

Geology 103: Marine Environmental Geology

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This course is an introduction to the aspects of marine geology and oceanography that affect the coastal environment and marine resources. Topics include sedimentation processes, seawater characteristics, circulation, wave and tides, plate tectonics, climate change, petroleum resources, and fisheries. Weekly field trips and labs are designed to elucidate specific environmental problems affecting the Maine coast. In addition to lectures and laboratories, each student will participate in a defined project that addresses a specific aspect of a coastal marine environmental issue.

There are several dozen topics and techniques that you will have to master in this course. You will need to master all of these at an introductory level, and based on which project you select, you will have to master some of these at a more advanced level. It is expected that you achieve your desired level of mastery through the lectures, discussions, labs, field trips, and projects.

Class: 9:30 – 10:25 (MWF in Druckenmiller 20)

Lab Section 1: 1:15 – 4:30 (W)

Lab Section 2: 1:15 – 4:30 (Th)

Service-Learning Projects

In Geo 103 and many other geology courses, service-learning is an essential component of how we help you learn about the earth. We deliver part of the content of this course by arranging for you to solve a problem with a local community partner. This semester our community partners are the Bowdoin Buoy Facility and the Friends of Casco Bay. Small groups of students will examine a research question in detail over the course of the semester, conducting field studies, analyzing data, preparing a final report, and drawing conclusions that may then be used by our partners. We hope that by working in this way you will learn the lessons more durably, you will become better problem solvers, and that by helping community partners you will gain skills that will prove useful in later life. An additional goal is to provide the community partners with information that may not otherwise be available to them.

Labs

For the first half of the semester, we will spend our lab time conducting service-learning projects. We will also take a required weekend field trip to Bunganuc Bluffs in September. For the second half of the semester, labs will consist of one-week modules on a variety of topics and project work will take place independently. We have arranged the timing of project work as well as we can within the constraints of Bowdoin's very traditional schedule. However, tides and weather do not always cooperate and you must be prepared for a few occasions where you will be out in the field outside of normal class time. This may include early mornings, nights, and maybe even part of a weekend. If this is necessary, we will even out this extra work by giving you more time in class or labs to get your project work done.

Blackboard

This course makes extensive use of Blackboard (<http://blackboard.bowdoin.edu>). All Power Point lectures are archived here for your reference, and assignments, readings, and announcements are posted regularly. *You are expected to check **Announcements** before class and lab for last minute updates.* Submit all e-Journal entries using the tool provided on Blackboard. We will let you know which other assignments may be submitted electronically using the Digital Dropbox. All electronic submissions are due before the start of class.

Text

Segar, D.A. 2007. Introduction to Ocean Sciences. 2nd ed. W.W. Norton & Co., Inc., New York, NY.

Supplemental Readings

Will be available on Blackboard under the Course Materials link.

Coursework and Grading

Exams

There will be two exams for the course. The first hourly will be Wednesday, October 3 and the second will be Wednesday, November 28. Both will take place in the evening and in-class review sessions will be held before each exam.

Class Assignments

Short assignments related to class activities will be scheduled throughout the semester. These might include short essays on a subject or on a reading assignment, quantitative or graphing exercises.

Laboratory Assignments

Throughout the semester, a series of short lab assignments will be given. These may be lab reports, essays, analysis of data we have collected, or a small project related to the lab. Assignments are due in class on Fridays unless otherwise noted in the Schedule.

e-Journals

You will be asked to submit e-journal entries 5 times throughout the semester. We will give you specific questions to write about, which will help you reflect on your progress in the class. You are encouraged to be candid in your responses. Ed and Cathryn will respond to questions or needs that arise through the entries as necessary. Your complete e-journal will receive a grade at the end of the semester based on the effort and thought put into it.

Projects

The project is the largest component of your grade, which reflects its importance to us as well as to our community partners. Participation in all aspects of the project work will be considered in your total project grade.

The results of your study will be *presented orally* in two stages. In October, there will be a brief, informal presentation to the class. In mid-November, you will present your findings more formally to your classmates and our partners in a mini-conference. We hope that you will use the presentations as opportunities to make connections between your project and your colleagues', and we encourage collaboration in this way.

The *Report* will be given to our community partners at the conclusion of the projects. Therefore, its quality should reflect the effort you've put into your project throughout the semester in both content and form. The report is due during finals week. Toward the end of the semester, we will assist you with guidelines and feedback on your report.

At the end of the semester, we will hold a *Poster Symposium* in conjunction with other service-learning classes. The posters are a creative outlet for the projects and the symposium is a celebration of the hard work you've done all semester. Our community partners look forward to this annual event so that you can share your results with them.

