Course Syllabus

Course Description: An introduction to chemical compounds and their biogeochemical cycles in the oceans and atmosphere, with emphasis on climate issues like ocean acidification, greenhouse gases and the carbon cycle, other biogeochemical cycles, chlorofluorocarbons and the ozone hole, urban pollutants and their photochemistry, and aerosol particles and their effects on clouds.

Prerequisites: CHEM 6C or CHEM 6CH and MATH 20C or MATH 31BH or consent of instructor.

Textbook: Atmospheric topics in this course (Instructor: Russell) use Jacob 2000 **Introduction to Atmospheric Chemistry**, available as a pdf on the Canvas Overview page; a newer edition is also available online at **https://acmg.seas.harvard.edu/education (https://acmg.seas.harvard.edu/education)** but the pages and problems might be slightly different.

Lecture Schedule (this may be updated during the quarter):

Date		Dy	Ins.	Ch	Lectures and Topics
29-Mar	1a	Tu	JS		Course overview: Why study ocean and atmosphere together?
31-Mar	1b	Th	JS		How does the sea become salty? Weathering reactions
5-Apr	2a	Tu	JS		Carbon chemistry in seawater
7-Apr	2b	Th	JS		Acid-base ocean chemistry
12-Apr	3a	Tu	JS		Anthropogenic CO_2 uptake by the ocean
14-Apr	3b	Th	JS		Ocean acidification
19-Apr	4a	Tu	JS		Alkalinity and calcium carbonate precipitation/dissolution
21-Apr	4b	Th	JS		Long-term control of atmospheric CO_2 and feedbacks
26-Apr	5a	Tu	JS		Methane, N_2O, ozone, and other greenhouse gases
28-Apr	5b	Th	JS		Snowball Earth, long-term atmospheric oxygen variation
3-May	6a	Tu	JS		MIDTERM EXAM - Oceans

5-May	6b	Th	LR	7	Greenhouse Gases and their Effects
10-May	7a	Tu	LR	10	Stratospheric Ozone Formation
12-May	7b	Th	LR	10	The Ozone "Hole"
17-May	8a	Tu	LR	11	Tropospheric Oxidation by OH
19-May	8b	Th	LR	11	Tropospheric O3 Production
24-May	9a	Tu	LR	12	Ozone Limiting Factors
26-May	9b	Th	LR	12	Ozone and Pollution Control
31-May	10a	Tu	LR	8	Aerosols and their Lifetimes
2-Jun	10b	Th	LR	8	Climate Engineering by Aerosols
7-Jun			LR		FINAL EXAM - Atmosphere (8-11am, Location TBD)

Assignments and Exams: These are listed in the course summary, but this list is not complete and will be updated. Check back here and on the online syllabus to find new updates. The midterm will be given as listed in the Schedule above.

Scanning App: If you want to write your homework and exams on paper rather than using a text editor, you will need a way to scan and post that information. There are many free scanning apps for cell phones, e.g. GeniusScan **https://thegrizzlylabs.com/genius-scan (https://thegrizzlylabs.com/genius-scan)** . It is easy to use, allows students to make multi-page pdfs, and can automatically apply color and perspective corrections. The scan results can be saved and uploaded directly to Canvas.

Grading Scale:

- 90 – 100% A
- 80 – 89% B
- 70 – 79% C
- 60 – 69% D
- 0 – 59% F

Grade Dissemination: Graded tests and materials in this course will be returned individually. You can access your scores at any time on TritonEd.

Late Work Policy: There are no make-ups for quizzes or exams. We do not accept late work. TritonEd is configured to accept completed assignments up to the midnight of the due date and then it will not accept submissions. We will share complete information on assignments to allow ample time for completion if you do not procrastinate. Please respect the time of your instructors and your colleagues; plan ahead and submit on time so that we can all progress through this learning experience together.

Grades of "Incomplete": The current university policy concerning incomplete grades will be followed in this course. Incomplete grades are given only in situations where unexpected emergencies prevent a student from completing the course and the remaining work can be completed the next semester. Your instructor is the final authority on whether you qualify for an incomplete. Incomplete work must be finished by the end of the subsequent quarter or the “I” will automatically be recorded as an “F” on your transcript.

Disability Access: Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter issued by the Office for Students with Disabilities (OSD), which is located in University Center 202 behind Center Hall. Students are required to present their AFA letters to Faculty (please make arrangements to contact me privately) and to the OSD Liaison in the department in advance so that accommodations may be arranged. Contact the OSD for further information: 858.534.4382 (phone); **osd@ucsd.edu(email (mailto:osd@ucsd.edu(email)**); **http://disabilities.ucsd.edu (http://disabilities.ucsd.edu/)** (website).

