



GEOL512: Introduction to Chemical & Physical Oceanography

Fall 2024. 4 Units

Lectures: Wed-Fri 10:00-11:50, ZHS 118

Discussion: We will try to find a time when everyone is available, *likely some time on Thursdays or Tuesday AM*. Discussion sections will not occur every week, but will be held as-needed and announced in class.

Slack: We, particularly Julien, will use the USC OS 512 Slack channel (fall24-os-512-48302) for class discussions and communications. We encourage questions to be asked on Slack rather than email so everyone can benefit from the answers.

Zoom: Classes will generally be recorded by Zoom, offering the chance for students who are not able to attend in person the opportunity to view the recordings, and offering others an opportunity to view the lectures again. However, when possible we ask that you attend class in-person.

Instructors:

Prof. Seth John

Office: ZHS 271

Office Hours: By appointment

Contact Info: sethjohn@usc.edu

Prof. Julien Emile-Geay

Office: ZHS 275

Office Hours: Wednesdays 2-4

Contact Info: julieneg@usc.edu. Quickest replies on Slack.

Course Description

Principles of physical, chemical, and geological oceanography including discussions of air-sea interaction, biogeochemical cycling and the role of the ocean in modulating climate and atmospheric composition. The discussion section will provide practice with basic calculations that illustrate these principles.

Learning Objectives

By the end of the course students should be familiar with the basic principles of chemical and physical oceanography, and be able to answer both qualitative and quantitative questions on the subject matter.

Prerequisite(s): None.

Recommended Preparation: Undergraduate CHEM/PHYS/MATH.

Course Notes

Lecture slides and reading materials will be posted to Brightspace.

Required Readings and Supplementary Materials

Readings for each lecture are described in the course schedule below. You will not necessarily need to purchase a hard copy of the textbooks, so please wait to purchase copies until after the class has begun.

S&G: Sarmiento, Jorge L, and Nicolas Gruber. 2006. Ocean Biogeochemical Dynamics. STU-Stud. Princeton University Press.

E&H: Emerson Steven, and Hedges John. Chemical Oceanography and the Marine Carbon Cycle. Cambridge University Press; 2008.

Karnauskas, Kris., 2020: Physical Oceanography and Climate, Cambridge University Press, ISBN: 9781108423861, 350pp, <https://doi.org/10.1017/9781108529594>.

Description and Assessment of Assignments

You will have four homework assignments over the course of the semester.

You may work in small groups to complete these assignments, but everyone in your group should be an active and engaged participant in the work. Each student must submit their own copy of the assignment. We discourage the use of generative AI (ChatGPT, Claude or similar) for assignments; if you find a creative use for such tools, please acknowledge their use, quote the prompt you provided to the AI, and critique the result (beware of AI hallucinations!).

Typically, you will be given an opportunity to go back and correct any problems which you did not succeed on at the first attempt. Thus, if you work diligently to complete the assignments you should be able to obtain 100% of the available points. However, *your task is not just to get the right answers, but to understand how the right answers were obtained!* Indeed, for the final exam you will be asked to solve problems with great similarity to Homework Set problems, so it is in your best interest to use homework sets as a chance to make sure that you have a good understanding of the questions, and how to answer these questions.

The final exam will involve about 80% of material strongly inspired from the problem sets. The remaining 20% will be synthesis, essay-type questions. The exam will be closed book, closed notes. A remote option will be available on account of the post-AGU timing.

Grading Breakdown

Grading breakdown is provided below:

Assessment Tool	Points
Chemical oceanography HW #1	200
Chemical oceanography HW #2	200
Physical oceanography HW#3	200
Physical oceanography HW #4	200
Final exam	200
TOTAL	1000

Grading Scale

Course final grades will be determined using the following scale:

Letter grade	Corresponding numerical point range
A	95-100
A-	90-94
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	63-66
D-	60-62
F	59 and below

Attendance

Students should attend class when possible, and please let the instructors know if you will be absent from class.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

Academic dishonesty has a far-reaching impact and is considered a serious offense against the university. Violations will result in a grade penalty, such as a failing grade on the assignment or in the course, and disciplinary action from the university itself, such as suspension or even expulsion.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment or what information requires citation and/or attribution.

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relation to the class, whether obtained in class, via email, on the internet, or via any other media. Distributing course material without the instructor's permission will be presumed to be an intentional act to facilitate or enable academic dishonesty and is strictly prohibited. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Course Schedule

	Content/Instructor	Readings/Preparation	Notes
Week 1 08/28-30	Oceanography, briefly (Seth) Circulation and density (Julien)		
Week 2 09/04-06	Phosphorous (Seth) Nitrogen (Seth)	S&G Chap 5	
Week 3 09/11-13	Iron (Seth) Organic C and O (Seth)		
Week 4 09/18-20	Gas exchange (Seth) Inorganic carbon (Seth)	E&H Chap ? E&H Chap ?	HW #1 due Friday
Week 5 09/25-27	Quantitative Chemical Oceanography (Seth)	S&G Chap 1	
Week 6 10/2-10/4	Quantitative Chemical Oceanography (Seth)	S&G Chap 1	HW #2 due Friday
Week 7 10/09 only	Math for oceanographers (Julien)		Fall Recess 10/10-11
Week 8 10/16-18	Earth history and carbon (Seth) Climate/geoengineering (Seth)		
Week 9 10/23-25	Heat Budget (Julien)	Karnauskas, Chap 2	
Week 10 10/30-11/1	Salt Budget (Julien) Momentum Budget (Julien)	Karnauskas, Chap 3 , 4	
Week 11 11/6-8	Wind-driven circulation I : steady-state(Julien)	Karnauskas, Chap 5, 6	
Week 12 11/13-15	Wind-driven circulation II Waves & transients (Julien)	Karnauskas, Chap 6	HW #3 due
Week 13 11/20-22	Buoyancy-driven circulation (Julien) The Cycle of Water Masses (Julien)	Karnauskas, Chap 8	
Week 14	THANKSGIVING		(no class)
Week 15 12/4-6	The oceans in global change. (Julien) Review (Seth + Julien)	Karnauskas, Chap 9	HW #4 due
FINAL	Dec 18 (remote option available)		Refer to the final exam schedule in the USC <i>Schedule of Classes</i> at classes.usc.edu .

Statement on University Academic and Support Systems

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services \(OSAS\)](#) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Student Financial Aid and Satisfactory Academic Progress:

To be eligible for certain kinds of financial aid, students are required to maintain Satisfactory Academic Progress (SAP) toward their degree objectives. Visit the [Financial Aid Office webpage](#) for [undergraduate](#)- and [graduate-level](#) SAP eligibility requirements and the appeals process.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline consists of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-2500

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.