ES 144 Summer 2024

Instructor: Dr. Zoe Hughes
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Lecture: MW 9:00 am -12:30 pm in CAS 214
Office Hours: M 1-2, W 1-2 or by appointment/zoom any time!

Dates to remember:
First class: Wednesday 05/24/23
Last chance to register/drop without W: Tuesday 05/30/23
Last chance to drop with W: Thursday 06/15/23.
FINAL EXAM: Wednesday, 06/28/23 (last day of class).

Course Text: Garrison and Ellis, Oceanography: An Invitation to Marine Science 9th edition; available at BU bookstore.

Class info, powerpoints etc.: Blackboard.
Class questions: Piazza?

Course Overview – Oceanography is a branch of Earth Sciences that encompasses a variety of topics from ocean currents and plate tectonics to chemical fluxes and ecosystem dynamics. Over 70% of the earth's surface is ocean - so learning about the oceans will help us to understand how the whole earth system functions. In addition, the oceans are not only one of the most important agents controlling global climate, but they are also one of the chief sinks (and in some cases, sources) for many of the gases and chemical compounds about which mankind is worried (e.g., carbon dioxide and methane). An interdisciplinary approach is critical to understanding how the oceans function.

In this course we will examine the four major disciplines of oceanography including physical (e.g., waves, currents, tides, and the behavior of light and sound), geological (e.g., plate tectonics, weathering, coastal erosion), chemical (e.g., composition of seawater, interactions of seawater with the atmosphere), and biological (e.g. distribution and ecology of marine organisms). By the end of this course you will have a solid understanding of controls on oceanic circulation, the connection between the ocean and the atmosphere, the major chemical transport and reactions in the ocean, and the how organisms alter the ocean and vice versa. You will also learn about how human activities alter the ocean, and how the ocean makes our earth habitable.

Course objectives:

- You will identify the ways the four major disciplines of oceanography (physical, geological, chemical, and biological) investigate the controls of oceanic circulation, the connections between the ocean and the atmosphere, the impact of ocean chemistry on life, and the ecology and biology of the ocean as well as interactions between humans and the ocean. You will learn how scientists employ interdisciplinary methods to explain the complexity of the physical world and the human impact on it. (*Scientific Inquiry I*)

- You will recognize the ocean as a site of conflict and opportunity among and within human cultures, and you will discuss the ways exploration, commercialism, and food production continue to impact intercultural relations. You will also analyze the ocean as a site for the study of climate change. (*Ethical Reasoning*)

- As the course begins with intercultural contacts and proceeds to human interactions with the environment, you will contend with the ethical issues that face communities when oceans bridge them and affect their livelihood, and you will examine the ways your own communities and interactions with the ocean may affect future generations. (*Ethical Reasoning*)

Readings and surveys: Readings are assigned for each class topic. The exams cover reading assignments from the text and lecture material. Ideally, reading assignments should be completed *before* the class. In conjunction with the reading material, a survey will be posted every week or two on blackboard (5 questions, multiple choice). The purpose of the survey is to check your understanding of the reading material and to show me where we need to concentrate our in-class discussions, so it is really important that you take the time to complete them. These surveys are not compulsory and will not contribute to your grade, they are just there to help you and me, but in situations where extra credit is requested, consistency in completing the weekly survey will be considered.

Exams and Course Grading – You will have two tests during the (short!) semester plus a final exam. Tests 1, and 2 are each worth 25 % of your grade. The final exam is worth 35%. In class participation is worth the final 15% of your grade. The exams are based on what we discuss in class *and* on the readings. The tests will include a range of question types including: true or false; multiple choice; short answer and a final diagrams question - to let you demonstrate your understanding of concepts. Tests are given roughly every three to four classes (2 weeks) and will be based on lecture material covered during just those preceding lessons, except the final exam which will cover the entire course. All tests will be straightforward, yet challenging, and I expect you to try to link new material you are learning to material from earlier in the class as we progress, so it will become progressively more integrative. There are lots of opportunities for bonus points!