Title IX Compliance: The University recognizes the inherent dignity of all individuals and promotes respect for all people. Sexual misconduct, physical and/or psychological abuse will NOT be tolerated. If you have been the victim of sexual misconduct, physical and/or psychological abuse, we encourage you to report this matter promptly. As a faculty member, we are interested in promoting a safe and healthy environment, and should we learn of any sexual misconduct, physical and/or psychological abuse, we must report the matter to the Title IX Coordinator. Should you want to speak to a confidential source you may contact the Counseling Center. The Office for the Prevention of Harassment & Discrimination (OPHD) provides assistance to students, faculty, and staff regarding reports of bias, harassment, and discrimination. OPHD is the UC San Diego Title IX office. Title IX of the Education Amendments of 1972 is the federal law that prohibits sex discrimination in educational institutions that are recipients of federal funds. Students have the right to an educational environment that is free from harassment and discrimination. Students have options for reporting incidents of sexual violence and sexual harassment. Sexual violence includes sexual assault, dating violence, domestic violence, and stalking. Information about reporting options may be obtained at OPHD at (858) 534-8298, ophd@ucsd.edu or**http://ophd.ucsd.edu (http://ophd.ucsd.edu/)**. Students may receive confidential assistance at CARE at the Sexual Assault Resource Center at (858) 534-5793, sarc@ucsd.edu or**http://care.ucsd.edu (http://care.ucsd.edu/)** or Counseling and Psychological Services (CAPS) at (858) 534-3755 or**http://caps.ucsd.edu (http://caps.ucsd.edu/)**. Students may feel more comfortable discussing their particular concern with a trusted employee. This may be a student affairs staff member, a department Chair, a faculty member or other University official. These individuals have an obligation to report incidents of sexual violence and sexual harassment to OPHD. This does not

necessarily mean that a formal complaint will be filed. If you find yourself in an uncomfortable situation, ask for help.

"Attendance" Policy: All students are responsible for all information and updates provided in all scheduled lectures, which will also be posted online whenever possible. Our expectations for your attendance of class is that you be prepared, engaged, and “present” for all discussions or activities. Illness, wifi problems, and unforeseen circumstances may prevent you from attending one or more classes during the quarter. Automated recordings have been scheduled, but they do not always work perfectly. If you have questions, please ask them in office hours (by zoom) or write to us using the Canvas messaging system.

Professionalism Policy: We expect the classroom to be an active, open environment, which encourages diverse thought and comments. Please attend to all university policy and classroom etiquette procedures. Those not heeding the policies will be asked to leave the classroom/lab immediately so as to not disrupt the learning environment. Please arrive on time, be attentive, and respectful for all class meetings. Students who habitually disturb the class by talking, arriving late or other unprofessional behavior may suffer a reduction in their final class grade. Active, positive, engaging, participation in class activities is essential. As pre-professionals or professionals, you should be at the point in your career where you have learned to ask and answer these questions:

1. How do I know when I know something? What is the evidence and how reliable is it?
2. How are things, events, theories, models or people connected? What is the cause and effect?
3. What is new and what is old - have I run across this idea before? When, where, what did it mean to me then, and how I can expand and further connect the concept now?
4. So what? Why does it matter? What does it all mean?

Academic Conduct Policy: The Policy on Integrity of Scholarship aims to encourage and maintain the highest ethical standards in research. The policy reaffirms the University’s commitment to integrity: Integrity is essential for an academic community. The University expects that both faculty and students will honor this principle and in so doing protect the validity of University intellectual work. For students, this means that all academic work will be done by the individual to whom it is assigned, without unauthorized aid of any kind. Instructors, for their part, will exercise care in planning and supervising academic work, so that honest effort will be upheld. It is against policy to submit the same paper for credit in more than one course.

Instructor Goals. At a minimum, we hope to pursue the following goals and solicit your open and timely feedback on how well we are meeting these goals:

- Communicate effectively and frequently;
- Be enthusiastic, active and involved in learning;
- Demonstrate a mastery of the discipline;
- Relate material to current practice and research;
- Clearly explain complex concepts and ideas;

- Provide a framework for lifelong learning;
- Strive to involve participants in class activities;
- Be available to assist participants in or out of class; and
- Have respect and concern for all participants.

Course Summary:

Date	Details	Due
Thu Apr 7, 2022	Oceans Problem Set #1 (https://canvas.ucsd.edu/courses/36483/assignments/458343)	due by 9:30am
Thu Apr 14, 2022	D10b-WhatStopsTheO3Hole? (https://canvas.ucsd.edu/courses/36483/assignments/458324)	due by 11:59pm
Fri Apr 15, 2022	Oceans Problem Set #2 (https://canvas.ucsd.edu/courses/36483/assignments/458344)	due by 11:59pm
Fri Apr 29, 2022	Problem set #3 (https://canvas.ucsd.edu/courses/36483/assignments/492577)	due by 11:59pm
Tue May 3, 2022	Ocean MIDTERM EXAM - Turn In Here (https://canvas.ucsd.edu/courses/36483/assignments/458342)	due by 10:50am
Thu May 5, 2022	PracticeQuiz (https://canvas.ucsd.edu/courses/36483/assignments/458317)	due by 9:30am
	Q07a-RadiationBalanceQuiz (https://canvas.ucsd.edu/courses/36483/assignments/458313)	due by 5pm
	D07a-HowWouldTheFaintSunChangeEarth? (https://canvas.ucsd.edu/courses/36483/assignments/458326)	due by 11:59pm
Fri May 6, 2022	Integrity&PolicyQuiz (https://canvas.ucsd.edu/courses/36483/assignments/458312)	due by 11am
	DiscussionSignUps (https://canvas.ucsd.edu/courses/36483/assignments/458335)	due by 5pm

