

INTRODUCTION TO OCEANOGRAPHY; BIOL 342

Syllabus

Spring Semester 2019

Class meetings: Tue. & Thu. 12:45 – 14:00; GML 202

Laboratory (1) Tue. 14:05 – 17:05 GML 113

Laboratory (2) Thu. 14:05 – 17:05 GML 113

Instructor

Dr. Gorka Sancho
Grice Marine Laboratory
College of Charleston
205 Fort Johnson
Charleston, SC 29412

Telephone: (843) 953 9194

Fax: (843) 953 9199

Email: sanchog@cofc.edu

Office: GRICE Rm. 206

Office Hours

By appointment in my office. Also right after the completion of the Laboratory sections (Tue 17:05 and Thu 17:05) There are no excuses to not come by my office to discuss any issues related with this course, we can make appointments on Tue or Thu before lectures. My door is always open, and I encourage all students to stop by my office and introduce yourself to me 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 field trips on board the RV Silver Crescent, primary literature analyses, independent research projects, public presentations and examinations.

Student Learning Outcomes

- 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.
- Learn to analyze different sources of oceanographic information to determine their usefulness for your work.
- To understand key problems and processes 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.
- Demonstrate the impact of human practices on social, economic, and/or ocean ecological systems.
- To have a good time because learning about the oceans is fun.

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 or providing an excuse afterwards. I will warn you that if you miss lecture classes you will have great difficulties passing this course due to the high level of critical thinking involved. 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 me 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 me as soon as possible as well as to contact the Center for Disability Services (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. Over the years, I have realized that most electronic devices are a source of distractions from the lectures. Laptops should not be used in lectures without permission from the instructor, but students are encouraged to use them in the laboratory sessions. You are strongly 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 4th edition which is available for **FREE** online: <http://www.reefimages.com/oceansci.php>

There is a link for **User donations**. **Please contribute some money to help cover the labor and editorial costs that make this resource available. Donation link can be found at the bottom of the webpage.** 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 my 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 before each class, and on occasions I will expect students to study independently certain materials from the textbook. It is also recommended that you read the Critical Concepts sections used in each chapter, since they are very useful and will help bridge the gaps between your different backgrounds. I will also suggest that during lectures you take your own 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). I will make all the Powerpoint lecture slides available to you through OAKS. 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. Chances are you aren't the only one wondering! Also come to talk with me in my office or after laboratories 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 and many oceanographic concepts can be very abstract.

The written exercises will help you become familiar with scientific primary literature, oceanographic techniques and allow you to explore in depth some recent oceanographic discoveries.

Oceanographic literature exercise:

One review written exercise will help you learn how to read and analyze scientific publications in different oceanographic fields. I will provide in due time a guideline and present an example in order to insure that students know the expectations for this exercise. For this written review exercise students must choose a specific oceanographic primary literature publication to review 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). I will provide with a list of possible papers, but will also accept others that you find on your own. This review exercise can be used to help with the independent research project by reading a paper on the topic of your laboratory research (see next) or to further investigate an oceanographic topic of your interest (i.e. fisheries oceanography, importance of oceans in global warming and climate, effects of whales on ocean productivity, etc.). Papers to be reviewed **must** be approved by the instructor beforehand, and it is encouraged that students establish a communication with the instructor about choosing an appropriate paper well before the deadline.

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

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, 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 compliment the class.

For those seniors that will graduate in May 2019, if you participate in the Biology Department Graduation Assessment Exam, you will receive an extra credit (2 pts) to be applied to you final exam grade

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 potential re-scheduling of this cruise.

Lab Independent Study:

The second half of the laboratory sessions will pursue independent research projects. These projects must be performed by TEAMS of 2 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. Thirdly (3) collect samples and analyze the resulting data. Finally (4) present the data in the form of a scientific poster and an oral class presentation.

Topics of research must include collection of data or samples in Charleston Harbor, or be based on the growth of phytoplankton in the Laboratory. 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 results of the research poster will be turned in for evaluation as a Research Poster (PDF file) and eventually 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 2018 if students desire to do so and receive approval by the instructor (no extra credit, this is just voluntary).

