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About SEA

Sea Education Association (SEA) is a private, non-profit educational institution that enrolls students from colleges and high schools around the United States. Our primary program, SEA Semester®, is designed for undergraduates to study the ocean through an integrated curriculum, including science, policy, and humanities. Located in Woods Hole, Massachusetts, SEA is a member of the world renowned scientific community that includes Woods Hole Oceanographic Institution, Marine Biological Laboratory, U.S. Geological Survey, National Marine Fisheries Service, and Woods Hole Research Center, making it an ideal setting for studying the world’s oceans.

Undergraduates who successfully complete a SEA Semester program receive 17-18 semester credits (12 credits for the SEA Summer Session or Trimester Program). These credits are either issued through their home institution (colleges or universities affiliated with SEA) or through transfer credit from our academic partner, Boston University.

SEA is committed to making our programs affordable and accessible to all motivated and qualified students. Need-based financial aid and merit scholarships are available for every program.

Key Facts

Shore Campus: Woods Hole, Massachusetts

At-Sea Campuses: Sailing research vessel SSV Robert C. Seamans (Pacific)
Sailing research vessel SSV Corwith Cramer (Atlantic)

Academic Credit: 17-18 credits (SEA Semester), 12 credits (SEA Summer Session, SEA Trimester Program) issued by Boston University

Financial Aid: Available for every SEA Semester program. Over $1,000,000 per year is awarded. Over 50% of our students receive some sort of financial assistance; out of those, 95% receive aid from SEA.

Majors Represented by Program:
- Ocean Exploration – all majors
- Oceans & Climate – upper-level science majors
- Colonization to Conservation in the Caribbean – humanities, social science, geography, environmental science/studies majors
- Sustainability in Polynesian Island Cultures & Ecosystems – humanities, social science, geography, environmental science/studies majors
- Energy & the Ocean Environment – upper-level science majors, policy majors
- Marine Biodiversity & Conservation – upper-level science majors, policy majors
- SEA Summer Session/SEA Trimester Program – all majors

Maximum Number of Students: 25 per program

Independent Research Project: Required for every SEA Semester student
Ship Specifications

SEA vessels were custom designed and built for SEA to be safe and effective educational research platforms. As such, our vessels fly the United States flag and are inspected and certified by the United States Coast Guard as Sailing School Vessels (SSV). Sailing School Vessels are required to meet stringent safety standards that differ from those of a passenger vessel on a comparable route. Both SEA vessels meet or exceed the safety requirements for their class.

SSV Robert C. Seamans

Year Built: 2001
Rig: Brigantine
Cruising waters: Pacific Ocean
Sparred length: 134’ 6”
Length on Deck: 111’ 6”
Draft: 14’
Beam: 25’ 6”
Rig Height: 115’
Sail area: 8,554 square feet
Tons: 211 ITC
Main Engine: Caterpillar-3408, 455 HP
Hull: Steel

SSV Corwith Cramer

Year Built: 1987
Rig: Brigantine
Cruising waters: Atlantic Ocean
Sparred length: 134’
Length on Deck: 98’
Draft: 12’6”
Beam: 26’
Rig Height: 110’
Sail area: 7,500 square feet
Tons: 158 GRT
Main Engine: Cummins-KTA19, 500 HP
HP Hull: Steel
Academic Programs

SEA offers six semester-length program options, one summer session, and one trimester program to meet the interests of any undergraduate major. Each program includes an initial shore component at the SEA campus in Woods Hole, MA followed by a sailing research voyage aboard the Robert C. Seamans (Pacific) or Corwith Cramer (Atlantic). Three programs culminate with a final shore component for synthesis of the research projects. See Appendix C for detailed course content, and visit www.sea.edu/academics for full course descriptions.

SEA Semester: Ocean Exploration
Ocean Exploration takes an interdisciplinary approach to help students develop a broad understanding of the sea and its impact on human society. The curriculum combines data and perspectives from oceanography, the humanities, social sciences, and public policy together with practical skills in nautical science (including meteorology, astronomy, and physics). Course content is developed according to the specific cruise track of each semester, either in the Caribbean Sea, North Atlantic, North Pacific, or South Pacific Oceans. This program is designed for students with a wide diversity of backgrounds and interests and includes an independent research project in oceanography.

Courses:
- Oceanography (3 credits)
- Maritime Studies (3 credits)
- Nautical Science (3 credits)
- Practical Oceanography I (4 credits)
- Practical Oceanography II (4 credits)

SEA Semester: Oceans & Climate
Oceans & Climate is an upper-level oceanography semester, informed by perspectives from the social sciences, humanities, and policy, that focuses on the pressing issue of global climate change. Onshore, guided by SEA faculty and leading climate researchers invited from across the country to serve as visiting faculty, students study topics in oceanography and ocean policy and learn skills necessary to operate a sailing research vessel. In addition, students design an independent research project to be carried out during the 3,000 mile research cruise crossing the equatorial Pacific. The curriculum is tailored to upper-level science majors.

Courses:
- Oceans in the Global Carbon Cycle (4 credits)
- Ocean Science and Public Policy (3 credits)
- Nautical Science (3 credits)
- Oceanographic Field Methods (3 credits)
- Directed Oceanographic Research (4 credits)

Prerequisite: A minimum of three lab science courses, including one at the 300-level or higher. May be waived pending SEA faculty approval.
SEA Semester: Colonization to Conservation in the Caribbean

Colonization to Conservation in the Caribbean is a social sciences and humanities-intensive semester focusing on understanding 500 years of change in the multicultural Caribbean region from European contact to the present. In this semester students explore how to document these changes using the source materials and methodological approaches of both the humanities and sciences. Aboard the Corwith Cramer, students will witness firsthand the change wrought on the cultures and environments of the Caribbean as the ship visits two to three island nations during the sea component. The curriculum is designed for students with a stronger focus in the humanities and social sciences. Previously titled Documenting Change in the Caribbean.

Courses:
- Maritime History and Culture (4 credits)
- Marine Environmental History (4 credits)
- Nautical Science (3 credits)
- Oceanography (3 credits)
- Practical Oceanographic Research (3 credits)

SEA Semester: Sustainability in Polynesian Island Cultures & Ecosystems

The use of the term "sustainability" has become increasingly common in a time of profound environmental and economic change. Amidst these changes, questions of the future security of individuals, societies, and the environment around us naturally arise. Sustainability in Polynesian Island Cultures and Ecosystems sets out to examine these interactions using the isolated small islands of French Polynesia as a case study. The curriculum is designed for students with a specific interest in environmental studies and sustainability.

Courses:
- Maritime History and Culture: Island Peoples (4 credits)
- Marine Environmental History: Island Environments (4 credits)
- Nautical Science (3 credits)
- Oceanography (3 credits)
- Maritime Studies: European Perspectives of Polynesia (3 credits)

SEA Semester: Energy & the Ocean Environment

The future of ocean-derived energy is a controversial topic but is also imperative to understand. In this semester, students investigate a number of ocean energy resources including offshore oil, gas hydrates, wind, waves, tides, and currents. As we look to the ocean to supply more energy, how do we balance the desire for both economic stability and ocean health? Students explore this question and many others as they address the future of energy and the world's ocean environments. The curriculum is especially suited to environmental science/studies majors.

