All students are expected to abide by the following policies when in lecture in order to provide a more respectful and productive learning environment.

- All cell phones must be silenced.
- Laptops are not permitted.
- Texting and other non-class related smart phone activities are not allowed. Students should quietly excuse themselves from the lecture if substantial external electronic communication is required.

SYLLABUS CHANGE POLICY

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice. Updates will be posted regularly on BlackBoard.

INTEGRATING CASE STUDIES

The course integrates Case Studies with Unit 4: The Ocean Environment. Four case studies selected from the list of general topics in oceanography provided below will be used to foster students' understanding of the ocean. Each case study highlights various content and themes within the discipline, and is designed to promote the development of a citizen scientist, from describing fundamental concepts in oceanography, collecting, analyzing and synthesizing data to articulating the empirical evidence that supports theories and points of view. Students will be responsible for constructing a position paper for each selected case study.

- **Plate Tectonic Theory:** Possibly the most substantial contribution the discipline has made to society, this theory details the basic processes of the scientific method from the

construction of the continental drift hypothesis to the elevated unified theory involving mantle convection and sea floor spreading.

- **Eutrophication, Gulf of Mexico Dead Zones to Lobster Die Offs in Long Island Sound:** Students deconstruct the processes that give rise to eutrophication on the local and regional scale, and how these conditions have been influenced by land use and management policies. Students will review the current research to determine what role eutrophication played in the decline in lobster populations in LIS.
- **Grey Seals To Great Whites:** Through this case study students explore population dynamics and fishery management. The rebound in the grey seal population following culling in the 19th and 20th centuries has led to the return of the North Atlantic white sharks and a birth of ecotourism for Cape Cod, MA.
- **Garbage Islands, Plastic Land Up For Grabs:** Students explore ocean circulation and the world's most pervasive surface drifter: plastic. Ownership and responsibility are called into question, as Ocean Stewardship becomes an increasing global priority.
- **Arctic Sea Ice, The Polar Vortex and Planetary Scale Waves:** Students investigate how accelerated sea ice loss in the Arctic has influenced the recent breakdown of the polar vortex, mechanisms for ocean-atmosphere coupling and global teleconnections.
- **Meridional Overturning Circulation:** Students research the debated primary and secondary processes influencing the rate and variability of MOC, the role observing systems play in deciphering the redistribution of heat and carbon.
- **Antarctica, the Southern Ocean and Climate Change:** The Antarctic Peninsula is one of the fastest warming spots on the planet and the latest evidence seems to indicate that it is the warm ocean waters that are eating away the ice along the western part of the Peninsula. Students will research the primary and secondary processes influencing the rate and variability of melting, the role the atmosphere and the ocean systems play in deciphering the redistribution of heat and the specific conditions of this area that may be aiding the melting process.
- **The Oceans and their Giant Waves** - Learning from the mariners, the scientists and the surfers. Students will read different chapters of the book "The Wave" by S. Casey and will then research the most recent evidence of these giant waves as detected by modern measuring methods.
- **Monitoring Ocean Changes in the 21st Century:** Ocean temperature and chemistry changes strongly influence the well-being of organisms and the composition of marine food webs. Since the preindustrial era, the oceans have absorbed at least one fourth of the carbon dioxide (CO₂) that humans have put into the atmosphere, resulting in an increase in ocean acidity. The amount of oxygen dissolved in ocean water has changed as well, driven by warming and changes in circulation patterns. These effects are further compounded in coastal regions, where marine ecosystems face additional human pressures such as pollution, land use changes, and overfishing. How do scientists learn about the oceans and how and when changes take place? What are those changes? It's all about observations!

- **Climate, the Oceans, Climate Change and the Role Humans Play:** Students investigate the development of what has become a topic of current concern and debate: global warming and policies (or lack of) to address it. This topic is selected because it includes the entire Earth system, a system in which the ocean occupies a central place, and because an important part of a course in science is to provide information about topics that affect our everyday life.

ADDITIONAL HELPFUL INFORMATION

My Teaching Philosophy: My goal in teaching is to help students in becoming confident and responsible professionals and to make this experience an enjoyable one. My approach to teaching involves being a facilitator in the learning process as opposed to being the authoritarian lecturer at the front of the room with a “one-way information transfer” style. I understand and respect individual differences in learning and do my best to promote learning in the classroom by working with individual differences rather than against them. At the same time, I wish to impart technical skills and a sense of responsibility by encouraging students to play the role of professionals in the classroom.

I expect students to put their best effort into this course. This involves participating in the in-class exercises, reading the assigned material, working out in-class assignments and Case Studies, editing when necessary until they are clear and correct, and preparing for quizzes and exams.

Lecture: I will spend part of the lecture time explaining the key concepts of oceanography and devote time to class discussion. You are expected to devote time outside the classroom to understand the concepts and review questions. I expect that lectures and discussion will help you be ready for exams.

Finally: It is important to start with a good study habit. Consistency is the key. Forming study groups is extremely helpful. Use my office hours and any other resource available to you throughout the semester. Make progress steadily as the material in this course cannot be understood the night before the exam. Concentrate on understanding rather than ‘regurgitating’. Put out your best effort every day.