Grading:

Lecture Section

Exam 1	18%
Exam 2	18%
Final Examination	25%
Oceanographic Literature Review Paper-	15%

Laboratory Section

Laboratory Exercises & Project 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)

Date	LECTURE TOPIC	Readings
January		
Tu 8	Course Introduction & Goals	
Th 10	History of Oceanography	Ch 1-2
Tu 15	Ocean Floors & Margins – Geological Oceanography	Ch 3-4
Th 17	Plate Tectonics	Ch 4
Tu 22	Ocean Water Chemistry – Chemical Oceanography	Ch 5
Th 24	Marine Sediments	Ch 6
Tu 29	Ocean – Atmosphere Interactions – Physical Oceanography	Ch 7
Th 31	Ocean Circulation - surface 1 Deadline to choose Paper for Review Exercise	Ch 8
February		
Tu 5	Ocean Circulation - surface 2	Ch 8
Th 7	Ocean Circulation - deep	Ch 8
Tu 12	EXAM 1	Ch 9, 10
Th 14	Waves & Tides	
Tu 19	El Niño Southern Oscillation	Ch 7, 8
Th 21	Biological Productivity	Ch12, 13
Tu 26	Global Climate Change I – Before the Flood	Ch 16
Th 28	Global Climate Change II – Chasing Coral	Ch 16
March		
Tu 5	Phytoplankton Review Exercise Due in class	Ch12, 13
Th 7	Zooplankton	Ch12, 13
Tu 12	Nekton	Ch12, 13, 14, 15
Th 14	Benthos	Ch12, 13, 15
Tu 19	SPRING BREAK – NO CLASS	
Th 21	SPRING BREAK – NO CLASS	
Tu 26	Hydrothermal Vents	Ch 15
Th 28	Coral Reefs	Ch 15
April		
Tu 2	EXAM 2	
Th 4	Tsunami & Ocean Acidification	Ch 9, 16
Tu 9	Global Warming	Ch 16
Th 11	Fisheries Oceanography 1	Ch 13, 14, 15
Tu 16	Fisheries Oceanography 2	Ch 13, 14, 15
Th 18	Marine Conservation & Pollution	Ch 15, 16
Th 25	FINAL EXAM (12-3pm)	

(All dates are approximate and subject to changes as the course progresses)

Date	LABORATORY 1	
January		
Tu 8	Oceanographic Techniques; CTD use	
Tu 15	Bathymetry, Plate Tectonics – Research Project Discussion	
Tu 22	CTD theory and practice - Title and Abstract of Project Due	
Tu 29	Chlorophyll Pigments & Nutrient Analyses Lab Project Proposals and Bibliographies Due	
February		
Tu 5	Phytoplankton Microscopy	
Tu 12	Work on Lab projects – Data Collection- Methods Due	
Tu 19	Work on Lab projects - Data Collection	
Tu 26	Work on Lab projects - Data Collection	
March		
Tu 5	Work on Lab projects- Data Collection	
Tu 12	Work on Lab Projects – Final Figures Due	
Tu 19	SPRING BREAK – NO LAB	
Tu 26	Oceanographic Cruise with RV Silver Crescent – CTD	
April		
Tu 2	Work on Lab projects - Poster Preparation & Revision	
Tu 9	Final Lab Projects Posters due Movie Day – Hydrothermal Vents	
Tu 16	Oral Presentations	

Date	LABORATORY 2	
January		
Th 10	Oceanographic Techniques; CTD use	
Th 17	Bathymetry, Plate Tectonics – Research Project Discussion	
Th 24	CTD theory and practice - Title and Abstract of Project Due	
Th 31	Chlorophyll Pigments & Nutrient Analyses Lab Project Proposals and Bibliographies Due	
February		
Th 7	Phytoplankton Microscopy	
Th 14	Work on Lab projects – Data Collection- Methods Due	
Th 21	Work on Lab projects - Data Collection	
Th 28	Work on Lab projects - Data Collection	
March		
Th 7	Work on Lab projects- Data Collection	
Th 14	Work on Lab Projects – Final Figures Due	
Th 21	SPRING BREAK – NO LAB	
Th 28	Oceanographic Cruise with RV Silver Crescent – CTD	
April		
Th 4	Work on Lab projects - Poster Preparation & Revision	
Th 11	Final Lab Projects Posters due Movie Day – Hydrothermal Vents	
Th 18	Oral Presentations	