Courses:
- Oceans in the Global Carbon Cycle (4 credits)
- Ocean Science and Public Policy (3 credits)
- Nautical Science (3 credits)
- Oceanographic Field Methods (3 credits)
- Directed Oceanographic Research (4 credits)

Prerequisite: A minimum of two lab science courses, at least one at the 200 level OR two sequential 100-level labs. May be waived pending SEA faculty approval.
SEA Semester: Marine Biodiversity & Conservation
The oceans cover 70% of our planet and yet less than 1% of their area is protected. Scientists estimate that oceans contain more than one million species and report that less than one-quarter of these have been identified. Undiscovered ocean biodiversity has the potential to transform medicine, industry, environmental remediation, and energy production, but is threatened by pollution, habitat destruction, fishing, and climate change. With limited knowledge of biodiversity, we lack the data needed to plan rational and effective protection and conservation of the ocean. This semester challenges students to integrate the scientific study of marine biodiversity with conservation planning for the Atlantic high seas area. Specifically designed for upper-level science majors, or policy majors with a science background.

Courses:  Advanced Topics in Biological Oceanography (4 credits)
          Ocean Science and Public Policy (3 credits)
          Directed Oceanographic Research (4 credits)
          Advanced Ocean Policy Research (4 credits)
          Nautical Science (3 credits)

Prequisite: A minimum of three lab science courses, including one at the 300-level or higher. May be waived pending SEA faculty approval.

SEA Summer Session/SEA Trimester Program
The SEA Summer Session and the SEA Trimester Program offer students a comprehensive understanding of the world’s oceans through interdisciplinary coursework on shore and at sea. The curriculum is modeled after the Ocean Exploration semester but designed for motivated students who can’t fit a SEA semester into their academic schedule. These 8-week programs combine 4 weeks of academic study in Woods Hole with 4 weeks of sailing in the Pacific, and are offered during the summer and during the late spring (alternate years). The interdisciplinary curriculum suits all majors.

Courses:  Oceanography (3 credits)
          Maritime Studies (3 credits)
          Nautical Science (3 credits)
          Practical Oceanographic Research (3 credits)


**Student Research at SEA**

Part of every SEA Semester experience is the oceanographic research project students design and complete, on their own or as a member of a student team. Building on the lessons and concepts of physical, chemical, geological, and biological oceanography introduced during the shore component in Woods Hole, students go to sea prepared to ask the important questions of and pursue the answers to the global challenges of today. Student research at SEA recognizes the relationship between humanity and the ocean, and the importance of stewardship as we work to learn more about this important resource.

Our students engage in a level of research rarely found at the undergraduate level. As a result, many SEA Semester projects lead to conference presentations, publications, completion of a senior thesis, or the pursuit of a topic at the graduate level.

SEA Semester students conduct research in a wide variety of areas, including:

**Marine Pollution:** SEA gained international attention in Summer 2010 by conducting the first federally funded research expedition to study plastic pollution in the North Atlantic (www.sea.edu/plastics/). This work is ongoing with a recent NSF collaborative research grant that incorporates student research to look at the interaction between microbes and plastic marine debris.

**Climate Change:** The global ocean covers about 70% of the earth’s surface and plays a pivotal role in the regulation of the planet’s climate system. Understanding how the various pathways work, and how they may change over time, is crucial in our attempts to forecast earth’s changing climate. NASA recognized the value of SEA student research contributions by funding instrumentation that contributes to student projects and also the global database for climate research.

**Marine Biodiversity:** Scientists estimate that the oceans contain more than one million species and report that less than one-quarter of these have been identified. A thorough understanding of ocean biodiversity has the potential to transform medicine, industry, environmental remediation and energy production. With support from a NSF curriculum development grant, SEA students use some of the latest techniques and contribute to international databases documenting marine species diversity.

**Ocean Conservation:** From shallow, tropical reefs to the most remote regions of the open ocean, SEA Semester students have studied multiple marine communities. As humanity continues to deplete fisheries and disturb marine ecosystems for commercial and recreational purposes, it is becoming ever more critical to document, monitor, and work toward a sustainable use of these shared, natural resources.

For more information about faculty and student research at SEA, visit [http://www.sea.edu/academics/research](http://www.sea.edu/academics/research).
Course Descriptions

Full course descriptions for each SEA Semester program may be found on the Academic section of our website at www.sea.edu/academics.

SEA Faculty

Academic Dean – Dr. Paul Joyce
Dr. Joyce joined SEA in 1988 as a faculty member and was appointed Dean in 2003. He received his MS in Biology at the University of Notre Dame and earned his PhD in Biological Oceanography from the University of Rhode Island. His research interests include parasitology, ocean pollution and the Cariaco Basin (Venezuela).

Associate Dean, Institutional Relations and Research – Dr. Erik Zettler
Dr. Zettler joined SEA in 1994 as science coordinator and was appointed Associate Dean in 2009. He received his BS in biology at Allegheny College, MSc in Biology at University of Waterloo, and earned his PhD in Microbial Ecology from the Autonomous University of Madrid. Visiting faculty member, Shoals Marine Lab (Cornell University and University of New Hampshire). His research interests include protists in extreme environments, plankton community structure, and the interaction between microbes and plastic marine debris.

Associate Dean, Student and Financial Services – Virginia Land McGuire
Captain Land McGuire joined SEA in 2000 as a faculty member and was appointed Associate Dean in 2008. She received her BA in English and American Studies from Wellesley College and earned her EdM from Harvard University.
U.S. Coast Guard Licensed Master, Ocean Auxiliary Sail Vessels of 1600 Tons

Oceanography

Dr. Deb Goodwin
PhD University of New Hampshire, Oceanography
MS University of Washington, Biology
BA Carleton College, Earth Science Systems
Research interests: The development and application of coastal ocean observing systems throughout the greater Gulf of Maine and North Atlantic regions, including monitoring of the marine environment with autonomous buoys and remote sensing. Hydrographic and optical forces influencing phytoplankton dynamics.

Dr. Kara Lavender Law
PhD Scripps Institution of Oceanography, Physical Oceanography
BS Duke University, Mathematics
Research interests: Plastic marine debris and ocean circulation; Large-scale and mesoscale ocean circulation; intermediate and deep water formation in the North Atlantic and its role in the meridional overturning circulation; methods of statistical objective analysis and use of subsurface floats as ocean observers.
Dr. Chuck Lea
PhD  Texas A&M University, Biological Oceanography
MS  Texas A&M University, Biological Oceanography
BS  University of Colorado, Boulder
Research interests: Marine invertebrates, neustonic and pelagic cephalopods, especially the distribution of cephalopods and pelagic zoogeography.

Dr. Jeff Schell
PhD  University of Wisconsin, Madison, Zoology with emphasis in aquatic ecology
MS  SUNY Stony Brook, Marine Environmental Science
BS  College of the Holy Cross
Research interests: Fundamental ecological questions concerning the role of environmental variables, disturbance and behavioral adaptations on the distribution, diversity and composition of marine and freshwater animal communities.

Dr. Amy Siuda
PhD  University of Connecticut, Biological Oceanography
BS  Middlebury College, Biology and French
Research interests: Importance of trophic interactions for control of planktonic primary production; direct and indirect impacts of copepods on the lower food web and how phytoplankton size and elemental composition modulate these effects.

Dr. Jan Witting
PhD  Northeastern University, Marine Biology
BS  Northeastern University, Marine Biology
Research interests: Coral feeding ecology, an important link in benthic-pelagic coupling in tropical waters; design and construction of autonomous underwater vehicles.

