OCN 623: Chemical Oceanography
Spring 2025
Syllabus

Instructor:
Seth Bushinsky: smb4@hawaii.edu, MSB 523

Individual lectures by other MGG members

Course texts:
Emerson and Hamme: Chemical Oceanography- Elemental Fluxes in the Sea

or:

Emerson and Hedges: Chemical Oceanography and the Marine Carbon Cycle

- I have one copy of Emerson and Hamme and two copies of Emerson and Hedges that I can loan out for the semester. There should also be a copy available at the library. However, I think these are very useful texts to have (regardless of your specific sub-discipline) and recommend buying a copy of the Emerson and Hamme text.

Course format:
Tuesday & Thursday, 1:30-2:45pm, MSB 307

Office hours:
Mondays at 11am, MSB 523

General Zoom link for when/if we need it:
https://hawaii.zoom.us/j/92353711331?pwd=ZUhHM1ZnSUtlai9GNDY3YkVDZU5YZz09
Meeting ID: 923 5371 1331
Passcode: 281167

Course Schedule
Readings / lectures/ Assignments subject to change with notification

Section	Week	Month	Day	Topic	Readings	Assign.
Section 1: Ocean Chemistry Concepts	**1**	**Jan.**	14	Introduction, Chemical composition of SW	E & Hedges Ch. 1; E & Hamme, Ch. 1	PS1
			16	Ocean circulation, Geochemical Mass Balances	E & Hedges Ch. 2; E & Hamme, Ch. 2	
	2		21	Gas solubility and Exchange	E & Hedges Ch. 10; E & Hamme Ch. 2.2	PS2

			23	Hydrothermal systems	E & Hedges Ch. 2.3; E & Hamme, Ch. 2.1.4	
Section 2: The chemical signature of life in the ocean	**3**		28	Nutrient distributions, biological production and consumption	E & Hedges Ch. 6; E & Hamme, Ch. 3	
			30	Bio day 2, seasonal cycle box models		PS3
	4	**February**	4	*Paper discussion or in class problem*		
			6	Global Carbon Cycle and box models	E & Hedges Ch. 11; E & Hamme, Ch. 8	
	5		11	Export and the nitrogen cycle, sediments (*McClish*)	E & Hedges Ch. 6, E & Hedges Ch. 12; E & Hamme, Ch. 3, 4; E & Hamme, Ch. 4.2.5	
Section 3: Thermodynamics, or why do things happen the way they do?			13	*Review Session*		
	6		18	Exam 1		
			20	*BUOYS - No Class*		
	7		25	Balancing equations, oxidation state, redox	Pdf on Laulima	PS4
			27	Thermodynamics	E & Hedges Ch. 12; E & Hamme, Ch. 4.2.5	
	8	**March**	4	Chemistry in seawater: Redox potential, pE-pH	E & Hedges Ch. 3 (pdf on Laulima)	PS5
			6	Acids and Bases + Carbonate chemistry	E & Hedges Ch. 4; E & Hamme, Ch. 5	
	9		11	Estuarine & coastal biogeochemistry		PS6

			13	Diagenesis in sediments (*Daniela*)?	E & Hedges Ch. 3 (pdf on Laulima)	
	10	*Spring Break*		*Spring Break*		
		Spring Break		*Spring Break*		
	11		25	Trace elements in SW	E & Hedges Ch. 6; E & Hamme, Ch. 3.1.3	
			27	*Review session*		
Section 4: Global Impacts	**12**	**April**	1	*Exam 2*		
			3	Global Energy Balance (*Sabine*)	E & Hedges Ch. 11; E & Hamme Ch. 8	PS7
	13		8	Global CO_2 and Climate (*Sabine*)	E & Hedges Ch. 5; E & Hamme, Ch. 7	
			10	Ocean Acidification (*Sabine*)		
	14		15	Paleoceanography (*Zeebe*)	E & Hedges Ch. 7; E& Hamme Ch. 8.3	PS8
Section 5: Measuring processes in the ocean on short and long timescales			17	*Paper discussion or in class problem*		
	15		22	Ocean tracers	E & Hedges Ch. 5; E & Hamme Ch. 6	
			24	Stable Isotopes	E & Hedges Ch. 5; E & Hamme, Ch. 6	PS9?
	16		29	Radioisotopes	E & Hedges Ch. 5; E & Hamme, Ch. 7	
		May	1	*Paper discussion or in class problem*		
	17		6	*Review session*		
				Last exam during finals week	Thursday May 15	

Course Learning Objectives:

1) Explain the underlying principles of chemical and biogeochemical cycling in marine systems;
2) Explain the first order ways that biological and physical processes are captured by global chemical tracers;
3) Identify marine chemical and biogeochemical processes that impact your area of oceanographic interest, and know how to access and understand information on these processes;
4) Develop your chemical intuition: start to learn how to determine if a given magnitude, rate, or flux seems right to a 1st order;

Prerequisites:
Chem 171 w/ B grade, or consent of instructor

Grading Breakdown:
Exams, 51% (17% each); 49% Homework assignments

Assignment improvements:
I will give you the opportunity to fix mistakes on HWs and Exams for a portion of credit back (typically ~50%). Ideally I would like these back within ~ 2 weeks of when I return them to you.

Submitting assignments and exams:
Assignments and exams can either be submitted in person or through Laulima (preferred). If electronically through Laulima, I would like a single pdf, not a picture or a separate file for each page. I use an app called "Adobe Scan" that converts pictures from my phone into pdfs and does a pretty good job of cleaning up the image.

Exams will be open notes, closed internet. I will hand out exams during the class period and give you 24 hours to submit the exam (either through Laulima or sliding it under my office door if I'm not around).

I encourage you to work together on assignments, but any work that you turn in should be your own.

Class leave / sick policy:
I ask that you respect both me and each other by not joining in person if you are sick or by wearing a mask if you are unsure. If you cannot come to class because you are sick let me know and I'll get zoom going for the day or record the lecture. Overall attending in person will be more useful as we will do problems together, but I want to be flexible if possible. Additionally, if you have to miss class due to field work or for other reasons, give me a heads up and we can come up with a workaround.

KOKUA / Accessibility
If you are enrolled in the KOKUA program (https://www.hawaii.edu/kokua/) and there are accommodations that you require, please let me know if I am not already aware through a KOKUA notification.

Regardless of whether you are in KOKUA, if there is any aspect of class that is not accessible to you or could be improved (graphics, delivery, etc.) please let me know and I'll try to make things better for you.

Pronouns / name
Send me an email or let me know in class if you use a different name than is in Laulima or would like to specify your pronouns. I use he/him.

Mental health / well-being
Grad school can/is a stressful time. The goal of this class is to help you learn the material by interacting with it in different ways. If you're feeling overwhelmed, talk to me and let me know. Also, the UH Counseling and Student Development Center has a variety of services available: https://manoa.hawaii.edu/counseling/.