

**INTRODUCTION TO OCEANOGRAPHY; BIOL 342**  
**Syllabus**  
**Spring Semester 2016**

Class meetings: Tues. & Thu. 9:25 – 10:40; SSMB 138  
Laboratory (1) Wed. 13:30 – 16:30 GML 113  
Laboratory (2) Thu. 13:30 – 16:30 GML 113  
Laboratory (3) Fri. 13:00 – 16:00 GML 113

**Lecture Instructor:**

Dr. Bobbie Lyon  
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**Laboratory Instructor:**

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**Office Hours**

Bobbie Lyon: by appointment.

Gorka Sancho: by appointment at Grice Marine Laboratory office.

There are no excuses to not meet with us to discuss any issues related with this course. We encourage all students introduce yourselves to us early in the course (and frequently afterwards).

**Course Description**

This course will introduce you to all aspects of General Oceanography, including Geological, Physical, Chemical and Biological Oceanography. This will be accomplished by combining a series of class lectures and laboratory sessions, complemented with a field trip on board the RV Silver Crescent, primary literature analyses, independent research projects, public presentations and examinations.

**Course Objectives**

Through this course you will learn to think critically about ocean processes that influence your daily lives, which you might need to understand and study in greater detail later in your careers. Also you will learn to analyze different sources of oceanographic information to determine their usefulness for your work. We will expect you to understand key problems and processes being studied by oceanographers today, analyze and describe important processes in the ocean, compare and select sources of information useful for further studies of oceanic processes and their influence on people, and we also expect you to have a good time.

**Policies and Requirements**

1. This course will be conducted strictly in accordance with the honor system of the College of Charleston (<http://www.cofc.edu/studentaffairs/HonorBoard.htm>). All work that you turn in for this course (whether for a paper, exam or quiz) must be your own, and have not been used, partially or

totally, to fulfill requirements for other classes. Any form of plagiarism (intentional and unintentional), cheating, or presenting someone else's work as one's own will be treated as a serious academic transgression and will be communicated accordingly by the instructor as an honor code violation to the Division of Student Affairs.

2. You are expected to attend all meetings of the class, including all the laboratory sections, unless you have a legitimate excuse (extreme illness or emergency), which should be approved if possible by the instructor in advance. We will warn you that if you miss lecture classes you will have great difficulties passing this course. Attendance will be recorded in all laboratory sessions. Each unexcused absence from laboratory session will result in a full letter grade loss in the laboratory portion of the grade, so please contact the instructor ahead of time if you have any difficulties attending a laboratory session, and we can work out a solution. Students who need special accommodation to fully participate in this class are encouraged to speak to the instructors as soon as possible as well as to contact the Center for Disability Services ([SNAP@cofc.edu](mailto:SNAP@cofc.edu))

3. All students are expected to turn in the papers and assignments by the beginning of the class period on the dates scheduled. **Late papers will be marked down one full letter grade for every day of delay** (so you receive an F for an assignment that is 4 days late!). You are expected to hold onto electronic and xeroxed copies of all assignments until the final grade for the class has been turned in.

4. Basic class etiquette: during lectures the use of cell phones for texting or laptops for emailing or checking Facebook is not tolerated. You are encouraged to ask questions, maintain conversations and establish constructive and inquisitive dialogue with the instructor during lectures and laboratory sessions, as well as after class hours.

#### **Required Textbook:**

*Introduction to Ocean Sciences*, 2007, Douglas Segar, 2nd edition. ISBN-13: 978-0-393-92629-3 or the 3rd edition which is available for **FREE** online: <http://reefimages.com/oceans/oceans.html>

There is a link for **User donations**. Please **contribute to help cover the labor and editorial costs that make this resource available**. I believe Dr. Segar has updated the link so that you can highlight and make notes on the pdf using Adobe Pro. If this is not the case, let me know and I will inquire with him. (There are many similar textbooks out there that cover the same topics, but this is among the most comprehensive oceanographic textbook in the market in our opinion. It is really helpful for understanding many critical concepts. If you already have a different general Oceanography Textbook, please show it to us since it is probably an acceptable substitute)