Maritime Studies

Dr. John Jensen
PhD  Carnegie Mellon University, Social History
MS  Carnegie Mellon University, History and Policy
MA  East Carolina University, Maritime History and Nautical Archaeology
BA  Lawrence University, History
Adjunct Professor of History, University of Rhode Island Graduate Faculty, and at the Frank C. Munson Institute of American Maritime History at Mystic Seaport; Current research includes maritime cultural landscapes and frontiers, the Great Lakes, marine cultural resource policy, public health and medicine, and museums.

Dr. Mary Malloy
PhD  Brown University, American Civilization
MA  Brown University, Museum Studies
MA  Boston College, American Studies
BA  University of Washington, Music
Museum Studies Faculty, Harvard University; Author of four books on the
maritime trade between New England and the North Pacific; numerous articles and monographs on whaling, African-American mariners, and women at sea; and appears on five albums of traditional sea music.

Nautical Science

Captain David Bank
U.S. Coast Guard Licensed Master, Ocean Auxiliary Sail Vessels of 1600 Tons
City and Guilds of London certification in wooden boat construction
BA Univ. of Pennsylvania, Natural Science
Professional interests: traditional vessel design and construction, high latitude navigation and exploration, the physics of sail, and meteorology for the mariner.

Captain Pamela Coughlin
U.S. Coast Guard Licensed Master, 1600 Tons, Steam, Motor, and Auxiliary Sail, Open Oceans Radar Observer Unlimited Able Seaman Unlimited, San Francisco Bay Ferry Boat Captain
Professional interests: Sail training, meteorology for mariners, traditional ship rigging, and wilderness medicine

Captain Jen Haddock
U.S. Coast Guard Licensed Master, Ocean Auxiliary Sail Vessels of 1600 Tons
BS in Mechanical Engineering with Ocean Studies: University of Rhode Island Masters in Marine Affairs, University of Rhode Island
Tall Ships America: Board Member
Professional interests: Meteorology for the mariner, Marine Policy and Law

Captain Elliot Rappaport
U.S. Coast Guard Licensed Master, Ocean Auxiliary Sail Vessels of 1600 Tons
BS Oberlin College, History
MS University of Maine, Science Education
Professional interests: Wooden boat construction, marine engineering, meteorology.

Captain Tom Sullivan
U.S. Coast Guard Licensed Master, Ocean Auxiliary Sail Vessels of 1600 Tons
Professional interests: Ship design, construction and maintenance, Meteorology, USCG history and customs.
Opportunities for Visiting Faculty at SEA

Guest Faculty
Embracing its place in the academic and oceanographic communities, SEA has long benefited from the participation of scholars and professionals visiting from other colleges, universities, and research institutions. During both the shore and sea components, there are frequent opportunities for faculty members from outside institutions to interact with our student body. Guest educators can give a single lecture ashore, spend six weeks working with our students in Woods Hole, go to sea with a SEA Semester class for one leg of a voyage or an entire sea component, or any combination of these activities.

Please contact Dr. Paul Joyce, Academic Dean, if you would like more information about this opportunity. See Appendix F for contact information.

SEA Colleague Voyages
One of the best ways to help faculty members and student advisors understand the nature of the SEA Semester program is to take them to sea aboard one of our ships. Each year we invite college and university faculty, advisors, and administrators to sail aboard the Corwith Cramer or the Robert C. Seamans on a short Colleague Voyage, which is specifically designed to allow participants to experience firsthand the research and education opportunities SEA Semester can afford their students. Colleague Voyage participants have the opportunity to stand navigational watches, discuss maritime studies and policy questions, deploy equipment, analyze data and discuss their ideas with fellow participants. One or more members of the SEA faculty and the Dean or Associate Dean sail with the participants to answer questions and help explain the student experience. There are no fees associated with the cruise; participating faculty simply provide their own travel to and from the ship.

Please contact Dr. Erik Zettler, Associate Dean of Institutional Relations & Research, if you would like more information about this opportunity. See Appendix F for contact information.
Collaborative Programs

Stanford @ SEA
Description: Offered exclusively to Stanford undergraduates, Stanford@SEA consists of five weeks of marine science (oceanography and marine physiology), maritime studies (literature, conservation, and policy) and nautical science (navigation, meteorology, astronomy), at Hopkins Marine Station in Monterey, California, followed by a five-week research cruise in the Pacific Ocean. Students develop an independent scientific research project while ashore and carry out the research at sea.

Collaborating Faculty: Dr. Barbara Block, Stanford University; Dr. Robert Dunbar, Stanford University

MIT/Woods Hole Oceanographic Institution Joint Program
Description: This is a 10-day program aboard the Corwith Cramer for entering MIT/WHOI Joint Program graduate students during their first summer of study in the graduate program. They are introduced to sampling techniques and equipment, chemical analyses and data processing while contributing to ongoing WHOI research projects.

Collaborating Scientists: Dr. Glen Gawarkiewicz and others.

Williams-Mystic Off-Shore Field Seminars
Description: Each semester, students and faculty from the Maritime Studies Program of Williams College and Mystic Seaport sail for ten days aboard the Corwith Cramer. The Williams-Mystic Offshore Field Seminar is designed to complement the Williams-Mystic curriculum by exposing students to a broad scope of experiences at sea.

Collaborating Faculty: Dr. Lisa Gilbert, Dr. Rich King

Harvard Department of Earth and Planetary Sciences
Description: At the beginning of specific academic semesters, the Department of Earth and Planetary Sciences (EPS) offers a field trip aboard the Robert C. Seamans. Sophomore EPS students take advantage of the state-of-the-art research tools available aboard the ship while participating in all aspects of running a sailing research vessel. The shipboard experience provides a real-world framework for their Harvard coursework.

Collaborating Faculty: Dr. Ann Pearson

Other Collaborative Programs
- Boston University Marine Program (BUMP)
- College of Charleston
- Colorado College
- Duke University
- Eckerd College
- University of Chicago
- University of San Diego
- Wharton School of the University of Pennsylvania
Collaborative Research

Over the years, collaborative research has led to over 45 publications. SEA collaborates with many domestic and international scholars including:

Oceanography
- Dr. Linda Amaral-Zettler, Marine Biological Laboratory
- Dr. Carol Arnoldi, UNC-Chapel Hill
- Dr. Barbara Block, Stanford University
- Dr. Amy Bower, Woods Hole Oceanographic Institution
- Dr. Ann Bucklin, Univ. of Connecticut
- Dr. Lanna Cheng, Scripps Institution of Oceanography
- Dr. William Curry, Woods Hole Oceanographic Institution
- Dr. Peter deMenocal, Lamont Doherty Earth Observatory
- Dr. Dan Distel, Ocean Genome Legacy
- Dr. Jeff Donnelly, Woods Hole Oceanographic Institution
- Dr. Robert Dunbar, Stanford University
- Dr. Casey Dunn, Brown University
- Dr. Eric Firing, University of Hawaii
- Dr. Lloyd French, Jet Propulsion Laboratory, California Institute of Technology
- Dr. Glen Gawarkiewicz, Woods Hole Oceanographic Institution
- Dr. Jim Gavel, University of Washington, Tacoma
- Dr. William Gilley, Hopkins Marine Station, Stanford University
- Dr. Cheryl Greengrove, University of Washington, Tacoma
- Dr. David Hyrenbach, Hawaii Pacific University
- Dr. Greg Johnson, NOAA PMEL
- Mr. Bruce Keafer, Woods Hole Oceanographic Institution
- Dr. Jean Lynch-Stieglitz, Georgia Institute of Technology
- Dr. Tracy Minster, Woods Hole Oceanographic Institution
- Dr. James Price, Woods Hole Oceanographic Institution
- Dr. Chris Reddy, Woods Hole Oceanographic Institution
- Dr. Peter Sorensen, University of Minnesota
- Dr. Peter Wiebe, Woods Hole Oceanographic Institution
- Dr. Michelle Wood, University of Oregon

