

SIO 60
Experiences in Oceanic and Atmospheric Sciences
4 Units

Term: Fall 2018

Class Meeting Days, Hours, Location:

M/W Lecture 11:00–11:50am Nierenberg 101, Scripps Institution of Oceanography
W Lab 1:00–2:50pm Vaughn Hall 147, Scripps Institution of Oceanography

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Course Description:

Oceanic and atmospheric sciences are introduced through a series of modules where students learn basic principles in the classroom and then have hands-on experiences demonstrating these principles. The course will include trips to the beach, the Scripps Pier, and laboratories at Scripps Institution of Oceanography. Prerequisites: none.

Student Learning Outcomes:

Upon completion of this course, students should be able to:

1	Demonstrate new ability to learn and communicate concepts in oceanic and atmospheric science through hands-on activities to support theoretical concepts.
2	Recognize and apply the main atmospheric principles governing the earth's energy balance, with specific focus to radiation & seasons, humidity, and pressure.
3	Determine and apply the main oceanic principles governing the ocean's circulation, with a specific focus on the general circulation, ocean gyres, and the influence of wind and waves.
4	Interpret and analyze the interactions between the atmosphere and ocean that drive weather and heat exchange worldwide, including ocean currents, heat exchange, and Coriolis force.
5	Generate new data through field collection and laboratory analysis.
6	Operate and experiment with instrumentation to investigate atmospheric and oceanic principles.

Required Materials:

SIO 60 Reader: A selection of readings from texts and primary literature.

Useful but not required texts:

Marshall and Plumb (2007) *Atmosphere, Ocean and Climate Dynamics: An Introductory Text*

Donald C. Ahrens *Essentials of Meteorology*, 7th Edition

Course Topics:

- I. Basic physical characteristics of the ocean and atmosphere
- II. Ideal gas law, Seawater Equation of State, Hydrostatic Balance, Archimedes principle
- III. Stratification, vertical structure, Diffusion
- IV. Radiation balance, convection, wind, pressure
- V. Rotation, Coriolis effect, geostrophic winds
- VI. General circulation of the atmosphere
- VII. General circulation of the ocean
- VIII. Coastal processes (wind, waves, and tides)
- IX. Introduction to climate change science: Extreme heat
- X. Introduction to Air/sea Interactions: Storms and hurricanes
- XI. Oceanic and Atmospheric Careers

Expectations and Class Rules:

- Arrive to class on time.
- Do not leave class early, except for emergencies. Emailing the professor before leaving class early is an expected courtesy.
- Show respect for the presenter and all students participating in class discussions.
- Please mute cell phone ringers and alarms.
- Please do not eat disruptively in the lecture classroom. If you drink or eat quietly, leave nothing behind.
- Do not eat in the laboratory.

Accommodations for Students with Disabilities:

If a student anticipates needing accommodations, please make arrangements to meet with the professor as soon as possible. Students must provide an Authorization for Accommodation (AFA) letter from the UCSD Office for Students with Disabilities (OSD) before accommodations can be applied. Accommodations cannot be applied retroactively (e.g., after an exam).

Academic Integrity:

All work must be the student's own and produced exclusively for this course. The use of sources (ideas, quotations, and paraphrases) must be properly acknowledged and documented. If in doubt, students should review guidelines for the proper use of sources, as well as UCSD policies on plagiarism and other forms of academic misconduct. UCSD policy on Integrity of Scholarship, is found here:

<https://senate.ucsd.edu/Operating-Procedures/Senate-Manual/appendices/2>

Course Format:

This course will be both lecture and lab based, with 50 min lectures on Monday and Wednesday each week, and lab-based exercises Wednesday. See time and locations on page 1. Most labs will involve data collection outside of the classroom, so please be prepared to partake in such activities with appropriate clothing and footwear. **The topics of labs are subject to change or rearrangement.*