#### **Classroom activities**

Lectures in class will provide you with basic information regarding Oceanographic Sciences. I expect you to read the assigned chapters from the textbook and/or supplemental references before each class, and on occasions I will expect students to study independently certain materials. It is also recommended that you read the **Critical Concepts** sections (end of textbook) referenced in each chapter, since they are very useful and will help bridge the gaps between your different backgrounds. I will make **PowerPoint slides available online via google drive** (doctorbobbilyon@gmail.com); however, I strongly suggest that during lectures you **take your own handwritten notes**. Take notes when the course becomes interesting, when it is dull and when pictures of oceanographic boats are being shown (basically always take notes). If you have any questions regarding the material covered or in the textbook, **please interrupt** me in class to ask questions or demand further explanations. I would really appreciate having an **INTERACTIVE** class, with a solid bi-directional communication with students, so please feel free to politely interrupt, question, and discuss. Chances are you aren't the only one wondering! Also come to

talk with me outside of class to receive more in-depth explanations if you need them to master any specific concept.

**If you miss classes, you will likely do poorly** in the exams - a lot of the materials presented are not found in the textbook. The **class activities (journal clubs, worksheets & occasional quizzes)** are to help you become familiar with analyzing scientific primary literature and thinking critically through important concepts. Previous students have requested more of these since they found them extremely helpful for preparing for exams. There are **no make-up options** for missing an in-class activity. Your lowest scoring activity (or 1 missing score) will be dropped from your class activity average.

**Tests/Exams:** They will take place during class hours. The in class exams will consist mostly of short essay questions.

**Exam 1:** Will include all the lecture material covered in the first third of the course, including the lecture right before the exam date.

**Exam 2:** Will include all the lecture material covered in the second third of the course, including the lecture right before the exam date.

**Final Examination: Cumulative** – Will have 2 sections: one including the last third of the course material, and a second cumulative section including all the topics covered during the course.

**Extra Credit Exercise** – In each of the examinations there will be 2 extra credit questions regarding the two extra credit books that I would like you to read for the course. The first is the book “*Mapping the Deep*”, by Robert Kunzig (ISBN 0-393-32063-4). The second book is “*Fixing Climate: What Past Climate Changes Reveal About the Current Threat-and How to Counter it*” by Wallace S. Broecker and Robert Kunzig (ISBN 0-8090-4502-8; 2008, 272 pp.) They are both great books describing historic and recent oceanographic discoveries and I highly recommend that you purchase them right away and read them (each is less than 10\$ at [www.amazon.com](http://www.amazon.com), cheaper if bought used). From each book, **Chapters 1-5 will be in the Exam 1; Ch 6-11 in Exam 2; the whole book for the Final Exam.** The books are great, they greatly compliment the class. This is the only extra credit that will be given!

### **Oceanographic literature exercises:**

One review written exercise will help you learn how to read and analyze scientific publications in different oceanographic fields. We will provide in due time a guideline and present an example JC in order to insure that students know the expectations for this exercise. For this review exercise students must choose a specific oceanographic primary literature publication to review from a list provided, and completed as if you were doing a peer-review for a scientific journal. You are expected to review the paper, write a small summary of the paper, and then proceed to critically evaluate the science, the methods and the conclusions of the paper (maximum of 4 pages).

### **General Laboratory activities:**

Some lab sessions will consist of traditional demonstrations, sample analyses and problems sets, with the purpose of complementing materials covered in lectures and introduce you to different analytical techniques. Each lab exercise will be due at the beginning of the following week’s lab and will be used in calculating your final grade.

All activities performed as part of the BIOL 342 Laboratory in room GML 113 will fall under the College of Charleston Safety Policies and Procedures (Full version has been handed to you with this syllabus, please read them carefully). According to this college-wide policy: “*Students dismissed from a teaching lab due to violations of the safety procedures will not be allowed to re-enter the laboratory until authorized to do so by their supervisor (instructor).* Any course work missed because of a violation

*of these guidelines cannot be made up at another time (or by an extension of the lab period) and will be treated as an unexcused absence”*