Date	Details	Due
Sun May 8, 2022	H07 Assignment (https://canvas.ucsd.edu/courses/36483/assignments/458337)	due by 5pm
Tue May 10, 2022	Q10a-ReactionRatesReview(Ch1,2,9)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458322)	due by 9:30am
	D10a-WhyDoesO3FormALayer? (https://canvas.ucsd.edu/courses/36483/assignments/458325)	due by 11:59pm
Thu May 12, 2022	Q10b-StratosphericO3(Ch10)withRelatedReviewQuiz (https://canvas.ucsd.edu/courses/36483/assignments/458316)	due by 9:30am
Fri May 13, 2022	SIO 174 - Chemistry of Atmosph and Ocean - Russell [SP22] (https://canvas.ucsd.edu/calendar?event_id=759988&include_contexts=course_36483)	1pm to 2pm
Sun May 15, 2022	H10 Assignment (https://canvas.ucsd.edu/courses/36483/assignments/458339)	due by 5pm
Tue May 17, 2022	Q11a-TroposphericSources&Sinks(Ch11)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458311)	due by 9:30am
	D11a-WhatDeterminesCH4Lifetime? (https://canvas.ucsd.edu/courses/36483/assignments/458327)	due by 11:59pm
Thu May 19, 2022	Q11b-TroposphericOzoneReactions(Ch11)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458320)	due by 9:30am
	D11b-WhatMakesTroposphericO3? (https://canvas.ucsd.edu/courses/36483/assignments/458328)	due by 11:59pm

Date	Details	Due
Fri May 20, 2022	SIO 174 - Chemistry of Atmosph and Ocean - Russell [SP22] (https://canvas.ucsd.edu/calendar?event_id=759989&include_contexts=course_36483)	1pm to 2pm
Sun May 22, 2022	H11 Assignment (https://canvas.ucsd.edu/courses/36483/assignments/458340)	due by 5pm
Tue May 24, 2022	Q12a-Hydrocarbon(Ch12)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458318)	due by 9:30am
	D12a-WhatLimitsO3Production? (https://canvas.ucsd.edu/courses/36483/assignments/458329)	due by 11:59pm
Thu May 26, 2022	Q12b-UrbanO3(Ch12)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458315)	due by 9:30am
	D12b-WhatChangesO3Production? (https://canvas.ucsd.edu/courses/36483/assignments/458330)	due by 11:59pm
Fri May 27, 2022	SIO 174 - Chemistry of Atmosph and Ocean - Russell [SP22] (https://canvas.ucsd.edu/calendar?event_id=759990&include_contexts=course_36483)	1pm to 2pm
Sun May 29, 2022	H12 Assignment (https://canvas.ucsd.edu/courses/36483/assignments/458341)	due by 5pm
Tue May 31, 2022	Q08a-Aerosols&Size(Ch08)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458321)	due by 9:30am
	D08a-HowLongAreAerosolLifetimes? (https://canvas.ucsd.edu/courses/36483/assignments/458331)	due by 11:59pm

Date	Details	Due
Wed Jun 1, 2022	SIO 174 - Chemistry of Atmosph and Ocean - Russell [SP22] (https://canvas.ucsd.edu/calendar?event_id=761085&include_contexts=course_36483)	1pm to 2pm
Thu Jun 2, 2022	Q08b-AerosolCooling(Ch08)Quiz (https://canvas.ucsd.edu/courses/36483/assignments/458314)	due by 9:30am
	D08b-WhichAerosolsCoolTheEarth? (https://canvas.ucsd.edu/courses/36483/assignments/458332)	due by 11:59pm
Sun Jun 5, 2022	H08 Assignment (https://canvas.ucsd.edu/courses/36483/assignments/458338)	due by 5pm
Tue Jun 7, 2022	Final-Atmosphere (Take-Home) (https://canvas.ucsd.edu/courses/36483/assignments/497546)	due by 11am
	CourseGrade (https://canvas.ucsd.edu/courses/36483/assignments/458333)	
	Homework Presentations and Reviews (https://canvas.ucsd.edu/courses/36483/assignments/458323)	
	Problem set #3 (https://canvas.ucsd.edu/courses/36483/assignments/492577) (SIO 174 - Chemistry of Atmosph and Ocean - Russell [SP22])	