

Biological and Chemical Oceanography
MARS 4200/6200 - Fall 2017

Course content: This course provides an introduction to Biological Oceanography, which investigates life in the ocean and the processes controlling its distribution and productivity, including ecology and biogeochemistry. We will also explore the distribution of salts, gases, and other compounds to discover how they support life in the ocean. Oceanography is a highly interdisciplinary field of study, and we will use coastal and open ocean environments around the world to illustrate key principles. This course complements MARS 3450, which focuses more on the diversity and biology of marine organisms and nearshore environments.

This course contributes 3 credits towards the 9 credit **Biology Major Electives Requirement** and is also part of the **Marine Biology Area of Emphasis**.

Prerequisites: BIOL 1108 or 2108H, CHEM 1211 and 2211
Recommended: MARS 1020, 1025H, or 3450

Lecture: 1:25 - 2:15 – Monday, Wednesday, and Friday
Room 239 - Marine Science Building

Professor: **Dr. Patricia L. Yager** (Ph.D, 1996, University of Washington)
Office: Marine Science Bldg., Rm. 166 (downstairs, window looks out to Snelling)
Office phone: 542-6824
Office hours: After class or by appointment

I'm happy to answer any questions you have about the course, the course material, or your grade. The best way to reach me outside of class is by email: pyager@uga.edu

Textbook: **Everything you really need to know for tests will be covered in my lectures**, but if you are thinking about a career in Marine Science, or want to have other resources to support your learning (especially if you don't have much marine science background), then getting the textbook is a good way to go. If you have not taken Marine Biology (MARS 3450) or if you learn material best by reading, then definitely consider getting:

Biological Oceanography, 2nd edition. C. B. Miller and P. A. Wheeler (2012).
Wiley-Blackwell. ISBN-13: 978-1444333022.

There are some new and used ones (and inexpensive electronic options) available online from Amazon or Wiley (\$21-50). I will provide PDFs of key content.

There is also a publisher's website with downloadable figures and tables:
www.wiley.com/go/miller/oceanography

Additional support: **Seawater: its composition, properties and behaviour**. 2004. The Open University. ISBN 0 7506 3715 3

Biological Oceanography An Introduction (2nd Edition). 2011. C.M. Lalli and T.R. Parsons. The Open University. ISBN 978-0-7506-3384-0

eLC: All lecture overheads will be available (in PDF or PPT format) through the UGA eLearning Commons (eLC). Study guides for each unit will also be available in the

“Objectives” folder. For complete information on the use of eLC please logon to your MyUGA (<https://my.uga.edu/>) and click on eLearning Commons (<https://www.elc.uga.edu/>). Once you log into eLC you will find all the courses you are authorized to use. Search for or click on the MARS 4200 or 6200 link and you will immediately see a link to Course Content. If you do not see it, let me know so I can give you access. If you encounter any problems please let me know as soon as possible so I can fix them for everyone.

Academic Honesty: All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are severe and ignorance is not an acceptable defense. Please make yourself aware of UGA’s Academic Honesty policy by checking out the following web page: http://www.uga.edu/ovpi/academic_honesty/academic_honesty.htm

Academic Accommodation: UGA seeks to provide students with disabilities the opportunity to participate fully in its educational programs and services. In keeping with this philosophy, it is the University policy for students with documented disabilities to receive reasonable accommodations by way of access to class information and assessment of their knowledge. Contact DRC (706-542-8719) or visit the website at www.drc.uga.edu.

Grading:	Class participation and attendance (Important!)	15 pt.
	Exam #1 (Sept 15)	15 pt.
	Exam #2 (Oct 18)	15 pt.
	Final Exam (Dec 13 - 12:00 - 3:00)	15 pt.
	Ocean Monitoring Team Project	20 pt.
	Research project and presentation:	20 pt.
	Optional Field Trip to GA Aquarium:	Extra Credit up to 10 pt.
	<i>(Participation in the field trip plus a follow-up one-page trip report)</i>	

Class participation grade will be based on how well you prepare in advance for a class (do the reading) and participate in class discussion. Attendance is required to earn full credit. Excused absences should be discussed with Dr. Yager in advance. Note that going on the field trip can transform a B into an A.

Points for final course grade:

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:** 60-69 pts

There is no mandatory curve for this course; everyone can get an A if they work hard and work smart.