1. You are responsible for knowing the biological, chemical, electrical, ergonomic, mechanical, and physical hazards associated with the equipment and materials that are being utilized in the laboratory. Listen to all instructions and ask questions about that which you do not understand.
2. Know the location of safety equipment: telephones, emergency shower, eyewash, fire extinguisher, fire alarm pull.
3. Know the appropriate emergency response procedures. If there is an injury or emergency, call 953-5611.
4. Do not work alone in the laboratory if you are working with hazardous materials or equipment.
5. Use hazardous chemicals, equipment, and biological agents only as directed and for their intended purpose.
6. Do not engage in horseplay, pranks or other acts of mischief while in lab.
7. Drinking, eating, and application of cosmetics is forbidden in laboratories where chemicals or biohazards are present. Smoking is forbidden in all College buildings.
8. Appropriate personal protective equipment shall be worn. The dress code for laboratory work when using chemicals, biological or physical hazards, or when instructed to do so by the laboratory supervisor is as follows:
  - a) Wear safety glasses or goggles at all times.
  - b) No exposed skin on arms, legs or torso.
  - c) Wear lab coats or other approved protective garments.
  - d) Wear gloves or other personal protective equipment (PPE) as directed by the instructor or mandated by prudent practices based on the chemicals being handled. If in doubt, wear appropriate gloves. Latex is not permitted. Avoid cross-contamination.
  - e) Remove PPE (gloves and lab coat) when exiting the laboratory.
  - f) Wash your hands, even if gloves were used, before leaving a lab where you did any lab work.
  - g) Closed toe shoes are required. The heel and top of foot must be covered. High heeled shoes, sandals, and perforated shoes are not permitted.
  - h) Confine long hair and loose clothing.
9. Inspect equipment or apparatus for damage before adding chemical reagents or biological samples or energizing electrical equipment. Do not use damaged equipment.
10. Never remove chemicals, biological samples, or laboratory equipment from a lab without proper authorization.
11. Presume that all chemicals and biological samples used in the laboratory are hazardous for you and the environment, unless instructed otherwise.
12. Never leave an experiment unattended unless proper safety precautions are in place.
13. Read all labels on chemicals twice before using them in the lab. Read all instructions twice for the operation of any equipment or machinery.
14. Properly and safely dispose of all waste materials.
15. Treat sharps and broken glassware containers carefully.
  - a) Broken glass should be disposed of in properly marked safety containers. All sharps (needles, razor blades, etc.) used for any purpose must be disposed of in specially labeled SHARPS containers.
  - b) Do not place contaminated glass in the broken glassware container. Consult your supervisor.
  - c) Waste chemicals and contaminated PPE should be discarded as directed.
16. When using a reagent, replace the lid immediately. Never return unused reagents to stock bottles. Take only the amount needed for your experiment.
17. All chemicals and biological samples/media are to be disposed of in appropriately labeled containers. Specific instructions for each material will be provided. Pay attention to waste container labels before adding the material to be discarded.

18. Use good personal hygiene. Keep your hands and face clean. Wash hands thoroughly with soap and water after handling any chemical or biological agent.
19. Keep the work area clean and uncluttered with chemicals and equipment. Clean up the work area on completion of an operation or an experiment. Before leaving the laboratory, you are responsible for making sure your lab area is clean and organized.
20. Never store a chemical or biological specimen in an unlabeled container.
20. Always have your College of Charleston identification and insurance information with you when working in a laboratory. MedicAlert identification must be worn if you have any potential life-threatening chemical sensitivities or medical conditions.
21. Report any accident or injury, however minor, to your teaching assistant, instructor, or lab supervisor immediately. An accident report form must be completed and forwarded to the department chair, dean, and to the Director of Environmental Health and Safety.

**Field activities:**

We will make one cruise to Charleston harbor on board the *RV Silver Crescent* of the SCDNR. Please bear in mind that some flexible scheduling will be necessary in order to allow for this cruise, and timing of other class activities might be affected by re-scheduling of this cruise. Other cruises will be scheduled if possible on board the *RV Chamberlain*, which is only capable of transporting 6 to 8 students at a time, in order to collect field data and samples from Charleston Harbor for independent research projects.

**Lab Independent Study:**

The second half of the laboratory sessions will pursue independent research projects. These projects must be performed by TEAMS of 2 or 3 students, in order to encourage group work and allow for more extensive and in-depth projects. I encourage that you carefully select project teams very early in the semester, and to communicate openly with teammates to establish common goals and expectations. The idea is that you will (1) select a oceanographic research question that you would like to address (please discuss your potential topics with me early), then (2) write a research proposal for my approval, specifying in detail your research questions and presenting the existing literature on the topic, the data collecting techniques to be employed, the laboratory and/or field instrumentation needed to collect and/or analyze samples, a detailed schedule of the intended field and laboratory work and a list of statistical tools to be employed in data analyses.

