



Oceanographic Research

Course Overview

How do coral reef ecosystems function in the Anthropocene? The valuable ecosystem goods and services provided by coral reefs are being lost as they face a suite of local and global stressors including pollution, overfishing, and climate change. Research and monitoring are needed to understand how coral reefs are faring in the Anthropocene. In this course, you will receive an introduction to field methods in tropical marine ecology and oceanography research. Then, you will apply these techniques to carry out your own collaborative research projects.

There are two electives for oceanographic research, Directed Oceanographic Research (DOR) and Practical Oceanographic Research (POR). DOR requires a prerequisite of three lab courses (or research experiences). Students enrolled in DOR will be conducting independent research projects. POR does not require any prerequisites. Students enrolled in POR will be conducting collaborative (i.e., group) projects. The course evaluation is the same for both electives.

Course Instructors: SEA faculty

Course Footprint: This program is 4 weeks long. There is a shore component on a Pacific Island followed by a sailing expedition that includes anchorages at nearby coral reefs.

Course Goals and Learning Outcomes

- 1) Study local and global human impacts on coastal ocean and coral reef ecosystems
- 2) Demonstrate proficiency in snorkel survey techniques and oceanographic deployments
- 3) Critically analyze, interpret, and visualize authentic marine science data
- 4) Communicate research through written and oral presentations

Course Philosophy and Approach

Undergraduate research experiences have been shown to increase science identity and self-efficacy (Carpi et al. 2017; Cooper et al. 2020). Therefore, this course emphasizes the development of research and science communication skills needed to study Pacific coral reef ecosystems. Our approach to developing these skills throughout the shore and sea components is two-pronged: instruction and hands-on activities guided by experts in the field.

The shore component classes aim to build foundational knowledge of coral reefs and regional oceanography, learn field research and science communication techniques, and develop collaborative, hypothesis-driven research projects. These classes will be a combination of lectures by coral reef experts, literature review and discussion, and hands-on activities. There will be 'Nautical Science Seminars' during the first week on shore, so you can build skills and knowledge needed to operate our oceanography research platform, *SSV Robert C. Seamans*. After the shore component, we will embark



on *SSV Robert C. Seamans* to study regional oceanography influencing reef ecosystems and conduct additional field surveys of reefs at other Pacific islands. Under mentorship of professional crew and faculty, you will collect and analyze real-world data that will be presented to the ship's company and submitted as a written report following formats commonly used in sciences.

Course Evaluation

Assignment	Percent of Grade
Shore Component Participation	15
Sea Component Participation	15
Snorkel Participation and Competency	20
Coral Reef Research Project	30
Oceanography Project	20

Shore Component Participation: The shore component will include lectures by coral reef experts, reading and evaluating scientific literature, and field trips including snorkeling. You should be a fully engaged member of our learning community by showing up to classes prepared, contributing to class discussions and hands-on activities, and being respectful to your peers and instructors.

Sea Component Participation: The designation of 'sailing school vessel' means there are no passengers on board. That means YOU are an important member of the crew and shipboard community. You are expected to stand watch on deck and in the laboratory as well as contribute to a safe, inclusive environment. By the end of the sea component, you should demonstrate proficiency in conducting oceanographic deployments and collecting and processing seawater and biological samples.

Snorkel Participation and Competency: You will be working in research teams to collect chemistry and ecology data from coral reefs using snorkel-based techniques. You are expected to contribute to the team effort to plan your snorkel and snorkel your plan. Everyone must help with post-snorkel processing of samples and photos as well as data entry. By the end of the program, you should show growth in your research skills and effective communication and teamwork.

Coral Reef Research Project: You will conduct hypothesis-driven research by analyzing and interpreting coral reef data. The final products of this project will be a poster which you will present to your shipmates and a paper to be submitted to the instructor. We will have weekly mentor meetings to support your research progress throughout the semester.

Oceanography Report: Working with your watch, you will examine trends in oceanographic conditions along our cruise track. Together, you will present your observations to the ship's company near the end of the program.

Belonging, Accessibility, Justice, Equity, Diversity, and Inclusion (BeAJEDI)



Belonging

We are committed to creating a learning environment that is welcoming, inclusive, and accessible to SEA's diverse student body and faculty. In fact, this is one of our primary responsibilities as your instructors. Everyone is expected to be respectful towards one another – even when there is a difference of opinions – to foster a positive learning environment and community. This courtesy should be extended to guests, too. Additionally, we will respect the public health and safety guidelines of local communities in which we live and study.

Accessibility

Course materials will be accessible through Blackbaud. Class presentations and required readings will be posted at least 24 hours in advance. The presentation slides will include teacher notes of what is being said in class. You may have cell phones, food, beverages, etc. in the classroom. Likewise, feel free to stand up and move around the classroom if you are getting restless. (Students in the past have knitted or created friendship bracelets.) Please keep in mind whether your actions are respectful to yourself, your peers, and your instructors. We should see you are still engaged in learning and participating in class discussions and hands-on activities. If we see anything that is becoming a problem, we may take away these privileges.

Justice

We respect and honor the Native Pacific Islanders still connected to these lands and are willing to learn from their ways of life. We also recognize these words are not enough and need to be followed with action steps. Thus, we are committed to ongoing efforts to decolonize our curriculum and engage in antiracist practices.

Equity

We expect you to attend all classes and field trips, but we recognize life gets in the way sometimes. If you need to miss a class or watch, please let us know ahead of time. This will allow us to find alternate ways to ensure you are supported, personally and academically. You will never be asked to submit 'proof' of illness or personal/family emergencies.

It is your responsibility to learn how to properly cite scholarly work by other scientists. Plagiarism will not be tolerated. Please talk to me if you would like to learn more about citations and plagiarism.

Inclusion

If you anticipate or encounter barriers to participating, please let us know immediately so we can work together to overcome this barrier. If you have a documented or undocumented disability that may require accommodations, please let us know in person or via email as soon as possible so we can support you. Similarly, please let us know if you do not feel respected or safe in this community so we can work together to create a more inclusive environment.



Class Schedule

Date	Time	Class	Topic
May 23	0900-1000	Coral Reefs	Intro to Pacific Coral Reefs and Human Impacts
	1015-1215	POR	<ul style="list-style-type: none">• Methods for Monitoring Coastal Ocean and Coral Reef Ecosystems & Our Science Plan• Mini Literature Reviews
May 24	0900-1000	Coral Reefs	Coral and Algal Physiology
	1015-1215	Nautical Science	Communication, Teamwork Activity, Boat Terminology
May 25	0900-1000	Coral Reefs	Coral Reef Ecology and Biogeochemistry
	1015-1215	POR	<ul style="list-style-type: none">• Fish and Invertebrate ID Activity• Develop Groups and Choose Research Questions
May 26	0900-1000	Coral Reefs	Guest Lecture: Hannah Barkley (NOAA)
	1015-1215	Nautical Science	Chart Basics, Intro to Plotting, Anchoring
May 27	0900-1000	Nautical Science	Weather
	1015-1215	POR	Prepare for Snorkel Surveys