Biology 4221/6221: Biological Oceanography (Spring 2010)

Instructor: Joseph P. Montoya, Professor
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Office Hours: after class or by appointment
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Meetings: Lectures: MWF at 1:00, EST L1125

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 schedule included in this syllabus is a working model and may be modified as the term progresses. Class attendance is *not* optional – 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 (Thurman, H.V. and A.P. Trujillo. 2004. *Introductory 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 pop 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 6221will research a topic of current interest in biological oceanography and 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	–	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	11 Jan	Course introduction and overview.		
	W	13 Jan	History of ocean science The ocean as a physical environment	Ch. 1	
	F	15 Jan	Physical properties of seawater: Temperature, Salinity, Density Spatial distribution of physical properties	Ch. 4	Biol 6221: start thinking of presentation/paper topics.
2	M	18 Jan	**Holiday**		
	W	20 Jan	Georgia Tech "Day of Engagement"		per email from Ray Vito
	F	22 Jan	Wind-driven circulation Coriolis force, Ekman spiral, geostrophy	Ch. 8 (230- 256)	Biol 4221: form groups and start thinking of a presentation topic.
3	M	25 Jan	The thermohaline circulation Deep water formation Chemical tracers of deep circulation	Ch 8 (257-259)	
	W	27 Jan	Seawater as a solution: Dissolved constituents of seawater pH and alkalinity	Ch. 6 (164-179)	
	F	29 Jan	Gases in seawater Solubility, speciation of CO_2 in solution Alkalinity and TCO_2	Ch. 6 (180-190)	
4	M	1 Feb	Sources and sinks of CO_2 in the ocean Box model of the C cycle The biological pump	Ch 2 (49-51) Ch 5 (144-153)	Biol 6221: Turn in a 1 paragraph overview of presentation/paper.
	W	3 Feb	Chemical Oceanography wrap-up		
	F	5 Feb	Introduction to the phytoplankton Survey of habitats & taxa	Ch. 13	
5	M	8 Feb	Phytoplankton and primary production Photosynthesis	Ch 14 (395-405)	Biol 4221: Turn in a listing of group members and a 1 paragraph presentation overview.
	W	10 Feb	Nutrients and primary production Uptake kinetics N and P limitation		
	F	12 Feb	Primary production: spatial & temporal patterns	Ch 14 (405-414)	
6	M	15 Feb	New production and fate of primary production	Ch 14 (413-423)	
	W	17 Feb	**Midterm Exam**		
	F	19 Feb	Phytoplankton and primary production wrap-up		
7	M	22 Feb	Guest lecture: Prof. Lin Jiang		
	W	24 Feb	Guest lecture: Prof. Lin Jiang		
	F	26 Feb	Guest lecture: Julia Grosse		

[1] All readings listed are in the textbook unless otherwise noted. Additional readings may be assigned.

Wk	Day	Date	Lecture Topics (tentative)	Readings[1]	Notes
8	M	1 Mar	Microbial loop		
	W	3 Mar	Introduction to the zooplankton Survey of habitats & taxa	Ch 15 (426-437)	
	F	5 Mar	Zooplankton feeding strategies		**Last day to drop**
9	M	8 Mar	Planktonic food webs Feeding & assimilation of nutrients	14 (418-423)	
	W	10 Mar	Zooplankton production Secondary production and biomass Trophic structure of marine systems		
	F	12 Mar	Zooplankton vertical migration Diel and ontogenetic vertical migration		
10	M	15 Mar	Introduction to the benthos Survey of habitats and taxa	16 (479-488)	
	W	17 Mar	Deep sea benthos Diversity and production		
	F	19 Mar	Presentation abstracts (Biol 4221 & 6221)		Overview & discussion of presentation topics.
11	M	22 Mar	**Spring Break**		
	W	24 Mar	**Spring Break**		
	F	26 Mar	**Spring Break**		
12	M	29 Mar	Benthic biogeochemistry		
	W	31 Mar	Hot vents Chemosymbiosis & production		
	F	2 Apr	**Midterm Exam**		
13	M	5 Apr	Cold seeps Chemosymbiosis & production		
	W	7 Apr	Student presentations (day 1)		
	F	9 Apr	Nearshore and intertidal benthos.	16 (458-479)	
14	M	12 Apr	Intertidal ecology.		
	W	14 Apr	Student presentations (day 2)		
	F	16 Apr	Fisheries Fishery management Cod and other failures	17 (492-503)	
15	M	19 Apr	Ocean biogeochemistry N cycle C cycle		
	W	21 Apr	Student presentations (day 3)		
	F	23 Apr	The oceans and climate Long-term oceanic records of climate Ocean circulation and climate		Posters due

Wk	Day	Date	Lecture Topics (tentative)	Readings[1]	Notes
16	M	26 Apr	The oceans and climate change Biotic responses		Biol 4221 presentations
	W	28 Apr	Student presentations (day 4)		
	F	29 Apr	Course wrap-up and review		
17	M	3 May	Start of Final Exams		
	W	5 May	**Final exam (2:50 – 5:40)**		
	Sa	3 May	End of Final Exams		