Tests will be given on Blackboard during class time. We will have class – albeit shortened – on Test days. You will have a set length of time to take the exam (90 min unless you have an accommodation – please email me details ASAP), after which the exam will auto-submit. Once started you must complete the test in one sitting and you will get only one attempt, so do not start until you are ready.

Test dates are tentatively scheduled June 5th and June 14th, Final exam: June 28th.

Attendance and make up exams: Your attendance is required at all lectures and, of course, exams. Students who attend lecture earn much better grades compared to those who do not. Attendance and participation is part of your grade. Under extenuating circumstances, we can reschedule an exam. If you have any allowances for exam taking, please tell me as early as you can in the semester so we can make the proper arrangements. TO DEMONSTRATE YOUR PARTICIPATION – I will make a note of who is present in class, I will expect some kind of interaction from every person during each class, whether it be answering or asking questions or just adding to discussions. Failure to do this will mean reduced a participation grade. Likewise, the regular surveys won't count to your grade but they will be used to demonstrate participation.

Responsibilities – It is your job to participate and communicate. Please ask questions during class – there are NO dumb questions. Don't wait for the end of the semester to tell me your thoughts on any aspect of the course. I love constructive comments and suggestions, and will respond where possible, but I can only do this if you talk to me – so let me know. You are very welcome to contact me outside of class (email, office hours). This does not just apply to course material – if you are interested in a particular subject and would like more information on current topics, something you saw on the news, read in the paper or if you are interested in careers in oceanography, becoming a marine science major, research opportunities at BU, etc.– I am happy to help and point you in the right direction.

Missing class: If you are absent from class you will miss the equivalent of 3 normal semester classes so it is important to attend. If you are ill, you should look at the Powerpoints and borrow notes from other students for that day. For prolonged absence or quarantine issues, contact me, I will make every effort to accommodate you keeping up somehow.

Policy Statements

I want to stress the importance of your familiarity with, and adherence to, Boston University's ***College of Arts and Sciences Academic Conduct Code***. It is the responsibility of every student to be aware of the Academic Conduct Code's contents and to abide by its provisions. The Academic Conduct Code can be found at http://www.bu.edu/academics/policies/academic-conduct-code/. Cases of academic misconduct will be promptly referred to the Dean's Office.

Generative AI: Artificial intelligence (AI) language models, such as ChatGPT, may be used to gather ideas for writing extra credit essays and assignments but only with appropriate citation and an appendix of the interaction, and may not be used for exams. If you are in doubt as to whether you are using AI language models appropriately in this course, I encourage you to discuss your situation with me. An example of how to cite AI language models are available at https://libguides.slcc.edu/ChatGPT/Citations. You are responsible for fact checking statements composed by any generative AI.

Please refer to the University's policy on Religious Observance (http://www.bu.edu/chapel/religion/) and the Multi-faith Calendar (http://www.interfaithcalendar.org/)

Diversity & Inclusion – Diversity enriches all research and education, and is realized only with all voices, views, and perspectives operating within a supportive and respectful community. For this reason, the Department of Earth & Environment, including myself, are committed to fostering diverse, inclusive, and equitable living, learning, and working environments that are supportive and free from violence, harassment, disruption, and intimidation. As a student taking this course, you are also committing to fostering such an environment. Further, the Department of Earth & Environment recognizes that creating a safe environment and a culture of respect is the shared responsibility of all members of our community. To ensure an equitable environment that values and respects the unique experiences and perspectives of our community, the Department, including myself are dedicated to promoting diversity, inclusion, and equity among all members of our departmental community and encouraging open, honest, and compassionate communication. Again, as a student enrolled in this course you are committing to creating such an environment. You can read more about our departmental efforts for fostering a safe, inclusive, learning environment here: http://www.bu.edu/earth/about/diversityinclusion/.