Grading

All grades are posted on Blackboard under Course Tools.

| | |
|--------------------------------|------|
| First Hourly Exam | 20% |
| Second Hourly Exam | 25% |
| Classroom Exercises & Essays | 10% |
| Laboratory Exercises & Reports | 10% |
| e-Journal | 5% |
| Participation | 5% |
| Project | 25% |
| • Oral Presentations | (10) |
| • Poster | (5) |
| • Report | (10) |

Course Philosophy

Attendance. This is a fun and exciting topic with the unique opportunity to do research under the umbrella of service learning structure. Given the unique topic and emphasis on the Maine coastal environment, there are no readings that can provide you with the material that is covered in class or lab. While attendance will not be taken, it is expected that you attend every class and every laboratory, and, of course, the exams. That said, if you have a legitimate excuse for missing class or lab please contact each of us to arrange a time to get the material covered in class. Legitimate excuses include medical or family emergencies for which you will need a note from the deans' office. If you are on an athletic team and you have a conflict due to a scheduled competition (not a practice) you should let me know the first week of class so we can make arrangements.

Readings. *Please bring your text book to class.* It would be best to read the assignments before lecture and then again after lecture. I know that you have busy schedules so if you are pressed for time, at least look carefully at each of the figures in the reading assignment and try to understand the main concept behind them. Then read the chapter carefully after lecture. By comparing my lecture material with the reading content you will be able to see which concepts I think are the most important.

Office Hours. I have an open door policy for quick questions. If you want to schedule a longer period of time for discussion please contact me or see me after class so we can arrange a convenient time for both of us. The best time to talk with me is after class but before lunch.

Cell Phones. Please turn off cell phones before class and lab.

Academic Honor and Conduct Codes. You are expected to uphold both the academic honor and conduct codes in this course. In science, papers that have no or few citations are viewed poorly. It means you did not become familiar with the work of those before you. Your work is looked upon favorably when you cite the work of others. If you have any questions regarding citations for your work, please see us or consult with the librarian.

Class Participation. You are encouraged to ask questions during lectures. I will ask questions of each of you.

Extra Credit. There is none.

Incompletes. I cannot give incompletes. This issue has to be taken up with the Deans office.

Grading Policy. While I do not like to grade exams or assignments, I take grading very seriously. Because of that I do not like to argue over a point. If you feel there is an error in the grade, I will look it over but I will regrade the entire assignment. Grade levels will follow the description in the student handbook:

| Grade | What the handbook says | How I interpret the handbook |
|-------|--|---|
| A | student has mastered the material of the course and has demonstrated exceptional critical skills and originality | Performance was outstanding , incorporating and synthesizing material from lectures, assignments, readings and laboratory exercises |
| B | student has demonstrated thorough and above average understanding of the material of the course | Performance was very good, a thorough understanding of the material presented but limited synthesis skills |
| C | student has demonstrated a thorough and satisfactory understanding of the course | Performance was fine , understanding most but not all material, no synthesis of material |
| D | student has demonstrated a marginally satisfactory understanding of the basic material of the course | Performance was weak , did not understand most of the material, weak effort |
| F | student has not demonstrated a satisfactory understanding of the basic material of the course | Performance was poor , effort was weak , made feeble attempts to improve |