Topics of research must include collection of data or samples in Charleston Harbor, or be based on the growth of phytoplankton in the Laboratory. Short oceanographic cruises within Charleston Harbor can be planned to help collect samples or make oceanographic measurements, and as part of your proposal you should include detailed requests for “ship time” and use of field equipment. Field datasets available on the web and collected through satellites, instrumented moorings, tidal gauges, etc, can also be used for the projects. You are encouraged to use techniques, instruments and knowledge gained in other classes (ecology, marine geology, plant or animal physiology, invertebrate biology, etc.). The final results of the research poster will be turned in for evaluation as a Research Poster and presented to the class as a 15 minute oral presentation. Exceptional projects may be presented as posters at the School of Sciences and Mathematics Poster session in April 2013 if students desire to do so and receive approval by the instructor.

**Grading:**

*Lecture Section*

Exam 1	15%
Exam 2	15%
Final Examination	21%
Oceanographic Literature Review Paper	15%
Class Activities	10%

*Laboratory Section*

Laboratory Exercises & Proj. Progress	4%
Final Independent Research Project Poster	15%
Oceanographic Oral Presentations	5%

**Grading scale:**

93-100 = A	Superb
90-92 = A-	Excellent
87-89 = B+	Very good
83-86 = B	Good
80-82 = B-	Just good
77-79 = C+	Above average
73-76 = C	Average
70-72 = C-	Below average
67-69 = D+	Acceptable
63-66 = D	Barely acceptable
62-60 = D-	Almost acceptable
<60 = F	Failing

## COURSE CALENDAR

**(All dates are approximate, and will likely be subject to changes as the course progresses)**

<b>Date</b>	<b>LECTURE TOPIC</b>	<b>Readings</b>
<b>January</b>		
Th 7	Course Introduction & Goals	
Tu 12	Ocean Floors & Margins – Intro to Oceanographers toolbox	Ch1
Th 14	Earth systems & <b>Geological Oceanography</b>	Ch2, 3
Tu 19	Plate Tectonics	Ch4
Th 21	Hydrothermal vents & Origins of Life	Ch15, Martin 2008
Tu 26	Amazing Water! - <b>Ocean Water Chemistry</b>	Ch 5
Th 28	Ocean Water Chemistry part II	
<b>February</b>		
Tu 2	Carbonate chemistry & Biogeochemical cycles	
Th 4	Marine Sediments (plankton & more biogeochemistry)	Ch 6
Tu 9	<b>JC</b> – Wood 2008: OA & brittlestar calcification	
Th 11	Ocean – Atm Interactions – <b>Physical Oceanography</b>	Ch 7
Tu 16	Ocean Circulation - surface	Ch 8
Th 18	Ocean Circulation - deep	
Tu23	El Niño & Climate Oscillations	(Ch 7)
Th 25	<b>EXAM-1</b>	
<b>March</b>		
Tu 1	Waves & Tides	Ch 9, 10
Th 3	Bioenergetics – <b>Biological Oceanography</b>	Falkowski 2008
<b>Tu 8</b>	<b>SPRING BREAK – NO CLASS</b>	
<b>Th 10</b>	<b>SPRING BREAK – NO CLASS (midterm grade filed)</b>	
Tu 15	Primary Production	Ch12, Thornton 2012
Th17	Phytoplankton ( <i>last day “W” withdraw Fri 18th</i> )	Ch13
Tu 22	Nutrient Cycling, HABs & Marine Omics	
Th 24	<b>JC</b> –Toseland 2013: omics & resource allocation	
Tu 29	Zooplankton - <b>Lit. Review Paper Due</b>	(Ch12)
Th 31	Benthos	Ch14, 15
<b>April</b>		
Tu 5	<b>EXAM-2</b>	
Th 7	Nekton & Fisheries	(Ch13, 14)
Tu 12	Polar Oceans	Ch 15
Th 14	Coral Reefs	
Tu 19	Climate Change	
Th 21	Final Review	
<b>Tu 26</b>	<b>FINAL CUMMULATIVE EXAM (8-11am)</b>	

(All dates are approximate and subject to changes as the course progresses. Cruise dates are likely to be changed, but due dates of project materials will not)