Non-US Institution Collaborations:
- Dalhousie University, Halifax, Nova Scotia, Canada
- Universite de la Polynesie Francaise, Tahiti, French Polynesia
- Centro Interdiciplinario de Ciencias Marinas, La Paz, Mexico
- Gump Station, Moorea, French Polynesia
- CMAR, University of Costa Rica, San Jose, Costa Rica
- Institute for Ocean Sciences and Fisheries, Sidney, British Columbia, Canada
- University of the Azores
- University of West Indies, Mona
- St. Georges University, Grenada
- Ocean University of China
Maritime Studies Collaborators and Guest Speakers:
Mr. Rodney Avila, New Bedford Fishermen's Family Assistance Center
Dr. Gordon Bigelow, Rhodes College, English Department
Dr. Dan Brayton, Middlebury College, History Department
Dr. Jeff Bolster, University of New Hampshire
Dr. Jim Carlton, Williams Mystic Maritime Studies Program
Dr. Joyce Chaplin, Harvard University History Department
Ms. Susan Danforth, Curator of Maps, John Carter Brown Library
Dr. Susan Faraday, The Ocean Conservancy
Dr. Stuart Frank, Senior Curator, New Bedford Whaling Museum
Dr. Mark Hanna, Harvard University History Department
Dr. Jeff Howarth, Middlebury College Geography Department
Dr. Julia Lagus, European University of St. Petersburg, Russia
Ms. Christine Lynch, Senatorial Aid to Sen. Olympia Snow
Keitapu Maamaatuaiahutapu, Univ. of Fr.Poly.
Tahiari'i Pariente, Raiatea navigator and canoe builder
Ms. Joanna Pohlsenberg, Congressional Aid to Rep. Tom Udall
Dr. Andy Rosenberg, University of New Hampshire
Dr. Helen Rozwadowski, University of Connecticut
Vice Admiral Thomas Weschler, U.S. Navy (retired)
Dr. Alexei Yurchenko, European University of St. Petersburg, Russia
APPENDICES
## Appendix A: Sample Program Schedule

<table>
<thead>
<tr>
<th>Semester</th>
<th>Program</th>
<th>Cruise Track</th>
<th>On Campus</th>
<th>At Sea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Fall</td>
<td>Ocean Exploration</td>
<td>Woods Hole, MA to St. Croix, USVI</td>
<td>Aug – Sep</td>
<td>Oct – Nov</td>
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<tr>
<td>Early Fall</td>
<td>Ocean Exploration</td>
<td>San Diego, CA to Honolulu, HI</td>
<td>Aug – Sep</td>
<td>Oct – Nov</td>
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<tr>
<td>Fall</td>
<td>Oceans &amp; Climate</td>
<td>Honolulu, HI to Papeete, Tahiti</td>
<td>Oct – Nov</td>
<td>Nov – Dec</td>
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<tr>
<td>Fall</td>
<td>Colonization to Conservation in the Caribbean</td>
<td>St. Croix, USVI to Key West, FL</td>
<td>Oct – Nov</td>
<td>Nov – Jan</td>
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<tr>
<td>Early Spring</td>
<td>Ocean Exploration</td>
<td>Key West, FL to Key West, FL</td>
<td>Jan – Feb</td>
<td>Feb – Mar</td>
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<tr>
<td>Early Spring</td>
<td>Sustainability in Polynesian Island Cultures &amp;</td>
<td>Papeete, Tahiti to Honolulu, HI</td>
<td>Jan – Feb</td>
<td>Feb – Mar</td>
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<tr>
<td></td>
<td>Ecosystems</td>
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<tr>
<td>Spring</td>
<td>Ocean Exploration</td>
<td>Key West to St. Croix, USVI</td>
<td>Feb – Mar</td>
<td>Mar – May</td>
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<tr>
<td>Spring</td>
<td>Energy &amp; the Ocean Environment</td>
<td>Honolulu, HI to Honolulu, HI</td>
<td>Feb – Mar</td>
<td>Mar – May</td>
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<tr>
<td>Late Spring</td>
<td>Marine Biodiversity &amp; Conservation</td>
<td>St. Croix, USVI to Woods Hole, MA</td>
<td>Apr – May</td>
<td>May – June</td>
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<td></td>
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<tr>
<td>Late Spring</td>
<td>SEA Trimester Program</td>
<td>Honolulu, HI to Honolulu, HI</td>
<td>Apr – May</td>
<td>May – June</td>
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<tr>
<td>Summer</td>
<td>SEA Summer Session</td>
<td>Honolulu, HI to San Francisco, CA</td>
<td>May – June</td>
<td>June – July</td>
</tr>
</tbody>
</table>

Appendix B: Sample Cruise Tracks & Port Stops

Cruise Tracks
SEA Semester programs follow various cruise tracks throughout the year in the Atlantic, Pacific, and Caribbean depending on the research focus, season, and weather conditions. On some cruises, students sail thousands of miles across the open ocean. On others, they investigate a smaller area of the ocean more closely.

The number of port stops varies from program to program; the Summer Session is an open ocean passage with no port stops. All voyages offer the unique perspective that comes with being removed from everyday life on shore.

Port Stops
SEA travels to locations that are relatively unseen, untouched, and unspoiled. We seek out places the cruise ships don’t go, and visit beyond the resorts. Most importantly, our students arrive in port as mariners and scientists, not as tourists.

Frequently, port stops include organized tours to help our students reach more remote destinations. However, students also have the opportunity to explore on their own. In some locations, a long history of SEA visits has resulted in a close friendship with the local community. The arrival of an SEA vessel often gives way to a soccer game with local students or a ship’s tour for the local community.

For up-to-date information on the schedule, visit www.sea.edu/documents/schedule.pdf.
Appendix C: Course Content

The following section contains examples of one-page, condensed syllabi for SEA courses.