Most Importantly... *Open your mind, work hard, and enjoy the class.*

Schedule

| Week | Date | Section | Lecture | Lecture Topic | Readings |
|------|-------------|------------------------------|---------|---|-------------------------|
| 1 | Aug 31 | Introduction | 1 | Service-Learning, Sediment texture, ocean basin shape, in class exercises | |
| 2 | Sep 03 | 1. Marine sediments | 2 | Shape of the ocean basins/Community Partners introduced | S: 34-45 |
| | Sep 05 | | 3 | Ocean Sediments/Community Partners introduced | S: 45-50 |
| | Sep 5 & 6 | | Lab 1 | Projects | |
| | Sep 07 | | 4 | Describing sediments e-Journal 1 due | S:168-186 CC4 |
| 3 | Sep 10 | | 5 | Sedimentary processes | S:187-197 |
| | Sep 12 | 2. Bunganuc Bluffs | 6 | Glaciation/Logistics for Saturday | S:97-99 BB:bunganuc |
| | Sep 12 & 13 | | Lab 2 | Projects | |
| | Sep 14 | | 7 | Glacial sediments Bunganuc | BB:bunganuc 2 |
| | Sat, Sep 15 | | | Bunganuc field trip (Rain Date: Sun 9/16) | |
| 4 | Sep 17 | 3. Sea Water | 8 | Seawater constituents Project Selection Essay due | S:130-147 |
| | Sep 19 | | 9 | Residence Times | CC8 |
| | Sep 19 & 20 | | Lab 3 | Method of Slices; Intro to Excel | |
| | Sep 21 | | 10 | Density and stratification e-Journal 2 due | S:148-167 CC1;CC6 |
| 5 | Sep 24 | 4. Circulation | 11 | Atmosphere circulation | S:207-222 CC12 |
| | Sep 26 | | 12 | Wind Driven Currents, Ekman, Coriolis | S:238-247 |
| | Sep 26 & 27 | | Lab 4 | Projects | |
| | Sep 28 | | 13 | Gulf Stream in-class exercise Bunganuc Lab Report due | S:247-261 CC13 |
| 6 | Oct 01 | | 14 | Gulf Stream | S:262-276 |
| | Oct 03 | | 15 | Conveyor belt Hourly Exam 1 | BB:conveyor CC1; CC6 |
| | Oct 3 & 4 | | Lab 5 | Projects | |
| | Oct 05 | 5. Waves | 16 | Anatomy of a wave | S:278-289 |
| 7 | Oct 08 | | | FALL BREAK | |
| | Oct 10 | | 17 | Deep vs. Shallow Waves | S:290-301 |
| | Oct 10 & 11 | | Lab 6 | Projects | |
| | Oct 12 | | 18 | Tsunamis | S:301-309 |
| 8 | Oct 15 | 6. Tides | 19 | Tide observations | S:310-323 |
| | Oct 17 | | 20 | Project sharing & updates | |
| | Oct 17 & 18 | | Lab 7 | Projects | |
| | Oct 19 | | 21 | Equilibrium and dynamic tides e-Journal 3 due | S:323-335 |
| 9 | Oct 22 | 7. Beaches and Coasts | 22 | Beaches | S:336-351 |
| | Oct 24 | | 23 | Barrier islands | S:351-369 |
| | Oct 24 & 25 | | Lab 8 | Reid Beach Profile | |

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|----|------------------------|-----------------------------------|---------------|---|---------------------------------------|
| | Oct 26 | | 24 | Coasts & Sea Level Rise | BB: sealevel |
| | Oct 29 | 8. Plate Tectonics | 25 | Plate Tectonics | S:68-103 CC3 |
| | Oct 31 | | 26 | Earthquakes and volcanoes | S:114-120 |
| | <i>Oct 31, Nov 1</i> | | <i>Lab 9</i> | <i>Project Data Analysis</i> | |
| | Nov 02 | | 27 | Magnetism and reversals Reid Beach Lab due | S:212-129 |
| 11 | Nov 05 | | 28 | Sea Floor spreading | BB: sfs |
| | Nov 07 | | 29 | Seattle dies | BB:Seattle |
| | <i>Nov 7 & 8</i> | | <i>Lab 10</i> | <i>Mapping with Google Earth & GIS</i> | |
| | Nov 09 | | 30 | Plate Tectonics and Sea Level e-Journal 4 due | SS:97-99 CC2 BB: mega plumes |
| 12 | Nov 12 | 9. Project Presentations | 31 | Project Presentations | |
| | Nov 14 | | 32 | Project Presentations | |
| | <i>Nov 14 & 15</i> | | <i>Lab 11</i> | <i>Plate Tectonics</i> | |
| | Nov 16 | | 33 | Project Presentations | |
| 13 | Nov 19 | 9. Sea Level, Climate, Oil | 34 | Ice ages through geological time | CC9 BB:Ice ages |
| | Nov 21-25 | | | THANKSGIVING BREAK | |
| 14 | Nov 26 | | 35 | Milankovitch/ Periodicity | |
| | Nov 28 | | 36 | Younger Dryas event Hourly Exam 2 | BB:Dryas CC10 CC11 |
| | <i>Nov 28 & 29</i> | | <i>Lab 12</i> | <i>Scanning Electron Microscope</i> | |
| | Nov 30 | | 37 | Petroleum | BB: petroleum |
| 15 | Dec 03 | 10. Fisheries | 38 | Nutrients and ENSO | S: 370-391 CC14 |
| | Dec 05 | | 39 | Phytoplankton & tropisms | S:392-404 CC15 |
| | <i>Dec 5 & 6</i> | | | <i>Poster Preparation</i> | |
| | Dec 07 | | 40 | Fisheries and Ryther Fisheries Exercise due | BB: Ryther CC16 |
| | Dec 07 | | | Poster Symposium, 2-4pm (Moulton Union) | |
| | Dec 12 | | | Project Report due Final e-Journal due | |

Readings Key:

S = Segar, your textbook

CC = Critical Concepts section from your textbook

BB = Blackboard (Course Materials > Readings)