

# Geosciences 208: Oceanography

## Fall 2018 Syllabus

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**Class website:** <https://sites.google.com/a/wellesley.edu/geos-208-fa-18>

**Class meetings:** 1:30-2:40pm Tuesdays and Fridays, Within Observatory (OBS) 114

### Course description:

The Earth is an ocean planet. Covering 71 percent of the Earth's surface and holding 97 percent of the Earth's water, the oceans are perhaps our planet's most distinctive feature. This course will address fundamental questions about the oceans, such as, how does the ocean influence Earth's climate and how is the ocean being affected by climate change? Why are there ocean currents, and how do they influence the patterns of life in the ocean? How are human actions changing the ocean today, and how does this impact people's lives?

To answer these questions, this course will introduce the complex interactions among physical, chemical, and biological processes in the modern ocean. Case studies, analysis of real oceanographic data, and communication assignments will emphasize quantitative problem solving, critical thinking, and science communication skills. A mandatory field trip to Woods Hole Oceanographic Institution and coastal Cape Cod will allow students to experience the excitement of oceanographic research in action.

### Learning objectives:

By the end of this course, you should be able to:

- Understand the drivers of current ocean changes, including sea level rise and ocean acidification, warming, and deoxygenation; predict and evaluate the consequences of these changes for marine organisms and for people.
- Describe why and how the ocean moves; explain how fundamental physical processes control ocean surface currents and deep ocean circulation.
- Understand the factors that control the distributions of salinity, temperature, nutrients, carbon, and oxygen in the ocean, and how marine organisms and people can alter these patterns.
- Relate physical processes such as surface gyres and deep currents, density stratification and mixing, upwelling and downwelling, to ocean chemistry and ocean life.
- Quantitatively analyze and interpret real oceanographic data presented in numerical and graphical formats.
- Evaluate the scientific and societal merit of proposed human interventions to address and adapt to current ocean issues and changes.
- Synthesize and effectively communicate about ocean science to public audiences, and function as an informed consumer of science media.

## Assignments:

### Readings:

A set of readings -- including videos and online articles as well as textbook selections -- will be posted on the website for each course topic, along with key questions/ goals to guide your reading. These materials will be posted at least one week in advance. **I will expect you to read and review these materials prior to beginning each topic in class** (before the Tuesday class meeting in most weeks). This will allow us to use our in-class time together for activities, discussion, and exercises that will help deepen your knowledge of complex subjects and practice problem solving skills, rather than my lecturing on the “vocabulary” of oceanography.

There is no required textbook for the course, but if you would like a text to refer to for background information, you can access a free online Oceanography text here:

<http://www.reefimages.com/oceansci.php>

### Problem solving exercises (PSE):

You will apply the concepts we are learning in class to quantitative problems and analysis of real oceanographic data through weekly problem solving exercises. A day of class time will be devoted to each of these exercises (most Friday class meetings), where you will begin work on the week’s problem solving exercise as an in-class cooperative group activity. Your completed version of each problem solving exercise will be due the following Thursday. I encourage you to continue to collaborate and discuss your work with your peers outside of class, but I expect your solutions to reflect your own understanding and work.

I will assess these primarily for effort and completeness. Solutions will be posted after each due date for you to check your own answers and ensure that you have fully understood each exercise. I will not accept late submissions, because I want you to be prepared to move on to the next PSE and for us to be able to follow up on challenging problems from past PSEs in class. I will drop your lowest grade on the problem solving exercises in computing your course grade, to account for circumstances that might lead you to not have completed the exercise by the due date.

### Exams:

There will be two take-home midterm exams and a self-scheduled final during exam period. The midterm exams will be in lieu of the regular weekly problem solving exercises. The exams in this course are designed to be both a learning experience and an assessment tool, and will ask you to independently complete tasks similar to in-class activities and the problem solving exercises. All exams will be cumulative, but will focus on new material since the previous exam.

### Ocean issues symposia:

We will hold two in-class “symposia” organized around a current ocean issue and proposed solutions. Each symposium will have an associated writing assignment and set of additional readings that you will complete prior to the in-class symposium.

The goal of these symposia to provide you with a chance to apply the knowledge you have gained in class to evaluate the scientific and societal merit of proposed human interventions in the ocean, and to consider the most effective ways to communicate with the public about these issues. These two symposia will occur immediately before each of the midterm exams, and will provide an additional way for you to synthesize and demonstrate what you have learned.

### Science communication project:

A key goal of this course is that you be able to synthesize scientific knowledge about the ocean, re-frame it, and effectively communicate it to the public. Over the course of the semester, you will produce a concise translation of a concept from this course into the artistic or journalistic medium of your choice. Examples could include (but aren't limited to) an animated video, a comic strip, a musical composition, a newspaper op-ed, an illustration or infographic, or a script for a public service advertisement. As part of your project, you will also consider the target audience and communication goals, and will write a reflection on the choices you made in order to effectively communicate your chosen messages and content.

An initial 1-page proposal describing your project will be due on Tuesday October 30. You will share your project with your peers in class at our last meeting on Friday December 7, and submit the final version of the project on Tuesday December 11. Further details will be distributed in advance of the proposal deadline.

### Field trip:

There will be a mandatory field trip to Woods Hole Oceanographic Institution and coastal Cape Cod on Saturday October 20. We will depart from campus early in the morning and return in the evening. I expect you to rearrange your schedule to ensure that you can attend; if you believe you have extenuating circumstances that will prevent your participation, please set up a meeting immediately to discuss this with me.