Marine Environmental History

<table>
<thead>
<tr>
<th>Topics</th>
<th>Topics (cont’d)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biodiversity and Introduced Species</strong></td>
<td><strong>Land Use Change, Tourism, Eco-tourism, Resource Management</strong></td>
</tr>
<tr>
<td>• Climate/currents</td>
<td>• The Environmental Impacts of “Consuming the Caribbean”</td>
</tr>
<tr>
<td>• Biomes</td>
<td>• Natural Disasters</td>
</tr>
<tr>
<td>• The Columbian Exchange</td>
<td>• Literature and Collective Imagination</td>
</tr>
<tr>
<td>• Introduced Species in the Americas</td>
<td>• The IMF and Jamaican Farming</td>
</tr>
<tr>
<td><strong>Resource Management</strong></td>
<td>• Discussion: Jamaica Kincaid’s <em>A Small Place</em></td>
</tr>
<tr>
<td>• Managing Ocean Resources</td>
<td>• Geographic History of Haiti and the Dominican Republic</td>
</tr>
<tr>
<td>• The International Law of the Sea</td>
<td><strong>Primary Texts</strong></td>
</tr>
<tr>
<td>• Marine Policy</td>
<td>Hans Sloane’s <em>Natural History of Jamaica</em> (1704); Benjamin Franklin’s <em>Chart of the Gulf Stream</em>; 17th-19th century bioprospecting guides; CARICOM Reports on Fisheries, Climate Change, Tourism and Pollution; and similar documents will be posted on the course website for analysis.</td>
</tr>
<tr>
<td>• The Conservation Movement and Modern Whaling</td>
<td><strong>Field Trips (from Woods Hole campus)</strong></td>
</tr>
<tr>
<td>• Haitian aquaculture.</td>
<td>John Carter Brown Library, Brown University</td>
</tr>
<tr>
<td>• Species vs Ecosystem Management</td>
<td>Haitian Tilapia Greenhouse, MBL</td>
</tr>
<tr>
<td><strong>Biodiversity 2</strong></td>
<td>Oyster Farm in Duxbury, MA</td>
</tr>
<tr>
<td>• Marine diversity</td>
<td><strong>Field Trips (in the Caribbean)</strong></td>
</tr>
<tr>
<td>• Zoogeography</td>
<td>Marine Sanctuary and Whale Museum at Silver Bank, Dominican Republic</td>
</tr>
<tr>
<td>• Speciation</td>
<td>Banana Plantation in Jamaica</td>
</tr>
<tr>
<td>• Plankton</td>
<td>Maroon Village of Mooretown, Jamaica</td>
</tr>
<tr>
<td><strong>Pollution</strong></td>
<td><strong>Evaluations</strong></td>
</tr>
<tr>
<td>• Marine debris</td>
<td>Research Paper 50%</td>
</tr>
<tr>
<td>• Biochemical Cycles – light, nutrients, productivity</td>
<td>Presentation 10%</td>
</tr>
<tr>
<td>• Harmful Algal Blooms</td>
<td>Logbook Presentation 10%</td>
</tr>
<tr>
<td>• Trophic Cascades</td>
<td>Reading Posts and Discussion 10%</td>
</tr>
<tr>
<td><strong>Climate</strong></td>
<td>Biological Illustrations and Description 10%</td>
</tr>
<tr>
<td>• Water Masses</td>
<td>At Sea Participation 10%</td>
</tr>
<tr>
<td>• Thermohaline circulation</td>
<td><strong>Climate Change, Tourism, Land Use Change</strong></td>
</tr>
<tr>
<td>• Natural Climate Cycles</td>
<td>• Cash crops</td>
</tr>
<tr>
<td>• Human Impacts</td>
<td>• Tourism</td>
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<tr>
<td>• Human impacts on climate and ocean chemistry</td>
<td>• Cruise Ship Industry</td>
</tr>
<tr>
<td>• Bathymetry</td>
<td><strong>Field Trips (in the Caribbean)</strong></td>
</tr>
<tr>
<td>• Biogeography</td>
<td>Marine Sanctuary and Whale Museum at Silver Bank, Dominican Republic</td>
</tr>
</tbody>
</table>

**Primary Texts**

Hans Sloane’s *Natural History of Jamaica* (1704); Benjamin Franklin’s *Chart of the Gulf Stream*; 17th-19th century bioprospecting guides; CARICOM Reports on Fisheries, Climate Change, Tourism and Pollution; and similar documents will be posted on the course website for analysis.

**Field Trips (from Woods Hole campus)**

John Carter Brown Library, Brown University
Haitian Tilapia Greenhouse, MBL
Oyster Farm in Duxbury, MA

**Field Trips (in the Caribbean)**

Marine Sanctuary and Whale Museum at Silver Bank, Dominican Republic
Banana Plantation in Jamaica
Maroon Village of Mooretown, Jamaica

**Evaluations**

Research Paper 50%
Presentation 10%
Logbook Presentation 10%
Reading Posts and Discussion 10%
Biological Illustrations and Description 10%
At Sea Participation 10%
Maritime History and Culture

**Topics**

**The Maritime Landscape**
- The Mariner’s Earth
- Pilot Charts

**Indigenous People & Cultures**
- Island Ecosystems
- Patterns of Migration
- Language & Material Culture
- Agriculture & Aquaculture

**European Expansion**
- Technological Underpinnings
- Maps and Charts
- Navigation Methods & Texts

**Colonial Demographics**
- The Impact of Disease
- Migration
- Enslaved & Indentured Labor

**Cultural Impacts**
- European Colonial Claims
- Missionaries
- Introduction of New Technology
- Exotic Stereotypes

**Plantation Agriculture**
- Foreign Management for Distant Markets
- Land Use Change

**War, Conflict & Competing Claims**
- The Spanish-American War
- World Wars

**Tourism in the 20th Century**
- Cruise Ships & All-Inclusive Resorts
- The Commodification of Culture
- Ecotourism

**The Future of Island Ecosystems**
- Cultural Sustainability
- Economic Impact of Pollution, Climate Change, Fish Stock Depletion
- International Maritime Law

**Primary Texts**

(A collection of documents will be available on the course website.)

**Required Books:**

*For Documenting Change in the Caribbean:*
- Christopher Columbus: *The Four Voyages*
- Eric Williams: *Documents of West Indian History*
- Phillip Curtin: *Rise and Fall of Plantation Complex*
- Jamaica Kincaid: *A Small Place*

*For Sustainability in Polynesian Cultures and Ecosystems:*
- James Cook: *Journals*
- Herman Melville: *Typee*
- Robert Sugg: *The Hidden Worlds of Polynesia*
- Albert Wendt: *Toward a New Oceania*

**Field Trips**
- John Carter Brown Library, Brown University
- New Bedford Whaling Museum
- Peabody Museum, Harvard University

**Evaluations**

Research Papers 50%
Presentation 20%
Class Participation 10%
Reading Posts and Discussion 10%
At Sea Participation 10%
Maritime Studies

<table>
<thead>
<tr>
<th>Topics</th>
<th>Primary Texts</th>
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<tbody>
<tr>
<td><strong>European Colonial Expansion</strong></td>
<td>(Representative list; please contact the Maritime Studies faculty for a reading list for upcoming classes.)</td>
</tr>
<tr>
<td>• Information Exchange</td>
<td>Christopher Columbus: <em>The Four Voyages</em></td>
</tr>
<tr>
<td>• Navigational Technology</td>
<td>Eric Williams: <em>Documents of West Indian History</em></td>
</tr>
<tr>
<td>• Maps and Charts</td>
<td>Jamaica Kincaid: <em>A Small Place</em></td>
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<tr>
<td><strong>Colonial Demographics</strong></td>
<td>Derek Walcott: “The Sea is History”</td>
</tr>
<tr>
<td>• The Impact of Disease</td>
<td>Joseph Conrad: “Youth”</td>
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<tr>
<td>• Migration</td>
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<tr>
<td>• Enslaved &amp; Indentured Labor</td>
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<td><strong>Cultural Impacts</strong></td>
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<tr>
<td>• European Colonial Claims</td>
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<td>• Missionaries</td>
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<td>• Introduction of New Technology</td>
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<td><strong>Plantation Agriculture</strong></td>
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<td>• Foreign Management for Distant Markets</td>
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<td>• Land Use Change</td>
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<td><strong>Maritime Commerce</strong></td>
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<tr>
<td>• Products</td>
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<tr>
<td>• Markets</td>
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<tr>
<td>• Technology of Ships</td>
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<tr>
<td><strong>Exploitation of Marine Resources</strong></td>
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<tr>
<td>• Fishing</td>
<td></td>
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<tr>
<td>• Whaling</td>
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<tr>
<td>• Aquaculture</td>
<td></td>
</tr>
<tr>
<td><strong>Managing Ocean Resources</strong></td>
<td></td>
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<tr>
<td>• The International Whaling Commission</td>
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<tr>
<td>• The Law of the Sea Treaty</td>
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<tr>
<td>• The Magnuson-Stevens Fishery Conservation/Management Act</td>
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<tr>
<td>• Regional Councils</td>
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</tr>
<tr>
<td><strong>Documenting the Maritime World</strong></td>
<td></td>
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<tr>
<td>• Art, Music &amp; Material Culture</td>
<td></td>
</tr>
<tr>
<td>• Works of Literature</td>
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</table>

