August 1993

NOTE: This catalog provides announcements for the 1993-94 academic year. It is current until August 1994. The College reserves the right to make changes in the regulations, charges, and curricula listed herein at any time.

Catalogs are issued for College programs as follows:

- Undergraduate
- School of Business Administration
- School of Education
- Graduate Studies in Arts and Sciences
- School of Marine Science
- Marshall-Wythe School of Law
- Summer Sessions
- Special Programs
School of Marine Science
Graduate Program
1993-1994
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Virginia Institute of Marine Science
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School of Marine Science, Virginia Institute of Marine Science

Administrative Staff

Charles McFadden ........................................ Library Director
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Sue N. Presson ............................................... Student Records Coordinator
Sarah R. Hamrick ........................................... International Student Advisor
V. Zealon Stilley ........................................ Executive Secretary
Main campus, the College of William and Mary, Williamsburg, Virginia.
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Calendar

Fall Semester

1993

August 16-20  Registration Validation for Returning SMS Students (Mon.-Fri.)
August 23-24  Orientation Period (Mon.-Tues.)
August 24  Registration for Incoming SMS Students (Tues.)
August 24  Tuition and Fees Due to SMS/VIMS Cashier (Tues.)
August 25  BEGINNING OF CLASSES: 8:00 a.m. (Wed.)
September 1  Last Day to Drop Courses (Wed.)
September 3  Last Day to Add Courses (Fri.)
September 3  Last Day to File for December 1993 Graduation (Fri.)
October 8  Mid-Semester (for grading purposes only) (Fri.)
October 9-12  Fall Break (Sat.-Tues.)
October 18-22  Advanced Registration for Spring 1994 (Mon.-Fri.)
October 29  Last Day to File for May 1994 Graduation (Fri.)
October 29  Last Day to Withdraw from a Class (Fri.)
November 18-19  Open Add/Drop (Thurs.-Fri.)
November 24  Beginning of THANKSGIVING HOLIDAY: 8 a.m. (Wed.)
November 29  End of THANKSGIVING HOLIDAY: 8 a.m. (Mon.)
December 3  End of Classes: 5 p.m. (Fri.)
December 4-5  Reading Period (Sat.-Sun.)
December 6-7  Examinations (Mon.-Tues.)
December 8  Reading Period (Wed.)
December 9-10  Examinations (Thurs.-Fri.)
December 10  Last Day to Submit Theses and Dissertations for December Conferral of Degrees (Fri.)
December 11-12  Reading Period (Sat.-Sun.)
December 13-14  Examinations (Mon.-Tues.)
December 15  Reading Period (Wed.)
December 16-17  Examinations (Thurs.-Fri.)
December 20  OFFICIAL GRADUATION DATE (Mon.)
1994

**Spring Semester**

January 3-7  Registration Validation for Returning SMS Students (Mon.-Fri.)
January 19  BEGINNING OF CLASSES: 8 a.m. (Wed.)
January 26  Last Day to Drop Courses (Wed.)
January 28  Last Day to Add Courses (Fri.)
February 15  Final Day to File Notice of Candidacy for May 1994 Graduation (Tues.)
March 4  Mid-Semester (for grading purposes only) (Fri.)
March 5-13  SPRING VACATION (Sat.-Sun.)
March 14-18  Advanced Registration for Fall 1994 Semester (Mon.-Fri.)
April 21-22  Open Add/Drop (Thurs.-Fri.)
April 29  End of Classes: 5 p.m. (Fri.)
April 30-May 1  Reading Period (Sat.-Sun.)
May 2-6  Examinations (Mon.-Fri.)
May 6  Last Day to Submit Theses and Dissertations for May Conferral of Degrees (Fri.)
May 7-8  Reading Period (Sat.-Sun.)
May 9-11  Examinations (Mon.-Wed.)
May 12-14  Senior Appreciation Days (Thurs.-Sat.)
May 15  COMMENCEMENT (Sun.)

1994

**Summer Sessions**

April 12  Summer School Bulletins Available (Watermen’s 233) (Thurs.)
May 16-18  Registration for SMS Students (Mon.-Wed.)
June 8  Last Day to File for August 1994 Graduation (Mon.)
May 31-July 1  Session I (Tues.-Fri.)
July 5-August 5  Session II (Tues.-Fri.)
August 10  OFFICIAL GRADUATION DATE (Mon.)
"The Point" - School of Marine Science campus shoreline.