### Assessment:

#### Grade calculation:

Problem solving exercises	20%
Midterm exams (x2)	20%
Final exam	15%
Ocean issues symposia (x2)	20%
Science communication project	15%
Field trip	5%
In-class activities	5%

### Wellesley grading policy:

This course complies with the Wellesley College grading policy (<http://www.wellesley.edu/registrar/grading/gradingpolicyfaq>). While that policy asks faculty to hold each 100- and 200-level course with 10 or more students to an average of no higher than 3.33, it does not require faculty to grade on a "curve." **There is no arbitrary limit on the number of A's, B's, C's etc., and every student will be assigned the grade they earn and deserve according to the grading standards of the college.**

### Guiding Principles:

The assessment scheme is designed for students with diverse interests and experiences. Thus 'good exam-takers' are not highly favored over students who do well on written assignments or more practical projects without a time limit. In addition, the assessment scheme is designed so that a poor grade on any one assignment or exam, completed on one given day, doesn't dictate your final grade.

## **Class policies:**

### **Office hours and email:**

I will be available for drop-in meetings during my office hours, which will be scheduled based on a poll of all students in my classes and then announced both in class and on the course website. In addition to my scheduled office hours, you are welcome to make an appointment with me at a mutually convenient time. The best ways to set a meeting are to catch me in class or email me. I will respond to your email as soon as I can, usually within 48 hours and often much sooner. However, do not count on more rapid e-mail turn-around time just before exams or other deadlines!

### **Accessibility and accommodations:**

It is my goal to create a learning experience that is as accessible as possible. If you anticipate any issues related to the format, materials, or requirements of this course, please meet with me outside of class so we can explore potential options.

If you are a student with a disability or condition, either long-term or temporary, and need or think you may need disability-related accommodations, I will be glad to work with you and with Disability Services to accommodate your needs for this course. If you are unsure but suspect you may have an undocumented need for accommodations, you are encouraged to contact Disability Services. They can provide assistance, including screening and referral for assessments. Disability Services can be reached at [disabilityservices@wellesley.edu](mailto:disabilityservices@wellesley.edu), at 781-283-2434, by scheduling an appointment online at their website [www.Wellesley.edu/disability](http://www.Wellesley.edu/disability), or by visiting their offices on the 3<sup>rd</sup> floor of Clapp Library, rooms 316 and 315.

### **Academic integrity and the Wellesley Honor Code:**

You are encouraged to study and collaborate with other members of the class, but the work you turn in must reflect your own understanding and ideas. All exams must be completed independently and not discussed with any other students in the class until after all students have completed the exam. I will be distributing solutions to the problem solving exercises and midterm exams. I expect that you will keep these materials confidential and not share with anyone outside this class.

If you are feeling stressed about work for this or other classes in a way that leaves you tempted to cheat as a way to catch up or improve your grade, please instead come talk to me so that we can discuss a plan that will allow you to succeed and learn.

### **Key dates:**

Fri. Oct. 12	Symposium #1 (in class)
Thu. Oct. 18	Midterm #1 due (5pm – distributed Fri. Oct. 12)
Sat. Oct. 20	Field trip to Woods Hole/Cape Cod (all day)
Tue. Oct. 30	Science communication project proposals due
Fri. Nov. 9	Symposium #2 (in class)
Thu. Nov. 15	Midterm #2 due (5pm – distributed Fri. Nov. 9)
Fri. Dec. 7	Science communication project: in-class presentations
Tue. Dec. 11	Science communication projects due
Dec. 14-20	Self-scheduled final exam

## Schedule:

This schedule is a fluid document and may change as the semester progresses. Changes will be announced in class and posted to the course website.

Reading assignments (to be posted on the course website) should be completed BEFORE the topic is covered in class. Problem solving exercises (PSE) and midterms will be due at 5pm on the Thursday after they are listed on the schedule.

Week	Tuesday	Friday
Sept. 4 and 7	Intro, logistics, ocean + climate	Sea level rise
Sept. 11 and 14	<b>No class - Rosh Hashanah</b>	PSE: Sea level rise
Sept. 18 and 21	Plate tectonics, ocean basins and coasts	PSE: Ocean basins and coastal hazards
Sept. 25 and 28	Density and stratification	PSE: Density and stratification
Oct. 2 and 5	Motion of the ocean, Coriolis and Ekman	PSE: Observing ocean motion
Oct. 9 and 12	<b>No class - Fall break</b>	Symposium #1: Plastic in the ocean  Midterm #1 out
Oct. 16 and 19	Ocean productivity	PSE: Observing ocean productivity  <b>**Field trip: Sat. Oct. 20**</b>
Oct. 23 and 26	El Niño-Southern Oscillation (ENSO)	PSE: ENSO, productivity, and fisheries
Oct. 30 and Nov. 3	<b>No class - Tanner</b>  DUE: Science communication project proposals	PSE: Top predators in the Pacific
Nov. 6 and 9	Ocean carbon cycle	Symposium #2: Engineering the biological pump  Midterm #2 out
Nov. 13 and 16	Ocean acidification	PSE: Oysters and ocean acidification
Nov. 20 and 23	Communicating ocean acidification	<b>No class - Thanksgiving break</b>
Nov. 27 and 30	Ocean deoxygenation and dead zones	PSE: Ocean deoxygenation
Dec. 4 and 7	Synthesis and ocean change	Science communication project: in-class presentations
Dec. 11 and 14	<b>No class - AGU Fall Meeting</b>  DUE: Science communication projects	<b>No class - Beginning of finals period</b>
Dec. 14-20	Final exam (self-scheduled)	