

# **INTRODUCTION TO OCEANOGRAPHY**

## **GEOL 18000**

### **TUESDAY/FRIDAY, 14:10-15:25**

### **HUNTER NORTH 1036**

#### **CONTACT INFORMATION**

**Instructor:** Dr. Frank Buonaiuto  
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**Office:** Hunter North 1049, Department of Geography  
**Office Hours:** Tuesday-Friday 1:30 – 2:00 pm, *and by appointment.*

**\*Note:** The best way to contact me is through your **Hunter College** @myhunter email – (1) You must include the **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.

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.

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**

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. Articulate and evaluate the empirical evidence supporting a scientific or formal theory:
6. Understand the scientific principles underlying matters of policy and public concern as they relate to the oceans:

## **CASE STUDIES**

To support Expected Learning Outcomes:

- 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 quality 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.

## **RECOMENDED TEXT BOOKS**

Essentials of Oceanography (12<sup>th</sup> Edition), Trujillo, A. P. and Thurman, H. V., 2017

ISBN 9780134073545, Pearson, retail \$180-\$200 (paperback).

Earlier editions are acceptable and eBook (\$124.99) 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 at <http://catalog.hunter.cuny.edu/content.php?catoid=23&navoid=3149>. 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 accumulate at least 50 points total in the course. Students on probation are ineligible.

### **ATTENDANCE AND CLASSROOM POLICIES**

Attendance and class participation constitutes 10% of the final grade. Attendance is required at all lectures. 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**

Four case studies selected from the list 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.
- **Sand Waves:** The mining of sand waves on the continental shelf is crucial for the maintenance of the NY barrier island system. However, little is known about the processes shaping these features and timescales upon which they evolve. The DOD and

the DOI have different perspectives on the roles these features currently play and should play in coastal resilience and management strategies.

- **Hurricane Sandy:** Students investigate the role of significant storm events in barrier coastline evolution. Analysis of the acute and long term impacts will be discussed. How did the storm influence the economy, habitat gain/loss, and bay water quality? How is it now shaping our thoughts and policies on climate change and coastal resilience?
- **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 cullings in the 19<sup>th</sup> and 20<sup>th</sup> 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. Ownership and responsibility is 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.

## **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](mailto:jtrose@hunter.cuny.edu) or 212-650-3262) or Colleen Barry ([colleen.barr7@hunter.cuny.edu](mailto:colleen.barr7@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>

Month	Date	Day	Topic	Reading	Unit Assignments
Jan	30	Tue	Introductory Lecture: Fluid Planet	Chapter 1	Marine Geology
Feb	02	Fri	Introductory Lecture: Fluid Planet	Chapter 1	Assignment 1: What Ocean?
	06	Tue	Plate Tectonics & The Ocean Floor	Chapter 2	
	09	Fri	Plate Tectonics & The Ocean Floor	Chapter 2	Assign Case Study 1
	13	Tue	Marine Provinces	Chapter 3	
	16	Fri	Marine Provinces	Chapter 3	
	20	Tue	<b>Monday Schedule</b>		
	23	Fri	Marine Sediments	Chapter 4	Case Study 1 Due
	27	Tue	Marine Sediments	Chapter 4	
Mar	02	Fri	Water & Seawater	Chapter 5	Ocean Chemistry
	06	Tue	Water & Seawater	Chapter 5	Assign Case Study 2
	09	Fri	<b>Mid-Term Exam I</b>	<b>Chapters 1-5</b>	
	13	Tue	Air-Sea Interaction	Chapter 6	
	16	Fri	Air-Sea Interaction	Chapter 6	
	20	Tue	Ocean Circulation	Chapter 7	Ocean Dynamics
	23	Fri	Ocean Circulation	Chapter 7	Case Study 2 Due
	27	Tue	Waves & Water Dynamics	Chapter 8	Assign Case Study 3
	30	Fri	<b>College Closed</b>		
Apr	03	Tue	<b>College Closed</b>		
	06	Fri	<b>College Closed</b>		
	10	Tue	Waves & Water Dynamics	Chapter 8	
	11	Wed	<b>Friday Schedule: Tides</b>	Chapter 9	Case Study 3 Due
	13	Fri	Beaches & Shoreline Processes	Chapter 10	
	17	Tue	Shoreline Processes & The Coastal Ocean	Chapter 10	
	20	Fri	<b>Mid-Term Exam II</b>	<b>Chapters 6-10</b>	The Ocean Environment
	24	Tue	Marine Pollution	Chapter 11	
	27	Fri	Marine Pollution	Chapter 11	Assign Case Study 4 (Sharks)
May	01	Tue	The Marine Environment	Chapter 12	
	04	Fri	Biological Productivity & Energy Transfer	Chapter 13	
	08	Tue	Biological Productivity & Energy Transfer	Chapter 13	
	11	Fri	The Oceans & Climate Change	Chapter 16	Case Study 4 Due
	15	Tue	The Oceans & Climate Change	Chapter 16	
	22	Tue	<b>Final Exam (11:30 – 1:30)</b>	<b>Chapters 11-16</b>	