The following are useful tips to do well in this or any class:

- Attend class and take detailed notes.
- Actively participate in class discussions.
- Read the assigned material in the course textbook (or another textbook) *before* coming to class.
- Re-write your notes as soon as possible after class. This will allow you to fill in the details still fresh in your memory, and prepare questions for the next time the class meets.
- Test yourself by answering the questions in the book and in class.
- Carefully study the diagrams and charts in the book and in the lectures.

HUNTER COLLEGE POLICY ON ACADEMIC INTEGRITY

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

ADA POLICY

In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, located in Room E1214B, to secure necessary academic accommodations. For further information and assistance, please call: (212) 772- 4857 or (212) 650-3230.

HUNTER COLLEGE POLICY ON SEXUAL MISCONDUCT

In compliance with the CUNY Policy on Sexual Misconduct, Hunter College affirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-biased harassment retaliation against student, employees, or visitors, as well as certain intimate relationship. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.

- A. ***Sexual violence***: students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444)
- B. ***All other forms of sexual misconduct***: Students are strongly encouraged to contact the College's Title IX Campus Coordinator, Dean Jean Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complementary services through the Counseling and Wellness services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link:

<http://www.cuny.edu/about/administration/offices/la/policy-on-sexual-misconduct-12-1-14-with-link.pdf>

**** A tentative schedule of classes, topics and reading assignments is provided below and will be updated on BlackBoard as needed ****

COURSE CALENDAR AND CONTENT

***** TENTATIVE SCHEDULE *****

| Class No & Date | Topic: Chapter Title, Assignments | Readings |
|--------------------------------|--|------------------------|
| Unit 1: Marine Geology | | |
| 1. Tue – 8/27 | Introductory Lecture Planet “Earth”, a ‘fluid’ planet! | Chapter 1 |
| 2. Fri – 8/30 | Introductory Lecture – Fluid Earth | Chapter 1 |
| 3. Tue – 9/3 | Plate tectonics and ocean floor | Chapter 2 |
| 4. Fri – 9/6 | Plate tectonics and ocean floor <i>Assign Case Study 1</i> | Chapter 2 |
| 5. Tue – 9/10 | Marine Provinces | Chapter 3 |
| 6. Fri – 9/13 | Marine provinces | Chapter 3 |
| 7. Tue – 9/17 | Marine sediments | Chapter 4 |
| 8. Fri – 9/20 | Marine sediments | Chapter 4 |
| 9. Tue - 9/24 | Marine sediments Case Study 1: Paper Due Today | Chapter 4 |
| 10. Fri – 9/27 | Midterm I: Chapters 1 - 4 | Chapter 4 |
| Tuesday – 10/1 | No Classes Scheduled | No class |
| Unit 2: Water Chemistry | | |
| 11. Fri – 10/4 | Water and seawater <i>Assign Case Study 2 - Discuss</i> | Chapter 5 |
| Tuesday – 10/9 | No Classes Scheduled | No class |
| 12. Fri – 10/11 | Water and seawater | Chapter 5 |
| Unit 3: Ocean Dynamics | | |
| 13. Tue – 10/15 | Air Sea Interactions | Chapter 6 |
| 14. Fri – 10/18 | Air Sea Interactions | Chapter 6 |
| 15. Tue – 10/22 | Air Sea Interactions Case Study 2: Paper Due Today | Chapter 6 |
| 16. Fri – 10/25 | Atmosphere’s general circulation | Chapter 6 |
| 17. Tue – 10/29 | Atmosphere, ocean & climate | Chapter 6 Chapter 7 |
| 18. Fri – 11/1 | Ocean Circulation <i>Discussion of Case Study 3</i> | Chapter 7 |
| 19. Tue – 11/5 | Ocean Circulation | Chapter 7 |
| 20. Fri – 11/8 | Midterm II: Chapters 5, 6, 7 | |
| 21. Tue – 11/12 | Ocean Circulation | Chapter 8 |
| 22. Fri – 11/15 | Ocean Waves Case Study 3: Paper Due Today | Chapter 8 |
| 23. Tue – 11/19 | Ocean Waves | Chapter 8 |

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| 24. Fri – 11/21 | Ocean Waves | Chapter 8 |
| 25. Tue – 11/26 | Tides | Chapter 9 |
| Thanksgiving Break 11/28 – 11/30 – College Closed | | |
| Unit 4: The Ocean Environment | | |
| 26. Tue– 12/3 | The coastal ocean: overview <i>Discussion of Case Study 4</i> | Chapter 10 |
| 27. Fri – 12/6 | Marine Pollution: overview | Chapter 11 |
| 28. Tue– 12/10 | The oceans & climate Case Study 4: Paper Due NO LATER than 12/13 | Chapter 16 |
| Friday 12/13 – Reading Day | | |
| FINAL EXAM: Tuesday, December 17, 11:30 AM to 1:30 PM | | |
| NOTE: focus of final exam is material discussed since Midterm Exam II | | |