Field Trips
New Bedford Whaling Museum
Fishing Port, New Bedford
USS Constitution, Boston

Evaluations
3 Papers 20% each
Presentation of Research Project 20%
Discussions of Course Readings 10%
Class Participation 10%
Nautical Science

<table>
<thead>
<tr>
<th>Topics</th>
<th>Primary Texts</th>
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<tr>
<td><strong>Navigation Fundamentals</strong></td>
<td>Issued:</td>
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<tr>
<td>• Coordinate Systems</td>
<td>Chase, Carl A.: <em>Introduction to Nautical Science</em></td>
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<tr>
<td>• Geographic Projections</td>
<td>Maloney, Elbert S.: <em>Dutton’s Navigation &amp; Piloting</em></td>
</tr>
<tr>
<td>• Compass use and corrections</td>
<td>SEA: <em>Organization &amp; Operations Manual for the Sea Component</em></td>
</tr>
<tr>
<td>• Log</td>
<td>On Reserve in Library:</td>
</tr>
<tr>
<td>• Great circles</td>
<td>Adkins, Jan: <em>The Craft of Sail</em></td>
</tr>
<tr>
<td><strong>Piloting Techniques</strong></td>
<td>Ahrens, C. Donald: <em>Meteorology Today</em></td>
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<tr>
<td>• Lines of Position</td>
<td>Bowditch, Nathaniel: <em>The American Practical Navigator</em></td>
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<tr>
<td>• Deduced Reckoning</td>
<td>Carr, Michael: <em>Weather Predicting Simplified</em></td>
</tr>
<tr>
<td>• Fixing ship’s position</td>
<td>Chase, G. Andy: <em>Auxiliary Sail Vessel Operations</em></td>
</tr>
<tr>
<td>• Calculating and compensating for current</td>
<td>Kotsch, William J.: <em>Weather for the Mariner</em></td>
</tr>
<tr>
<td><strong>Celestial Navigation</strong></td>
<td>Ladage, John: <em>Stability and Trim for the Ship’s Officer</em></td>
</tr>
<tr>
<td>• Sextant Use and Corrections</td>
<td>Newby, Eric: <em>The Last Grain Race</em></td>
</tr>
<tr>
<td>• Spherical Trigonometry Application</td>
<td>Schlee, Susan: <em>On Almost Any Wind</em></td>
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<tr>
<td>• Time and the Nautical Almanac</td>
<td>Taylor, Roger C.: <em>The Elements of Seamanship</em></td>
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<tr>
<td>• Solving the Celestial Triangle</td>
<td>U.S. Dept. Of Trans.: <em>Navigation Rules – International – Inland</em></td>
</tr>
<tr>
<td>• Plotting the Celestial Line of Position</td>
<td></td>
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<tr>
<td>• Local Apparent Noon</td>
<td><strong>Field Trips</strong></td>
</tr>
<tr>
<td><strong>Sailing Vessel Operations</strong></td>
<td>New Bedford Seaport, Ocean Explorium</td>
</tr>
<tr>
<td>• Applied Aerodynamic Forces - Sail Theory</td>
<td>Mystic Seaport</td>
</tr>
<tr>
<td>• Applied Hydrodynamic Forces - Vessel Handling Under Sail and Power</td>
<td>Martha’s Vineyard Ferry</td>
</tr>
<tr>
<td>• Meteorology - pressure systems, frontal boundaries, weather map</td>
<td>Nobska light house</td>
</tr>
<tr>
<td>interpretation, basic forecasting</td>
<td></td>
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<tr>
<td>• Ship Stability</td>
<td><strong>Evaluations</strong></td>
</tr>
<tr>
<td>• Navigation Publications – Light List, Coast Pilot, Rules of the</td>
<td>Piloting Exam 20%</td>
</tr>
<tr>
<td>Road</td>
<td>Celestial Exam 20%</td>
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<tr>
<td>• Diesel Engine Fundamentals</td>
<td>Final Exam 15%</td>
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<tr>
<td>• Safety at sea</td>
<td>Quizzes, Presentations, Journals 10%</td>
</tr>
<tr>
<td></td>
<td>Sea Component Evaluations/Exercises 35%</td>
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</table>

**Field Trips**
- New Bedford Seaport, Ocean Explorium
- Mystic Seaport
- Martha’s Vineyard Ferry
- Nobska light house

**Evaluations**
- Pilot ing Exam 20%
- Celestial Exam 20%
- Final Exam 15%
- Quizzes, Presentations, Journals 10%
- Sea Component Evaluations/Exercises 35%
Ocean Science and Public Policy

<table>
<thead>
<tr>
<th>Topics</th>
<th>Primary Texts</th>
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</thead>
<tbody>
<tr>
<td><strong>Defining the Ocean</strong></td>
<td>Spencer Weart, <em>The Discovery of Global Warming</em>.</td>
</tr>
<tr>
<td>• Changing Conceptions of the Ocean</td>
<td>Michael Critchton, <em>State of Fear</em></td>
</tr>
<tr>
<td>• Ocean Boundaries/Ocean Law</td>
<td>Joel Tarr, “Environmental Risk in Historical Perspective”</td>
</tr>
<tr>
<td>• Ocean as Frontier</td>
<td>Joseph Konvitz “Changing Concepts of the Ocean 1550 to 1950”</td>
</tr>
<tr>
<td>• Major Issues in Ocean Policy</td>
<td>Gary Kroll, <em>America’s Ocean Frontier</em> (selections)</td>
</tr>
<tr>
<td><strong>Historical Roots of Environmental Problems</strong></td>
<td>Orrin H. Pilkey and Linda Pilkey Jarvis, <em>Useless Arithmetic: Why Environmental Scientist Can’t Predict the Future</em> (selections)</td>
</tr>
<tr>
<td>• Environmental Risk in Historical Perspective</td>
<td>Jeff Bolster “Putting the Ocean into History”</td>
</tr>
<tr>
<td>• Human Population Growth and the Ocean</td>
<td>Paul Erlich and John Holdren “Impact of Population Growth”</td>
</tr>
<tr>
<td>• History of Global Warming</td>
<td>Hugo Grotius, <em>Mare Liberum</em></td>
</tr>
<tr>
<td><strong>Science, Culture, and the Politics of Governance</strong></td>
<td>Boris Worm et al., “Impacts of Biodiversity Loss on Ocean Ecosystems Services.”</td>
</tr>
<tr>
<td>• Culture, Politics, and Scientific Skepticism</td>
<td>Arne Kalland, “Whaling Politics and Green Legitimacy”</td>
</tr>
<tr>
<td>• Science and Advocacy</td>
<td>James R. Fleming, “Global Climate Change and Human Agency: Inadvertent Influence and Intentional Intervention”</td>
</tr>
<tr>
<td>• Culture and Politics of Offshore Energy</td>
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<tr>
<td><strong>Topics in Ocean Science and Public Policy</strong></td>
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<tr>
<td>• Marine Protected Areas and Marine Spatial Planning</td>
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<tr>
<td>• Geo-engineering</td>
<td></td>
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<tr>
<td>• Ocean Acidification</td>
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<td>• Whale Wars</td>
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<td>• Harvesting the Sea</td>
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<td>• Underwater Cultural Heritage</td>
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<tr>
<td><strong>Applied Public Policy</strong></td>
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<tr>
<td>• Research in Ocean Science and Public Policy</td>
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<tr>
<td>• Communication from Science to Policy</td>
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<tr>
<td>• The Policy Brief</td>
<td></td>
</tr>
<tr>
<td>• Student Symposium in Ocean Science and Public Policy</td>
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</tr>
</tbody>
</table>

