



# COLLEGE OF MARINE STUDIES

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For more information, please visit the college web site at: <http://www.ocean.udel.edu>

The goal of the college is to educate scholars who will provide intellectual leadership in the areas of marine biology-biochemistry, marine policy, oceanography, and physical ocean science and engineering. Graduates of the college are expected to understand the complex interactions of these areas in real-world situations, in addition to mastering advanced work in the area of their speciality.

Students in the marine biology-biochemistry program may approach the field from organismic, ecological, biochemical, and molecular perspectives. In marine policy, students analyze issues relating to the legal, political, and economic aspects of the coastal zone, the seabed, and the ocean.

Students in the oceanography program may specialize in biological, chemical, geological, or physical oceanography. Students in the Physical Ocean Science and Engineering Program use physics for the advanced study of contemporary research topics in coastal physical oceanography, ocean acoustics, nearshore processes, environmental fluid dynamics, estuarine dynamics, and ocean engineering. The Master of Science and Doctor of Philosophy in Ocean Engineering is offered through a cross-disciplinary program operated jointly by the College of Marine Studies and the College of Engineering. (See page 320 in the College of Engineering for specific degree requirements).

Each student's program may be individually planned to match the specific interests of the student while meeting the college's requirements. An advisory committee is established to oversee the student's research and academic program. Students engage in serious research and are expected to demonstrate through the thesis or dissertation an ability to identify, define, and solve problems in their area of interest. The master's program normally takes two years while the doctoral program may take an additional two or three years. Financial support in the form of a graduate assistantship or college fellowship is often available to qualified students.

The college has two locations: Robinson Hall at Newark on the main campus of the University and the Hugh R. Sharp Campus at the coastal city of Lewes at the mouth of Delaware

Bay. During the academic year, courses are taught at both sites. Interactive television linking the two sites minimizes the need for commuting between campuses. Students may live at either location depending on convenience, the nature of their research, and the location of their adviser.

## RESEARCH FACILITIES

The Graduate College of Marine Studies (CMS) maintains facilities on the UD main campus in Newark and at the seaside Hugh R. Sharp Campus in Lewes. Although located approximately 90 miles apart, the two campuses are linked by two-way interactive television, allowing faculty and students to participate in classes and meetings from either location.

Robinson Hall, on the UD main campus in Newark, is CMS's administrative base and houses 45% of our faculty and students. It also is home to two of the college's five research centers. The Center for Remote Sensing gathers and analyzes satellite data to yield valuable information about oceanic properties and coastal resources, ranging from the dispersion of oil slicks to global change in plant production. The Center for the Study of Marine Policy, the first of its kind to be established at an American university, conducts interdisciplinary ocean and coastal policy research and education programs with a variety of local, national, and international partners.

Also based on the main campus, the Lammot du Pont Chemistry, Biochemistry, and Marine Studies Laboratory provides state-of-the-art, contamination-free, "clean-lab" facilities for the study of trace metals in marine waters and sediments. The nearby Delaware Biotechnology Institute, a partnership among government, academia, and industry to help establish Delaware as a center of excellence in biotechnology and the life sciences, supports leading-edge interdisciplinary research in genomics and proteomics, including marine science initiatives.

Another major coastal research facility available at UD is the College of Engineering's Ocean Engineering Lab in the Center for Applied Coastal Research. CMS students may use the lab's flumes and wave basins through a joint degree program offered by the College of Marine Studies and the College of Engineering. The lab contains such novel equipment as the directional wave basin - a 66-foot-long, 66-foot-wide, 3.3-foot-deep apparatus equipped with 34 wave-generating paddles for simulating a realistic sea. Faculty and

students use the device to study the physics of waves and the effectiveness of various coastal protection measures.

At the Hugh R. Sharp Campus in Lewes, on the shores of Delaware Bay, CMS provides all the amenities for a thriving marine research and teaching program, including offices, research and teaching laboratories, classrooms, computer facilities, and a library. Cannon and Smith laboratories are equipped with recirculating seawater systems and controlled-environment rooms for maintaining saltwater fish and plants. Cannon Lab also is home to two research centers: the Center for Marine Environmental Genomics focuses on deciphering the genetic code of marine organisms and determining the role that specific genes play, while the Ocean Information Center electronically archives a wide variety of marine data for use by scientists around the world.

Smith Lab includes a shellfish hatchery, algal culture facilities, fish aquaria, microbiology labs, and greenhouse space for halophyte (salt-tolerant plant) research. It also houses the Center for Halophyte Biotechnology, which is developing salt-tolerant plants for agricultural use and wetlands restoration in collaboration with local and international partners.

Two smaller laboratories in Lewes contain specialized research facilities. Henlopen Lab, adjacent to Cape Henlopen State Park, is home to one of the world's only tilting wind-wave tanks for studying physical phenomena at the air-sea interface. The Pollution Ecology Laboratory serves as supplemental space for marine geological research.

The Adrian S. Hooper Marine Operations Building and harbor support the seagoing research activities of the college. The harbor is home port of the 120-foot research vessel Cape Henlopen, which is a member of the University-National Oceanographic Laboratory System fleet. Several smaller vessels are available for scientific exploration and sampling in nearby Delaware Bay and coastal Atlantic waters.

