

Biology 4221/6221: Biological Oceanography (Spring 2012)

Instructor: Joseph P. Montoya, Professor
ES&T 1244, 404-385-0479
Office Hours: after class or by appointment
email: montoya@gatech.edu

Meetings: Lectures: MWF at 1:00, EST L1205

Course Description and goals:

Biology 4221/6221 is an interdisciplinary introduction to biological oceanography. Our goal will be to develop an integrated view of the oceans as a coupled physical-chemical-biological system, with an emphasis on the role of organisms in driving major biogeochemical cycles.

Lectures: The lectures will cover all of the materials central to the course. The appended schedule is a working model and may be modified as the term progresses. Class attendance is *critical* – each meeting will include time for interactive discussion of course materials and a portion of your overall class grade will be based on participation in those discussions. All assigned readings should be done before class.

Readings and Reference Materials: In addition to the recommended textbook (Trujillo, A.P. and Thurman, H.V. 2011. *Essentials of Oceanography*, 10th Edition. Pearson Prentice Hall, Upper Saddle River, NJ), we will read and discuss a number of papers selected from the recent literature.

Quizzes: I may give unannounced quizzes to reward those who've done the assigned readings before coming to class. I will drop your lowest quiz grade but will not give makeup quizzes, so if you miss class or arrive late, you're out of luck for that day.

Exams: Two midterms and a final exam. The exams will consist primarily of questions that require short (1-2 sentence) written answers designed to test your understanding and ability to articulate concepts as well as facts. Portions of these exams may be administered online.

Group Project (Biol 4221): Groups of students will research a topic of current interest in biological oceanography and prepare an in-class presentation (12 minutes + 3 minutes for discussion) and a scientific poster. Each group must also submit a written statement outlining the contribution of each member to the overall project.

Individual Presentation (Biol 6221): Each student enrolled in Biology 6221 will research a topic of current interest in biological oceanography and will prepare an individual class presentation (15 minutes + 5 minutes for discussion) and a 10 page paper.

Grading: Course grades will be based on the following combination of items:

Course Component	Biol 4221	Biol 6221
Midterm exams	30%	30%
Participation	15%	15%
Quizzes	10%	10%
Group Project	20%	–%
Individual Presentation and Paper	–	20%
Final exam	30%	30%

Note that the total is 105% in each case, which means that 5 points of extra credit are built into this scheme. At the end of the term, I will normalize individual scores to the highest scores in the class, then assign grades in the usual way ($A \geq 90\% > B \geq 80\% > C \geq 70\% > D \geq 60\% > F$).

Honor Code:

All students are expected to abide by the Academic Honor Code, which can be viewed online at <http://www.honor.gatech.edu>.

Wk	Day	Date	Lecture Topics (tentative)	Readings ¹	Notes
1	M	9 Jan	Course introduction and overview.	Ch. 1	
	W	11 Jan	History of ocean science The ocean as a physical environment	Ch. 3	
	F	13 Jan	Physical properties of seawater: Temperature, Salinity, Density Spatial distribution of physical properties	Ch. 5.1-5.4, 5.6-5.7	Biol 6221: start thinking of presentation/paper topics.
2	M	16 Jan	Holiday		
	W	18 Jan	Wind-driven circulation Coriolis force, Ekman spiral, geostrophy	Ch. 6.1-6.5	Biol 4221: form groups and start thinking of a presentation topic.
	F	20 Jan	Guest Lecture: TBD	Ch. 7.1-7.4	
3	M	23 Jan	The thermohaline circulation Deep water formation Chemical tracers of deep circulation	Ch 7.5-7.6	
	W	25 Jan	Seawater as a solution: Dissolved constituents of seawater pH and alkalinity	Ch. 5.3-5.5	
	F	27 Jan	Gases in seawater Solubility, speciation of CO ₂ in solution Alkalinity and TCO ₂	Ch. 5.5	
4	M	30 Jan	Sources and sinks of CO ₂ in the ocean Box model of the C cycle The biological pump	Ch 13.4-13.5	Biol 6221: Turn in a 1 paragraph overview of presentation/paper.
	W	1 Feb	Chemical Oceanography wrap-up		
	F	3 Feb	Introduction to the phytoplankton Survey of habitats & taxa	Ch. 3 (review) Ch. 12	
5	M	6 Feb	Phytoplankton and primary production Photosynthesis	Ch 13.1-1.3	Biol 4221: Turn in a listing of group members and a 1 paragraph presentation overview.
	W	8 Feb	Nutrients and primary production Uptake kinetics N and P limitation	Ch. 13.4	
	F	10 Feb	Primary production: spatial & temporal patterns	Ch 13.3	
6	M	13 Feb	New production and fate of primary production	Ch 14 (413-423)	
	W	15 Feb	Midterm Exam		
	F	17 Feb	Phytoplankton and primary production wrap-up		
7	M	20 Feb	Guest lecture: TBD		
	W	22 Feb	Guest lecture: TBD		
	F	24 Feb	Guest lecture: TBD		

¹ All readings listed are in the textbook unless otherwise noted. Additional readings may be assigned at any time.

Wk	Day	Date	Lecture Topics (tentative)	Readings ¹	Notes
8	M	27 Mar	Microbial loop	Ch 13.4-13.5	
	W	29 Mar	Introduction to the zooplankton Survey of habitats & taxa	Ch 3 (review) Ch. 141-14.3	
	F	2 Mar	Zooplankton feeding strategies		Last day to drop
9	M	5 Mar	Planktonic food webs Feeding & assimilation of nutrients	Ch. 13.5	
	W	7 Mar	Zooplankton production Secondary production and biomass Trophic structure of marine systems	TBD	
	F	9 Mar	Zooplankton vertical migration Diel and ontogenetic vertical migration	TBD	
10	M	12 Mar	Introduction to the benthos Survey of habitats and taxa	15.1, 15.5	
	W	14 Mar	Deep sea benthos Diversity and production	15.5	
	F	16 Mar	Presentation abstracts (Biol 4221 & 6221)		Overview & discussion of presentation topics.
11	M	19 Mar	Spring Break		
	W	21 Mar	Spring Break		
	F	23 Mar	Spring Break		
12	M	26 Mar	Benthic biogeochemistry	TBD	
	W	28 Mar	Hot vents Chemosymbiosis & production	3.5, 15.5	
	F	30 Apr	Midterm Exam		
13	M	2 Apr	Cold seeps Chemosymbiosis & production	TBD	
	W	4 Apr	Student presentations (day 1)		
	F	6 Apr	Nearshore and intertidal benthos.	15.2-15.4	
14	M	9 Apr	Intertidal ecology.	Ch. 9.1-9.5	
	W	11 Apr	Student presentations (day 2)		
	F	13 Apr	Fisheries Fishery management Cod and other failures	17 (492-503)	
15	M	16 Apr	Ocean biogeochemistry N cycle C cycle	TBD	
	W	18 Apr	Student presentations (day 3)		
	F	20 Apr	The oceans and climate Long-term oceanic records of climate Ocean circulation and climate	Ch. 16.1-16.4	Posters due

Wk	Day	Date	Lecture Topics (tentative)	Readings ¹	Notes
16	M	23 Apr	The oceans and climate change Biotic responses	Ch. 16.4-16.5	Biol 4221 presentations
	W	25 Apr	Student presentations (day 4)		
	F	27 Apr	Course wrap-up and review		
17	M	30 Apr	Start of Final Exams		
			Final exam (2:50 – 5:40)		
	Sa	4 May	End of Final Exams		