**Films**
- *The Eskimo and the Whale*
- *Soylent Green*
- *The Silent World*

**Evaluations**
- Science and Skeptics Paper 20%
- 2 short film response papers 10%
- Class participation and assignments 20%
- Policy Research /Policy Brief 30%
- Policy Symposium Presentation 20%
Oceanography

**Topics**

**Physical Oceanography**
- Heat Budget and Atmospheric Systems
- Surface Circulation: coriolis and upwelling
- Surface Circulation: geostrophic calculations and vorticity
- Thermohaline Circulation and Climate Models
- Regional Circulation

**Chemical Oceanography**
- Seawater: properties, composition and residence time
- Carbon Cycle, pH and alkalinity
- Primary Productivity: light nutrients and vertical distribution
- Primary Productivity: seasonal, regional and global trends

**Biological Oceanography**
- Marine Organisms: morphology, phylogeny and classification
- Secondary Production: energy transfer and trophic structure models
- Marine Ecology: habitats, adaptations, ecological concepts

**Geological Oceanography**
- Earth Structure and Ocean Basins
- Plate Tectonics: development of a theory
- Plate Tectonics: mechanisms and processes
- Marine Sediments: sources and distribution
- Paleo-Oceanography: methods, historical records and implications

**Research Group Meetings**
- Cruise Track Introduction and Pilot Chart exercise
- Cruise Prospectus and Introduction to Research Projects
- Scientific Process and Hypotheses
- Writing an Introduction
- Methods, Analysis and Graphics Discussion
- Giving a Scientific Presentation

**Field Trips**
New England or Mystic Aquarium
Marine Biological Laboratory (MBL): library, aquaculture facilities and cruise on RV Gemma
New England salt marsh, rocky intertidal and sandy beach
WHOI core lab

**Primary Texts**
Primary scientific literature: historic and current available from MBL library
Corso, William, and Joyce, Paul, 1995. *Oceanography*
Miller, Charles B., 2004. *Biological Oceanography*
Pinet, Paul R. 1992. *Oceanography: An Introduction to the Planet Oceanus*
The Open University 1991 *Oceanography Series*

**Evaluations**
- Exams (3) 30%
- Lab Exercises/Questions 15%
- Research Group Writings 10%
- Project Presentation 15%
- Project Proposal 30%

**Labs**
- Thermohaline Circulation demonstration
- Plankton and Nekton identification and adaptation
- Statistical analysis and graphing: Excel and OceanDataView
Oceans in the Global Carbon Cycle

<table>
<thead>
<tr>
<th>Topics</th>
<th>Primary Texts</th>
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<tbody>
<tr>
<td>• Global Heat Budget</td>
<td>On Reserve in Library:</td>
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<tr>
<td>• Atmospheric Circulation</td>
<td>-Selected readings from scientific journals.</td>
</tr>
<tr>
<td>-Atmospheric Circulation</td>
<td></td>
</tr>
<tr>
<td>-Global Ocean Circulation</td>
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<tr>
<td>-Ocean-Atmosphere Coupling - ENSO</td>
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<thead>
<tr>
<th><strong>Ocean Chemistry</strong></th>
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<tbody>
<tr>
<td>• Dissolved Salts and Gases</td>
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<tr>
<td>• Inorganic Carbon Chemistry</td>
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<tr>
<td>• Ocean Acidification</td>
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<table>
<thead>
<tr>
<th><strong>Carbon Cycling</strong></th>
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<tbody>
<tr>
<td>• Global Carbon Budget</td>
<td></td>
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<tr>
<td>• Primary Production</td>
<td></td>
</tr>
<tr>
<td>• Secondary Production</td>
<td></td>
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<tr>
<td>• Measuring Carbon Flux to Sediment</td>
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<tr>
<td>• Direct Buoy Observations of Carbon Dioxide Flux</td>
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<tr>
<th><strong>Climate Past, Present &amp; Future</strong></th>
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<tbody>
<tr>
<td>• Ice Core Paleoclimatology</td>
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<tr>
<td>• Forecasting Tropical Cyclones</td>
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<tr>
<td>• Modeling – Iron Experiments</td>
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<td>• Harmful Algal Blooms</td>
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<td>• Carbon Sequestration</td>
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<tr>
<th><strong>Student Research Proposals</strong></th>
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<tr>
<td>• Vessel Research Capabilities</td>
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<tr>
<td>• Proposal Writing Strategies</td>
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<tr>
<td>• Proposal Presentations</td>
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<tr>
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<td>Problem Set:</td>
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<tr>
<td>Lab Assignments (2)</td>
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<td>Data Analysis Assignments (5)</td>
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<td>Meteorological and Oceanographic Observation Presentation (1):</td>
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<td>Research Project:</td>
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<td>Research Group Meetings (assignments and participation):</td>
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<tr>
<td>Proposal Presentation (evaluated by instructor and peers):</td>
<td>15%</td>
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<tr>
<td>Written Proposal:</td>
<td>25%</td>
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**Distinguished Lecturers and Guest Presenters**

Drs. Francisco Chavez (MBARI), Sarah Das (WHOI), Scott Doney (WHOI), Hugh Ducklow (MBL), Issac Ginis (URI), Cynthia Pilskaln (UMass, Dartmouth), Christopher Sabine (NOAA-PMEL), Jorge Sarmiento (Princeton U.), Deborah Steinberg (VIMS), Peter Strutton (Oregon State U.), Matthais Tomczak (U. of Flinders)
Appendix D: Affiliated & Sending Institutions

Students from the following institutions have enrolled in recent SEA Semester programs. For a complete list of participating institutions, visit www.sea.edu/academics/affiliates.

Bolded institutions are formal affiliates of SEA.