#### **REQUIREMENTS FOR ADMISSION**

Prospective students must submit:

1. General (Aptitude) Test and Subject (Advanced) Test for Marine Biology-Biochemistry Program (in area of undergraduate major),
2. A letter of intent, stating specific interests and objectives for seeking graduate study.
3. Other requirements as listed in the "Graduate Admissions" chapter in this catalog.

Early application for admission is advised. Successful applicants typically have combined verbal and quantitative GRE scores above 1200 and grade-point averages above 3.0 (4.0 = A). After applying, applicants are advised to check with the academic affairs coordinator to ensure that all necessary documents have reached the college.

#### **REQUIREMENTS FOR THE DEGREES**

Each program in the college has its own requirements. All students in the master's program are required to complete 30 graduate credits (39 for marine policy). An introductory course in a CMS program outside the student's area of concentration is required. All students must write a thesis. Exceptional students may be permitted to bypass the master's degree and work directly toward the Ph.D. Requirements for the Ph.D. degree are similar to those for the master's degree, but are more intensive. Written and oral qualifying examinations are required before students are admitted to candidacy for the Ph.D. degree.

#### **PROGRAM DESCRIPTIONS:**

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### **MARINE BIOLOGY - BIOCHEMISTRY PROGRAM**

Students in the Marine Biology-Biochemistry Program at CMS are exposed to a broad spectrum of interests and approaches, ranging from molecular biology and biochemistry to ecology and ecosystem studies, through class work and by participating in research projects. Areas of faculty interest include the physiology, genetics, molecular biology and ecology of marine and coastal plants; microbial ecology physiology; larval, chemical, and fisheries ecology; fisheries and aquacultural genetics, and symbiosis. In addition to the sophisticated classroom and laboratory facilities available at CMS, students enjoy ready access to a variety of marine ecosystems near the Hugh R. Sharp Campus in Lewes: dunes, salt marshes, mudflats, estuaries, and the Atlantic Ocean. Field research takes place from Alaska to the Antarctic, in environments ranging from coral reefs to deep sea hydrothermal vents to local salt marshes and coastal waters.

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### **MARINE POLICY PROGRAM**

The Marine Policy Program examines the economic, legal political, and social aspects of the world ocean, the seabed, and the coastal zone. Students and faculty in the program analyze public issues regarding the law of the sea, ports and shipping, marine minerals, ocean and coastal zone management, fisheries, naval affairs, marine biotechnology, and the global environment, frequently making recommendations for policy at the regional, national, and international level.

The master of marine policy, a two-year professional degree created at the University of Delaware, prepares students for careers in research, management, and administration in marine-oriented government agencies, private associations, and business firms. For a few highly qualified students who already hold an advanced degree in marine policy or a related subject and who generally have some experience in policy research or management, the Ph.D. in marine (policy) studies is available.

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### **OCEANOGRAPHY PROGRAM**

Oceanography Program faculty work on physical, geological, biological, and chemical problems in a variety of ocean environments. Historically, the program's strength has been estuarine, coastal, and continental shelf studies. In addition, issues relating to global environmental change are of increasing interest, particularly physical and chemical interactions between atmosphere and ocean. CMS studies have made the Delaware Bay one of the most extensively studied estuaries in the world. An integrated picture of the estuary is emerging from studies of its circulation, chemistry, sedimentary geology, and planktonic biology. The estuary's waters, salt marshes, and sediments provide sites for work on the cycling of trace metals, nutrients, and organic matter. Faculty and students investigate topics as diverse as the effects of water flow and sediment transport on the behavior of benthic organisms, investigations of past climate change using the geochemistry of marine sediments, to the development of microelectrode probes to diagnose the health of marine habitats. The Center for Remote Sensing uses satellites to study the impact of land-use changes on wetlands and estuarine health and the effects of oceanic circulation on climate.

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**PHYSICAL OCEAN SCIENCE AND  
ENGINEERING PROGRAM**

The Physical Ocean Sciences and Engineering (POSE) program focuses on coastal physical oceanography and coastal/ocean engineering. Areas of study and research address coastal ocean hydrodynamics, transport of material within the water column and along the seabed, and the physics of the interfaces of the ocean with the atmosphere and seabed. Students have the choice of pursuing a degree in Marine Studies or Oceanography, both through the College of Marine Studies, or a degree in Ocean Engineering which is offered in conjunction with the Department of Civil and Environmental Engineering in the College of Engineering.

Our students have access to the most recent research facilities. These include the RV Cape Henlopen, which is equipped with CTD (conductivity/temperature/depth) instruments, ADCP (acoustic doppler current profiler), towed profiling instrumentation (Scanfish) and global position system navigation. At the Air-Sea Interaction Laboratory students have access to one of the largest wind-wave-current flumes in the nation. At the Environmental Fluids Laboratory students have access to two rotating turntables for studies of coastal and ocean circulation. The Ocean Acoustics Laboratory has the latest acoustics sensors for studies of acoustical properties of the coastal ocean and seabed.

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