Class Land Acknowledgement: In this class we acknowledges that the territory on which Boston University stands is that of the Massachusett, Wampanoag and Nipmuc People. BU's campus is a place to honor and respect the history and continued efforts of the Native and Indigenous communities of Eastern Massachusetts and the surrounding region. This statement is one small step in acknowledging the history that brought us to reside on the land and to help us seek an understanding of our place within that history. Ownership of land is itself a colonial concept; many tribes had seasonal relationships with the land we currently inhabit. Today, Boston is still home to indigenous peoples, including the Massachusett of Ponkapoag, the Praying Indians of Natick (Massachusett-Nipmuc), the Mashpee Wampanoag, the Wampanoag Tribe of Gay Head (Aquinnah) and tribes of the Nipmuc Nation. For more information, please visit the North American Indian Center of Boston and the Commission on Indian Affairs of the State of Massachusetts.

Websites of Interest - There are several Web sites that you may find interesting to check out. Several are from educational/research institutions, several are from research groups, and others are just sort of "miscellaneous oceanography". There are many more –these are just to get you started.

- The Oceanography Society (TOS): http://www.tos.org/
- Joint Ocean Global Flux Study (JGOFS): http://www1.whoi.edu/jgofs.html
- Ocean Drilling Program (ODP): http://www.oceandrilling.org
- Sea Education Association (SEA): http://www.sea.edu
- Women in Oceanography: http://www.womenoceanographers.org/
- Earth from Space: http://www.earthfromspace.si.edu/
- The American Society of Limnology and Oceanography: http://www.aslo.org/
- Coastal and Estuarine Research Federation: http://www.erf.org/
- The Intergovernmental Panel on Climate Change: http://www.ipcc.ch/
- Careers in Oceanography and marine sciences: http://ocean.peterbrueggeman.com/career.html
- El Nino (NOAA Page): http://www.pmel.noaa.gov/tao/elnino/nino-home.html
- The Naked Scientists: http://www.thenakedscientists.com/

Please note, this is our working schedule – it will likely change. I will update it on blackboard regularly.

Date	Topic	Reading Chapter
05/22	Introductions.	NA
	Why Oceanography?	you pick
	History of Ocean Exploration - from the pioneers to present	2
	Origin of the solar system, the earth, and its oceans	1
05/27	Memorial Day – holiday!!	
05/29	Plate Tectonics 101- Theory and Evidence	3
	Plate Tectonics - Mid-Ocean Ridges, Subduction zones, Volcanic arcs	3
	Plate Tectonics – Its impacts on everything	3
05/31	*(Monday Schedule)* Glaciation	12
	Sediments - Biogenic Oozes, Turbidites, and more!	5
	Water, Water everywhere and not a drop to drink	6 &7
06/03	*Test 1*	
	Something wicked this way comes - atmospheric circulation	8
	Atmospheric circulation II	8
06/05	Ocean Circulation	9
	Surf Lessons	10
	Waves II	10
06/10	Tides are waves too.	11
	Light and Photosynthesis	13
	Global Ocean Productivity - Where, Why, and How do we know?	14
06/12	*Test 2*	
	The Sea is on Fire - Harmful Algal Blooms and Red Tides	14
	Life not from Sun - Hydrothermal vent communities	16
	Food Webs and Energy Transfers	13
06/17	Tiny Water Column Dwellers -Zooplankton	15
	Invertebrates - from small worms to colossal squid	15
	Everything you need to know about Fish	15
	Marine Mammals and other Charismatic Megafauna	15
	Life in the Deep Ocean Water Column	
06/19	Do Sea Monsters Exist?	
	Salt Marshes & Mangroves	
	Ocean Birds	
	Coral Reefs	
	To fish or not to fish? To whale or not to whale?	
06/24	Field Trip?	
06/26	Beyond all things it the ocean…	
	The Future of Ocean Research	
	Final Exam	