The Objectives sheets are your key to doing well on the exams. I encourage you to look at them before and after lecture to solidify and reinforce the most important information. After class, write down your answer. These will be useful to study for the test. If you aren't sure about the answer to an objectives question, check the book or work through lecture overheads, and put together a draft answer to check with me. I'm happy to confirm whether you are on the right track (or not).

I welcome you to come talk with me anytime if you are concerned about how to improve your grade. Most students do very well at some things (e.g., tests, papers, or presentations) and less well at others, but still do well in the class. The point distribution above prevents any one assignment from negatively impacting your grade. Note that your participation grade can easily determine the difference between an A and a B, and is comparable to one exam. The field trip can also make up to a full grade difference.

Provisional Lecture Schedule (subject to change)

Week	Date	Lecture Topic:
Week 1	Aug 14	Introduction to the class
	Aug 16	Living in Water: Distribution of heat, light, temp
	Aug 18	Living in Water: swimming with viscosity, sound, pressure
Week 2	Aug 21	Eclipse Day - no class
	Aug 23	Let's add salt: major & minor elements, gases, density
	Aug 25	Why phytoplankton care about density and depth
Week 3	Aug 28	Limiting factors, how do we measure productivity?
	Aug 30	Winds, mixed layers, and seasonality of productivity
	Sep 01	Satellites, productivity, turtles, and ocean circulation
Week 4	Sep 04	Labor Day - no class
	Sept 06	Motion in the global ocean
	Sept 08	Nutrients from land: Mississippi and Amazon Rivers
Week 5	Sept 11	Phytoplankton functional groups and global primary prod.
	Sept 13	Review
	Sept 15	Exam 1
Week 6	Sept 18	Zooplankton - the grazers of the sea
	Sept 20	Zooplankton ecology - growth rates and grazing rates
	Sept 22	Zooplankton ecology - reproduction and life history
Week 7	Sept 25	Biogeography and global patterns of zooplankton species
	Sept 27	What is the mesopelagic / twilight zone?
	Sept 29	A sea of microbes and the microbial loop
Week 8	Oct 02	Marine fish ecology
	Oct 04	Global marine fisheries
	Oct 06	Breathing in the deep - O ₂ in the ocean
Week 9	Oct 09	Guest speaker TBA (hopefully Gulf of Mexico)
	Oct 11	Guest speaker TBA (hopefully Gulf of Mexico)
	Oct 13	Not enough oxygen to breathe! OMZ
Week 10	Oct 16	Review
	Oct 18	Exam 2
	Oct 20	Deep sea fauna
Week 11	Oct 23	Ecology of the deep sea
	Oct 25	Symbioses and chemoautotrophy
	Oct 27	Fall Break - No Class
Week 12	Oct 30	Ocean Biomes
	Nov 01	Antarctic polynyas and melting ice sheets - Special seminar in Ecology Auditorium
	Nov 03	Polar Ecosystems and the effects of sea ice
Week 13	Nov 06	The Southern Ocean
	Nov 08	Arctic Ecosystems
	Nov 10	The North Atlantic Bloom
Week 14	Nov 13	Subarctic Pacific and "Station Papa"
	Nov 15	Subtropical gyres
	Nov 17	Equatorial oceans
	Nov 20-24	Thanksgiving BREAK
Week 15	Nov 27	Human impacts - ocean ecology and global climate change
	Nov 29	Human impacts - ocean ecology and global climate change
	Dec 01	Research Presentations
Week 16	Dec 04	Research Presentations
	Dec 05	Research Presentations
	Dec 13	12:00 - 3:00 Final Exam (synthetic but not cumulative)

MARS 4200/6200 - Fall 2017 Research Project

Assignment. Research a biological or chemical oceanographic question of your choice.

Choose a topic. Start with what interests you or select from the list I provide. Think about what you find to be the most interesting or exciting aspect of marine science. Go to the Science Library, find the section of the library where they set out recent volumes of marine science journals (or other journals on your topic), and then BROWSE. Take a few hours and just read through the titles and abstracts of recent journals. Narrow down your interests, download a few papers that get you excited, and then email or talk to me to discuss your topic choice.