Dates	Topics	Assignments
Week 1: Oct 1–5	Characteristics of Atmosphere and Ocean, ideal gas law, vertical structure. <i>Lab 1 (10/3): Balloon Launch & Pier</i>	Lab 1 due 10/8
Week 2: Oct 8–12	Equations of state. <i>Lab 2 (10/10): Hydrostatic Pressure / Stratification</i>	Lab 2 due 10/15
Week 3: Oct 15–19	Radiation balance, convection, wind, turbulence. <i>Lab 3 (10/17): Radiation Balance</i>	Lab 3 due 10/22
Week 4: Oct 22–26	Rotation, Coriolis effect, Geostrophy. <i>Lab 4 (10/24): Rotating tank–Geostrophy</i>	Lab 4 due 10/29
Week 5: Oct 29–Nov 3	General Circulation of the Ocean. <i>Wednesday Lab Cancelled – Optional Midterm Review</i> <i>*Lab 5: At sea on R/V Sproul (Saturday, November 3rd)*</i>	<i>R/V Sproul (Nov 3)</i> Write-up due 11/5
Week 6: Nov 5–9	Midterm in Lecture - Monday Nov 5. <i>Lab 6 (11/8): Waves.</i>	Midterm (11/5) Lab 6 due 11/12
Week 7: Nov 12–16	Veteran’s Day (no class) - Monday Nov 12. <i>Lab 7 (11/14): Birch Aquarium Tour / Science Literacy</i>	Project proposal due 11/14 Lab 7 due 11/19
Week 8: Nov 20–24	Moist convection, clouds and climate change. <i>Lab 8 (11/21): Clouds & Climate Change.</i>	Lab 8 due 11/26
Week 9: Nov 27–Dec 1	Air/Sea interactions, Storms and Hurricanes. <i>Lab 9 (11/28): Thermohaline circulation and melting ice</i>	Lab 9 due 12/3
Week 10: Dec 4–8	Course Review; Group Presentations	<i>Presentations</i>

Basis for final grade: Assessment and Weighting

There are 100 possible points available for this course.

Assessment	Details	Weighting	Student learning outcome #
Lab Assignments	Each week, we will complete a lab during the Wednesday two-hour time period. The assignments will be provided at the end of each Monday class. Students will be expected to review the lab assignment before the lab begins. Lab reports will be due the following Monday in class.	45%	1, 2, 3, 5, 6
Final Project/Group Presentation	Students will be divided in groups of ~4. During last week of class (5-Dec), groups will give conference-style presentations (12 min + questions) on a current research topic in oceanic or atmospheric science. Topics will be chosen midway through the quarter in consultation with the instructors.	15%	1, 2, 3, 4
Tests/Quizzes	We will have one exam in this class, and approximately 5 quizzes. The midterm exam will cover the course material from the first half of the quarter and is worth 20%. The remaining 10% will be distributed among the quizzes.	30%	1, 2, 3, 4
Class Participation	We expect students to attend and be active participants in both the lecture and laboratory components of the class.	10%	1

Final letter grades will be determined using a standard scale:

90 – 100% **A**; 80 – 89.9% **B**; 70 – 79.9% **C**; 60 – 69.9% **D**; 0 – 59.9% **F**

Policy on Absences and Late Submissions:

- Students who will miss a scheduled exam or lab due to an official university event must provide signed documentation from a university official at least one week prior to the exam.
- Students who miss a scheduled exam or lab for any other reason, including illness, must contact the professor within 24 hours of the exam, or else a grade of zero will be automatically applied.
- Students who miss attending a class, regardless of the reason, cannot be awarded participation points for that class.
- Lab assignments submitted late will be awarded no more than 50% of the points available for on-time submissions. We will not accept assignments submitted more than 5 days late.
- Students who wish to contest points received for exams, class participation, or assignments must do so within one week of the points being posted.
- Opportunities for extra credit points may be made available to the entire class, at the professor's discretion.