Albion College
Albemarle College
American University
Amherst College
Bard College
Barnard College
Bates College
Beloit College
Bentley College
Boston College
Boston University
Bowdoin College
Bowling Green State University
Brandeis University
Bridgewater State College
Brown University
Bryn Mawr College
Bucknell University
Butler University
California State University
Carleton College
Carnegie Mellon University
Central Michigan University
City College of New York
Claremont McKenna College
Clark University
Colby College
Colgate University
College of Charleston
College of the Atlantic
College of the Holy Cross
College of William & Mary
College of Wooster
Colorado College
Colorado State University
Columbia University
Connecticut College
Cornell University
Creighton University
Dartmouth College
Davidson College
Denison University
DePaul University
Dickinson College
Drexel University
Earlham College
Eckerd College
Emerson College
Endicott College
Eugene Lang College
Evergreen State College
Fairfield University
Florida Atlantic University
Florida Gulf Coast University
Florida Institute of Technology
Franklin & Marshall College
Franklin W. Olin College of Engineering
Furman University
George Washington University
Georgetown University
Georgia Institute of Technology
Gettysburg College
Gordon College
Goucher College
Grinnell College
Hamilton College
Hampshire College
Hampton University
Harvard University
Haverford College
Hawaii Pacific University
Hendrix College
Hobart & William Smith Colleges
Illinois Institute of Technology

**Ithaca College**
Jacksonville University
James Madison University
Johns Hopkins University
Juniata College
Kent State University
Kenyon College
Knox College

**Lafayette College**
LaSalle University

**Lawrence University**
Lesley University
Lewis & Clark College
Loyola College
Luther College
Lynchburg College
Macalester College
Marist College
Marlboro College
Mary Baldwin College
Maryland Institute College of Art
Massachusetts Institute of Technology
McGill University
Memorial University of Newfoundland
Miami University of Ohio
Michigan State University
Middlebury College
Millsaps College
Mount Holyoke College
Mount St. Mary’s University
New York University
North Carolina State University

**Northeastern University**
Northern Arizona University
Northwestern University

**Oberlin College**
Ohio State University, Columbus
Ohio Wesleyan University

**Oregon State University**
Pacific Lutheran University
Pennsylvania State University
Providence College

**Purdue University**
Randolph College

**Reed College**
Rhodes College

**Rice University**

**Ripon College**

**Rochester Institute of Technology**

**Roger Williams University**
Rollins College

**Rowan University**
Saint Mary’s College

**Salve Regina University**
San Francisco State University
Santa Clara University
Sarah Lawrence College
Scripps College
Simmons College
Skidmore College
Smith College
Spelman College
St. Francis Xavier University
St. Lawrence University
St. Mary’s College of Maryland
St. Michael’s College
St. Olaf College
Stanford University

**State University of New York, Environmental Science & Forestry**
State University of New York, Maritime College
State University of New York, Oswego
State University of New York, Stony Brook

**Stonehill College**
Swarthmore College

**Syracuse University**
The Citadel
Towson University
Trinity College
Trinity University
Tufts University
Tulane University
Union College
Unity College
| University of Alaska, Anchorage | University of Puget Sound |
| University of Arizona | University of Redlands |
| University of British Columbia | **University of Rhode Island** |
| University of California, Berkeley | University of Richmond |
| University of California, Los Angeles | University of Rochester |
| University of California, Riverside | **University of San Diego** |
| University of California, San Diego | University of South Carolina, Columbia |
| University of California, Santa Barbara | University of Southern California |
| University of Chicago | University of Southern Maine, Portland |
| University of Colorado, Boulder | University of Tampa |
| University of Connecticut, Avery Point | University of Texas, Austin |
| University of Delaware | University of the South, Sewanee |
| **University of Denver** | University of Vermont |
| University of Florida | University of Virginia |
| University of Hawaii, Hilo | University of Washington |
| University of Hawaii, Manoa | **Ursinus College** |
| University of Idaho | Valparaiso University |
| University of Kentucky | Vanderbilt University |
| University of Maine, Orono | Vassar College |
| University of Maryland, College Park | **Villanova University** |
| University of Maryland, Eastern Shore | Virginia Polytechnic Institute & State University |
| University of Massachusetts, Amherst | Wake Forest University |
| **University of Massachusetts, Dartmouth** | Warren Wilson College |
| University of Miami | Washington & Jefferson College |
| University of Michigan, Ann Arbor | Washington and Lee University |
| University of Nebraska, Lincoln | Washington University in St. Louis |
| University of New Brunswick, Saint John | Wellesley College |
| University of New England, Biddeford | Wells College |
| **University of New Hampshire** | Wesleyan University |
| University of New Mexico | Western Illinois University |
| **University of North Carolina, Chapel Hill** | Wheaton College |
| University of North Carolina, Wilmington | Willamette University |
| **University of Northern Colorado** | Williams College |
| University of Oregon | Worcester State College |
| **University of Pennsylvania** | Yale University |
Appendix E: Scientific Research Equipment

Winches:
- Electric hydrographic winch (Markey DESF-4) with 5000 m of ¼” wire rope
- Auxiliary “enhanced BT” winch (Markey DEBT-3) with ⅛” wire rope
- Hydraulic J-frame and electronic metered wheel (Dynacon)

Bathymetric Equipment:
- CHIRP-II sub-bottom profiling system consisting of:
  - TR-109 Transducers, Knudsen 3260 signal processor and digital recorder
  - Pinger (Oceanographic Instrument Systems Model 6000)

Physical/Chemical Oceanographic Equipment:
- Water sampling carousel (SBE 32-16) with Auto Fire Module (SBE 90208) and twelve 2.5-L water sampling bottles
- Two CTD units (Seabird SEACAT Profiler Model SBE 19plus v.2) with auxiliary oxygen sensor, PAR sensor, in-vivo chlorophyll and CDOM fluorometers, transmissometer
- Acoustic Doppler Current Profiler (RDI Ocean Surveyor 75 kHz)
- Heading (Xsea Octans fiber optic gyrocompass; traditional gyrocompass; ADU-5 satellite compass)
- Towed CTD (RBR) with optional in-situ chl-a fluorometer (Seapoint)
- FIALab 2500 flow injection system for nutrient analysis
- Handheld Salinity-Conductivity-Temperature meter (YSI)
- pH meter (Orion 3-star benchtop)
- Digital spectrophotometer (Ocean Optics USB2000)
- Reflectance and oxygen meters (Ocean Optics)
- PAR reference sensor
- Secchi disk

Biological Sampling Equipment:
- Remotely operated vehicle (VideoRay Pro-II ROV) 150m depth rating, cameras
- Remotely operated vehicle (Sea-Perch ROV): 20 m depth rating, color camera
- Fluorometer (Turner Designs Model 10-AU)
- Solid state bathyphotometer (Fucile SSBP) for bioluminescence measurements
- Plankton nets: 63, 200, 333, 1000 μm mesh (SeaGear)
- Neuston nets: 333 μm mesh (SeaGear)
- Tucker Trawl multiple opening/closing net
- Small otter trawl net (oceanographic purposes only) with Pelagic Electronics Weak Link tension release
- McLane WTS in-situ water sampling system
- MOCNESS (Multiple Opening/Closing Net & Environmental Sensing System)

Molecular Biology Equipment:
- BioRad MiniOpticon real time PCR machine
- EGel electrophoresis systems
- Shaking incubator for extractions and incubations

**Geological Sampling Equipment:**
- Shipek sediment grab
- Rock dredges
- Gravity corer
- Fisher sediment scoop

**Microscopes:**
- Two Zeiss stereo dissecting scopes
- Zeiss/Nikon compound scope with epifluorescence
- Camera for digital photomicrographs

**Datalogging:**
Clean flowing seawater (plastic pump and lines) with SBE45 thermosalinograph and *in-vivo* chlorophyll and CDOM fluorometers, and transmissometer. System logs these and other parameters together with GPS position every minute.

**Computer Network:**
Desktop and laptop computers, printers, wireless network, automatic data backup.

**Selected Other:**
Centrifuge, stir plate, adjustable micropipets, Milli-Q lab water, aquaria, hydrophone, plankton splitter, Minilog T-D sensor, portable pH meter, handheld GPS.
Appendix F: SEA Contact Information

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P.O. Box 6
Woods Hole, MA 02543

www.sea.edu

Tel: 800-552-3633 / 508-540-3954
Fax: 800-977-8516

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