Format. Present your research presentation in the style of a talk given at a national scientific meeting. Key ingredients are:

- 1) an **abstract** (turned in to Dr. Yager ahead of time - **DUE October 30**)
- 2) a brief **introduction**
- 3) **research** sections reviewing key findings from the literature or data from the internet.
- 4) a **discussion** where you synthesize what you learned,
- 5) a brief **conclusion** and
- 6) a list of **references** (turned in to Dr. Yager ahead of time - **DUE November 17**)

Your presentation should be **10 (± 1)** minutes in length. You can use PowerPoint or any other presentation software. Ask Dr. Yager for assistance.

References should be listed using the Name and Year system (I will show you some examples of this). You should cite no fewer than **5 primary references** (from peer-reviewed scientific journals). Citations of material found on the web, in textbooks, or in gray literature may be acceptable for this project, but these do not count as part of the 5-paper minimum. You should have five references identified before Thanksgiving Break. You can update the list as needed.

Grading. Presentations will be graded according to the scientific peer review system: students will grade each other's presentation using the attached sheet.

Presentation tips.

- Before finalizing your presentation, ask yourself if your paper has the following:
 1. An **opening** that catches the audience's attention.
 2. A **strong thesis**.
 3. A balance of **evidence and opinion**.
 4. Selectively chosen **examples**.
 5. A **conclusion** that leaves the audience with a clear understanding of the writer's point of view.
- Avoid **vague generalizations and overstatements** (e.g., "*Arctic microbiology is the most important field of study in oceanography.*")
- Use **topic sentences** to give guidance to your audience. Tell us where you are going. Tell us where you are. Tell us where you have been.
- Before discussing something, say why it is **relevant** to the topic.
- Proof read your **reference list** carefully using the original papers. Do *not* trust the accuracy of citations in other papers.

**MARS 4200 Fall 2017 Research Presentation
Review Form**

Reviewer ID (last four digits of your 810#) _____

Speaker's Name: _____ **Date/Time:** _____

CRITERIA	SCORE (8 = excellent, 6 = very good, 4 = good, 2 = fair, 0 = poor; circle one)
Choice of Topic - Was the topic relevant to the Marine Environment? Was it interesting to you? Did the speaker explain why they thought it was interesting?	8 7 6 5 4 3 2 1 0
Clarity - Did you understand the point of their talk? Did the speaker speak clearly and loudly enough? Were their graphics well chosen and easy enough to understand?	8 7 6 5 4 3 2 1 0
Depth - Did the speaker cover the topic thoroughly? Do you feel like you learned something new with enough detail to understand it?	8 7 6 5 4 3 2 1 0
Organization - Did the presentation follow a logical progression? Did the speaker tell you what to expect at the beginning of the talk? Did their conclusions reiterate the main points?	8 7 6 5 4 3 2 1 0
Focus - Did the speaker address the topic that they said they would? Did they avoid presenting too much unnecessary detail?	8 7 6 5 4 3 2 1 0

Total score (sum of five numbers; out of 40 points): _____

Please make some constructive comments or suggestions for improvement:

MARS 4200/6200 – Fall 2017

Ocean data monitoring and analyses assignment

The goal of this assignment is to familiarize you with the process of collecting and interpreting scientific data, working in teams of 2-3 students. You will spend the semester focused on a topic of your choice, monitoring the data from a web page in “real time” OR processing data from an ocean database. Frame a question and track the data to answer your question. If you are working in real time, you should monitor the data as frequently as needed to get a sense of the variability. Some measurements will change rapidly, others less so. There are many websites that share data collected on the state of the ocean as well as marine animal tags (I will provide an updated list or you can find your own).

Every other week each team should hand in a write up with an updated graphic to answer the team question. On occasion, teams will be asked to make a short presentation to the class about what they are finding. At the end of the semester, each team will hand in a brief summary (2 pages of text, plus selected figures) of their findings, including an analysis of the data from each write up.

This assignment is worth 20 percent of your total grade and the number of points your team receives depends on 1) **Reliability** (Was your team prepared to present something each time?), 2) **Teamwork** (Did everyone on the team clearly contribute?), 3) **Creativity** and risk taking (Did you investigate the data beyond the obvious?), and 4) **Time management** (Did you work consistently through the semester?).

I recommend that you copy graphics into MS PowerPoint or create a web page for comparative purposes to make your final report easier.