<b>Date</b>	<b>LABORATORY 1</b>	<b>Readings</b>
January		
We 6	NO LAB	
We 13	Oceanographic Techniques; CTD use – <b>Intro to Research Project</b>	Ch 1
We 20	Bathymetry, Plate Tectonics, Marine Sediments	Ch 1,2, 3, 6
We 27	CTD theory and practice <b>Title and Abstract of Project Due</b>	Ch 5,12
February		
We 3	<b>Nutrient Analyses &amp; Chlorophyll Pigments</b>	
We 10	Phytoplankton Microscopy & Cell Counting <b>Lab Project Proposals and Bibliographies Due</b>	Ch 12,13
We 17	<b>Zooplankton Sample Analysis</b>	Ch 12,13
We 24	Work on Lab projects	
March		
We 2	Work on Lab projects+ <b>How to make a Poster Lecture</b>	
We 9	<b>SPRING BREAK – NO LAB</b>	
We 16	Work on Lab Projects	
We 23	Oceanographic Cruise with RV Silver Crescent – CTD ; <b>Figures Due</b>	
We 30	Work on Lab projects – <b>Poster Finalizing and Review of drafts –</b>	
April		
We 6	<b>Final Lab Projects Posters due at beginning of Movie Day – Hydrothermal Vents - Lecture on how to give oral presentation.</b>	Ch 15
We 13	<b>Oral Presentations of projects</b>	
We 20	NO LAB	

(All dates are approximate and subject to changes as the course progresses. Cruise dates are likely to be changed, but due dates of project materials will not)

<b>Date</b>	<b>LABORATORY 2</b>	<b>Readings</b>
January		
Th 7	NO LAB	
Th 14	Oceanographic Techniques; CTD use – <b>Intro to Research Project</b>	Ch 1
Th 21	Bathymetry, Plate Tectonics, Marine Sediments	Ch 1,2, 3, 6
Th 28	CTD theory and practice <b>Title and Abstract of Project Due</b>	Ch 5,12
February		
Th 4	<b>Nutrient Analyses &amp; Chlorophyll Pigments</b>	
Th 11	Phytoplankton Microscopy & Cell Counting <b>Lab Project Proposals and Bibliographies Due</b>	Ch 12,13
Th 18	<b>Zooplankton Sample Analysis</b>	Ch 12,13
Th 25	Work on Lab projects	
March		
Th 3	Work on Lab projects+ <b>How to make a Poster Lecture</b>	
Th 10	<b>SPRING BREAK – NO LAB</b>	
Th 17	Work on Lab Projects	
Th 24	Oceanographic Cruise with RV Silver Crescent – CTD ; <b>Figures Due</b>	
Th 31	Work on Lab projects – <b>Poster Finalizing and Review of drafts –</b>	
April		
Th 7	<b>Final Lab Projects Posters due at beginning of Movie Day – Hydrothermal Vents - Lecture on how to give oral presentation.</b>	Ch 15
Th 14	<b>Oral Presentations of projects</b>	
Th 21	NO LAB	

(All dates are approximate and subject to changes as the course progresses. Cruise dates are likely to be changed, but due dates of project materials will not)

<b>Date</b>	<b>LABORATORY 3</b>	<b>Readings</b>
January		
Fr 8	NO LAB	
Fr 15	Oceanographic Techniques; CTD use – <b>Intro to Research Project</b>	Ch 1
Fr 22	Bathymetry, Plate Tectonics, Marine Sediments	Ch 1,2, 3, 6
Fr 29	CTD theory and practice <b>Title and Abstract of Project Due</b>	Ch 5,12
February		
Fr 5	<b>Nutrient Analyses &amp; Chlorophyll Pigments</b>	
Fr 12	Phytoplankton Microscopy & Cell Counting <b>Lab Project Proposals and Bibliographies Due</b>	Ch 12,13
Fr 19	<b>Zooplankton Sample Analysis</b>	Ch 12,13
Fr 26	Work on Lab projects	
March		
Fr 4	Work on Lab projects+ <b>How to make a Poster Lecture</b>	
Fr 11	<b>SPRING BREAK – NO LAB</b>	
Fr 18	Work on Lab Projects	
Fr 25	Oceanographic Cruise with RV Silver Crescent – CTD ; <b>Figures Due</b>	
April		
Fr 1	Work on Lab projects – <b>Poster Finalizing and Review of drafts –</b>	
Fr 8	<b>Final Lab Projects Posters due at beginning of Movie Day –</b> Hydrothermal Vents - <b>Lecture on how to give oral presentation.</b>	Ch 15
Fr 15	<b>Oral Presentations of projects</b>	
Fr 22	NO LAB	