Mollusk aquaculture research on the Eastern Shore campus.
Deep sea jellynose fishes are among the categories of vertebrate taxa that are the subjects of studies of evolutionary relationships.
The College of William and Mary

The College of William and Mary in Virginia, founded in 1693, is the nation's second oldest institution of higher education. During its 300 year history, the College has built an eminent reputation for excellence in education. The College's commitment to a thorough, well rounded education through exploration, innovation and involvement is the source of institutional coherence. Today the College is national and international in its character and contributions. Students and faculty from diverse backgrounds are attracted to both the undergraduate programs and the various schools offering graduate studies.

The College of William and Mary is a small, residential full-time university currently enrolling approximately 5,400 undergraduate and 2,300 graduate students. The School of Arts and Sciences offers Masters and Doctorate degrees in several departments. Graduate degrees may be pursued in four professional schools: Marshall Wythe School of Law; the School of Business Administration; the School of Education; and the School of Marine Science.

The College is accredited by the Southern Association of Colleges and Schools. In keeping with the College’s mission as a state institution, a wide range of courses, seminars and programs both for credit and non-credit are offered on all campuses.

School of Marine Science
Virginia Institute of Marine Science

Since their founding more than 50 years ago, the School of Marine Science and the Virginia Institute of Marine Science have functioned under a tripartite mission to: conduct independent research, to provide advisory services, and to provide education in the marine sciences. From 1940 to 1962, the academic program was conducted through the Department of Biology and Marine Science of the College of William and Mary. Since 1961, the School of Marine Science has functioned as a professional graduate school of the College of William and Mary. Faculty of the School of Marine Science are appointed from the larger faculty of the Virginia Institute of Marine Science. The School of Marine Science awarded its first masters degree in 1943 and inaugurated a doctoral program in 1964. Over the past 50 years more than 500 marine scientists have earned graduate degrees from the School of Marine Science.

At present the School of Marine Science has 120 graduate students; about one-half are working on their masters thesis and one-half are working on doctoral dissertations. In recent years the School has received more than 200 applications from prospective students. Approximately 30 enter the program each academic year.
Statement of Purpose for the School of Marine Science

The purpose of the School of Marine Science is to provide quality education and the scholarly research associated with advance degree programs to students pursuing careers in marine science. The objective of the program is to provide a fertile and stimulating learning environment in which students can pursue their studies. This is accomplished by providing a comprehensive program in the basic principles of marine science and marine resource management, and close interaction with faculty actively involved in research and management issues.

Facilities

School of Marine Science students participate in graduate studies at an active, year-round research facility with approximately 300 scientists, support technicians and staff. The 35-acre main campus of the School of Marine Science of the Virginia Institute of Marine Science (SMS/VIMS) is located in Gloucester Point at the mouth of the York River, an important estuary and natural passageway to the Chesapeake Bay and Atlantic Ocean.

The Wachapreague campus on Virginia’s Eastern Shore offers access to embayments, salt marshes, barrier beaches and coastal waters. This facility is an important center for research in bivalve aquaculture and houses a hatchery and nursery facilities in addition to nearby grow-out sites. A seawater flume laboratory is also located on the campus.

Various service centers and special programs at the SMS/VIMS complement and enhance the student’s experience.

Library: Current holdings include 521 journal subscriptions, 44,000 volumes and 19,200 titles in addition to topographic maps, nautical charts and scientific archives. On-line networks provide access to marine science literature, Aquatic Fisheries Abstracts, Chesapeake Bay Bibliography and other data bases. Students have access to on-line catalogs at Swem Library on the main campus of William & Mary from the SMS/VIMS library.

Vessels: The SMS/VIMS maintains and operates a fleet of 40 vessels for research, equipped with flow-through sea water and sample collection-analysis labs and electronics labs. In addition to the 65-foot R/V Bay Eagle, 44-foot R/V Langley, and 29-foot R/V Fish Hawk, there is a sizable trailerable fleet. State-of-the-art electronic systems can be transferred among the smaller boats. A new diving facility, completed in 1992, includes a diver training room and class room to support the 40-member dive team.

Aircraft: A DeHavilland Beaver airplane is equipped for reconnaissance, remote-sensing and aerial photography to support various research.
Information Technology and Networking Services Unit: Provides technical support for all computer platforms used on campus, in addition to maintaining a campus-wide backbone network linked to Internet and several local area networks (LAN’s).

Marine Advisory Service / