OCN 201: Science of the Sea

Spring 2021, 3 credits

I. Instructors

Seth Bushinsky
Marine Geology and Geochemistry
Oxygen and carbon cycles

Erica Goetze
Biological Oceanography
Plankton ecology

Phil Thompson
Physical Oceanography
Sea level rise and variability

Nick Hawco
Marine Geology and Geochemistry
Nutrient limitation and trace metal cycles

Grieg Steward
Biological Oceanography
Marine virology

Glenn Carter
Physical Oceanography
Ocean mixing, tides

Note: the primary instructors for the Spring 2021 course are Drs. Bushinsky, Goetze, and Thompson. All instructors have helped to prepare course materials.

II. Teaching Assistants (TAs)

Evan Lechner (Lead TA)

My current research is focused on describing carbon and oxygen chemistry in Hawaiian coastal ecosystems and how human actions affect natural cycles.

Emily Young

I am a deep-sea ecologist, interested in the communities of animals that live on the seafloor hundreds to thousands of meters below the ocean surface. My PhD research focuses on what happens to whale-bones and wood when they sink to the seafloor.

Alice Vislova

I'm a microbial oceanographer, my PhD work involves using meta-transcriptomic sequencing to study diel patterns in the behavior of marine microbes in the North Pacific Subtropical Gyre.

Kyle Conner

I am interested in applying geochemical techniques to answer questions about biological calcification (particularly that of corals) and its responses to global stressors like ocean acidification.

III. Course Information

A. Course Description

This course is designed to introduce students to the ocean sciences. Oceanography is inherently interdisciplinary, which is reflected in the differing expertise of the course instructors. Our goal is to cover the basics of how the ocean works and to make connections between physical, biological, and chemical processes in the ocean.

B. Course Content

The major topics covered in this course are: Origins of the earth/oceans, Formation and evolution of ocean basins, Radiative forcing and circulation, Waves and tides, Life in the Ocean, including both lower and upper trophic levels, and Climate Change.

C. Course Communication

Please use Laulima to email instructors and TAs. With a class of this size we need one central communication system otherwise messages can be lost.

D. Prerequisites

There are no prerequisites for this course.

E. Course Objectives

At the end of the course, we expect each student will be able to:

1. Explain the scientific method, how it has been applied in the ocean sciences , and how it differs from other ways of acquiring knowledge.
2. Discuss how the Earth is an integrative system across many scientific disciplines.
3. Describe the internal structure of the Earth and the dynamic processes of plate tectonics that shape its surface, including seafloor spreading, subduction, and continental drift.
4. Identify the major pathways of chemicals into the oceans and the effect that biological processes have on redistributing and removing chemicals from the oceans.
5. Describe the basic energy balance of Earth and the ocean’s role in redistributing heat from low to high latitudes.
6. Describe the major processes that cause the deep and shallow circulation of water in the oceans.
7. Describe the basic characteristics and types of surface gravity waves in the ocean (e.g., wind-generated swell, tsunami, and tides).
8. Differentiate the causes of rising sea level and its impacts on coastal areas, including erosion and beach loss.

9. Describe the diversity of life in the oceans, from single-celled bacteria to large-bodied multicellular animals.

10. Identify the major marine habitats, the types of organisms that live in those habitats, and give examples of how organisms are adapted to their habitat.

11. Describe the types of interactions that occur among organisms in the marine food web and between organisms and their environment.

12. Explain how light and nutrients control primary productivity in the ocean, and describe the fate of organic carbon as it is recycled in the upper ocean or exported to the deep sea.

IV. Required Materials

There are no required materials that you need to purchase for this class. We have worked to find open-source alternatives to expensive textbooks and will provide links and/or PDFs from the course Laulima site.

V. Course Format

This course is divided into one introductory module and seven learning modules. Each of the seven learning modules is spread over two weeks. The course is offered in a hybrid asynchronous-synchronous format, with mini-lectures, reading and quizzes provided in an asynchronous format and bi-weekly discussion sections and review sessions taught synchronously.

A calendar of course modules and detailed descriptions of asynchronous and synchronous components of the course follow in subsequent sections.

VI. Module Calendar

Module	***Title***	***Topics***
1 Week 1 Jan. 11–15	Course Introduction	**Lecture:** How you will be graded, why study the oceans, components of the scientific method
2 Weeks 2–3, Jan. 18–29	Origins	**Lecture:** Origin of the universe, history of oceanography, origin of earth and oceans, geologic time **Discussion:** Polynesian navigation

3	Weeks 4–5, Feb. 1–12	Formation and evolution of ocean basins	Ocean floor physiography, continental drift, seafloor spreading, plate tectonics and hotspots, sediments and coastal processes **Discussion:** Sea level rise
4	Weeks 6–7, Feb. 15–26	Radiative forcing and ocean circulation	**Lecture:** Radiative forcing, Surface heating/cooling, thermohaline circulation, differential heating and heat redistribution, ocean surface circulation, mesoscale circulation **Discussion:** Ocean warming
5	Weeks 8–9, Mar. 1–12	Waves and tides	**Lecture:** El Nino, Wind waves, non-wind forced waves, tides **Discussion:** Ocean garbage patches
6	Weeks 10–11, Mar. 22–Apr. 2	Life in the oceans: Lower trophic levels	**Lecture:** Origins of life, evolution and classification of life, marine habitats and lifestyles, marine primary producers, marine consumers **Discussion:** TBD
7	Weeks 12–13, Apr. 5–16	Life in the oceans: Higher trophic levels	**Lecture:** Diversity of marine animals, adaptations for survival, marine food webs and fisheries, deep sea biology, coral reefs **Discussion:** TBD
8	Weeks 14–16, Apr. 19–May 5	Climate Change: Past and Future	**Lecture:** Carbon cycle, sedimentary record, past climate, future climate **Discussion:** Geoengineering

VII. Asynchronous learning

Each module will open in Laulima on the Sunday prior to the first week of the module, which will provide students access to the asynchronous course content. The asynchronous portion of each module is composed of:

- A series of video mini-lectures and readings created and curated by course instructors.
- Quizzes (4–5 per module)
- Exam (1 per module)

Quizzes

Quizzes will appear after lecture videos and readings to test comprehension of key concepts. You can retake quizzes an unlimited amount of times before the end of the module. The highest score will count towards your grade. Note that the questions won't always be the same each time you re-take the quiz.

There will be 4–5 quizzes per module, with about 35–40 quizzes total. Since there are so many, each individual quiz is worth only ~0.5% of your grade, but together are worth a total of 20% of your final grade. Keeping up and doing well on these will help your final grade a lot, but missing a single quiz will not hurt your grade very much.

As such, **course policy will be to not reopen quizzes if you miss a quiz deadline.** If you miss one or two, for whatever reason, it will not make a significant impact on your grade, but make sure to not make it a habit.

Exams

Each module will culminate with a 30-minute exam. Module exams will be given on the last day of each two-week module (i.e., Friday of the second week). The exception is the last module, for which the exam will be given during exam week. This last exam will not be cumulative; it covers only material from the last module.

Each exam will open in Laulima at 4am on the day of the exam. You will have until 2am the next day to complete the exam. **Once you open the exam, you will have 30 minutes to complete it.**

The exams are open notes, but they are meant to be closed internet. We cannot, of course, monitor your internet usage, but the instructors will purposely create exam questions with answers that are not easily gleaned from an internet search. As such, if you rely on looking up each answer for the exam (either in the course material or via google), you will not have time to finish, and you will do poorly. It is important that you prepare for these exams by studying the material and aggregating your notes in advance.

Exams will be composed of a mix of roughly 20 multiple-choice, true-false, and fill-in-the-blank questions followed by two short answer/essay questions. Past exams are available here: http://www.soest.hawaii.edu/oceanography/courses_html/OCN201/exams.html. **Please note that the current course format, instructors, and material are different from versions of the course linked above.** Do not expect that reviewing these past exams will prepare you for all of

the material you are expected to know. We are posting this link because some students will have access to past exams either way and we want to level the playing field.

VIII. Synchronous learning

The typical schedule of synchronous interactions within each module will be as follows:

	Monday	Tu	**Wednesday**	Th	**Friday**
Week 1			Discussion sections (DS) 10:30-11:20am DS Wed. A DS Wed. B 12:30-1:20pm DS Wed. C DS Wed. D		Discussion sections (DS) 10:30-11:20am DS Fri. A DS Fri. B 12:30-1:20pm DS Fri. C DS Fri. D
Week 2			Review sessions (RS) 10:30-11:20am RS 1 12:30-1:20pm RS 2		**Module Exam** (not synchronous)

Discussion sections

Discussion sections are a **required** component of the course that provide students an opportunity to engage directly with instructors and TAs, as well as their classmates. In discussion sections we will:

- Discuss and clarify course content.
- Learn about historical and contemporary context for the ocean sciences.
- Discuss the societal implications of our changing ocean environment.

Each student will be assigned to a single discussion section (DS) led by one of the TAs. You will have the opportunity to indicate preferences for your assigned section, but we cannot guarantee you will get your first choice. Each discussion section will meet ONCE every two weeks. For example, if you are in DS Wed. C, you will meet with your discussion section only on the first Wednesday of every module at 12:30pm).

Discussion section assignments

Each discussion section will have two assignments that you will submit via Laulima (one before and one after):

1. **Prior to each discussion section**, you will be assigned materials (video or reading) to review. You will be asked to summarize the main takeaways of those materials and to formulate opinions and/or questions about the concepts.

2. **After each discussion section**, you will be asked to write 2-3 paragraphs synthesizing the discussion from your section and stating how and why your opinions did or did not change.

Review sessions

The review sessions will be led by one of the course instructors and are designed to help synthesize and clarify course material prior to the exam for each module. Review sessions will be held synchronously on the second Wednesday of each module.

IX. Grading

Exams: 60%, Quizzes: 20%, Discussion Section assignments: 20%.

We will drop your lowest exam score. The remaining 6 exams will each be worth 10% of your overall grade.

We may curve grades upward at the end of the class (i.e. your grade could be improved), but we will not curve downward.

X. Classes during a pandemic

This semester will not be normal. We will all do our best under difficult circumstances and should approach our academic lives with understanding and patience, both for ourselves and others.

- Communication: please let us know if you encounter issues, either with course design, teaching, or other obstacles to your learning.
- Your health and well-being are paramount. We will do what we can to support you and please let us know if we can help.
- This is the first year this course is fully online. We are doing what we can to make this a smooth process and to facilitate your learning experience. If you run into issues with the online delivery, let us know and we'll try to help.

XI. Course Technology

This course is delivered in Laulima, a Learning Management system (Laulima (Sakai) Accessibility). The majority of course materials and all quizzes and exams will be accessed through the course Laulima site.

Please be aware that Laulima

- will be unavailable on a daily basis from 3:00am-4:00am HST for server backup and maintenance.

- automatically logs you out *if it does not detect activity for two hours*. A warning message will appear notifying you of the lack of activity. Activity is defined as clicking a button in Laulima such as "Save Draft" or "Next" (in a test), clicking on a course tab, or taking an action that sends information to the server.

Other technological tools are used in this course. Remember to review privacy/security policies before using technologies for online learning. Contact me if you would like to discuss the use of alternate options or technologies.

- Videos will be posted on YouTube or Google Drive.
- PDFs, etc. will be made available through Laulima.
- Written assignments will be submitted via Laulima.

XII. Required Hardware and Software

- A more recent model desktop or laptop (2014 or later model), either Windows or Mac is recommended
- Reliable high-speed (Cable or DSL) Internet connection
- A recent version of Firefox Browser. Download from Firefox Browser Update if you don't have it.
- Adobe (Acrobat) Reader. Download is free.
- Please note that the UH Library has laptops and Wi-Fi hotspots available for students to borrow. Contact the University Librarian (Clem Guthro, guthroc@hawaii.edu) for more information about how UH can support your technological needs.

XIII. Minimum Technical Skill Requirements

In this course you would be required to utilize the Laulima learning management system to navigate and access course content. You will need to be proficient with basic computer skills such as word processing, navigating Internet browsers, downloading/uploading files, etc.

XIV. Technical Support

- UH ITS Computer Help Desk – email help@hawaii.edu or call 956-8883 (or toll free at 1-800- 558-2669 from the neighbor islands)
- Laulima Assistance Form – Click on the Request Assistance link at the bottom of any Laulima Page to fill out and submit a question and get your answer via email.
- Laulima Student Support

- Information Security for Students

XV. Academic Support

University of Hawai‘i Online Learning Academy (all students)

- The **Online Learning Academy** (OLA) provides FREE, one-on-one English, math and science tutoring, by highly-qualified college tutors, for the University of Hawai'i (UH) System students statewide. They offer tutoring in the following subjects: basic math, pre-algebra, algebra, geometry, trigonometry, calculus, biology, chemistry, physics, environmental science, writing, and language arts.

UH Mānoa

- Hamilton Library
- Distance Learning at UH Mānoa
- Writing Center
- Learning Assistance Center

XVI. Zoom suggestions / etiquette

During discussion sections we would certainly like to see you, so if you can turn your camera on, that would be great. We do understand, however, if for some reason you cannot use your camera. Either way you are expected to participate. We also suggest the use of a Zoom virtual background if your computer can handle it. In general, having your microphone muted when you aren't actively speaking is a good idea to keep background noise to a minimum. Holding down the spacebar will temporarily unmute you when you want to speak, or you can click on the microphone icon.

During review sessions everyone will be muted by default. You can either type questions into the chat box, or raise your virtual hand and the instructor will call on you. We will also give you the option to submit questions ahead of the review session so that you can be sure your questions will be addressed.

Zoom sessions will open 5 minutes prior to the start of class. Please be on time so that we can use our time together effectively.

Zoom links will be posted on Laulima.

XVII. University Policies and Procedures

The University of Hawai'i is an equal opportunity/affirmative action institution. It is committed to a policy of nondiscrimination on the basis of race, sex, victims of domestic or sexual violence, gender identity and expression, age, religion, color, national origin, ancestry, citizenship, disability, genetic information, marital status, breastfeeding, income assignment for child support, arrest and court record (except as permissible under State law), sexual orientation,

national guard absence, or status as a covered veteran. For additional details, visit the UH Systemwide Policies and Procedures Information System (PPIS) site.

Student Conduct

Review the UH Systemwide Student Conduct Code for more information. Review the Online Netiquette and Privacy Tips to prepare yourself when interacting online.

Academic Honesty

Acts of dishonesty, including but not limited to cheating, plagiarism, or other forms of academic dishonesty will not be tolerated. Instances of academic dishonesty will result in a zero on the assignment or exam and possible referral to the Dean of Student Services.

Cheating is an act of academic dishonesty and includes, but is not limited to:

- use of any unauthorized assistance in taking quizzes, tests, or examinations;
- use of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments;
- the acquisition, without permission, of tests or other academic material belonging to a member of the UH faculty, staff or student body; and
- engaging in any behavior specifically prohibited by a faculty member in the course syllabus or class discussion.

Plagiarism is also an act of academic dishonesty and includes, but is not limited to:

- the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgement.
- It also includes the unacknowledged use of materials prepared by another person or agency engaged in the selling of term papers or other academic materials.

Academic dishonesty also includes:

- Furnishing false information to any UH official, faculty member, or office.
- Forgery, alteration, or misuse of any UH document, record, or form of identification.

UH Title IX

- The University of Hawai‘i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking (UH Title IX). If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you.

- If you would like to report incidents of sex discrimination or gender based violence, contact your campus Title IX Coordinator or submit the online reporting form.
- If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, contact your campus' confidential resource.

Accommodation Statement

The University of Hawai'i is committed to a barrier-free campus and provides accommodations to ensure students with disabilities equal access to education. We agree to make academic adjustments to ensure non-discrimination of students with disabilities. This commitment is in accordance with applicable state and federal laws, including the Americans with Disabilities Act, and Sections 504 and 508 of the Rehabilitation Act.

Under the Americans with Disabilities Act (Title II) and the Rehabilitation act of 1973-section 504 and 508, individuals with disabilities have protections against discrimination and are assured access to programs, services and activities. For more information see "Americans with Disabilities Act" and "Rehabilitation Act of 1973 – Section 504 or Section 508".

Students must self-identify to the appropriate Disability Services Office and complete the intake process before receiving reasonable accommodations. To ensure the prompt and effective provision of accommodations, students should contact the Disability Services Office as early as possible. Find your disability services office contact for your home campus.

- **UH Mānoa**
  Visit the KOKUA website. KOKUA can be reached at (808) 956-7511 or (808) 956-7612, email: kokua@hawaii.edu.

Student Support

- Academic Advising
- Bookstore
- Career Services
- Counseling Services
- Registration

Financial Aid Statement

If students do not begin attendance in a course or stop participating in a course, Title IV funds must be returned according to Federal Return of Title IV funds regulations (34 CFR 668.21(a)). This means you may be required to return some (or all) of the financial aid you have received. It is very important to remember that colleges are required to take steps necessary to ensure that students are academically engaged in order to justify the disbursement of Federal Title IV student aid funds. If at any time your plans change and you no longer plan to participate in the

courses in which you enrolled, you must contact the financial aid office to minimize any possible negative financial impact.

For more information on financial assistance for your education, please contact your home campus financial aid office. Financial assistance may include grants, scholarships, and other resources to help you pay for the cost of college. A financial aid adviser will be able to help you navigate this process to determine your eligibility for these funds.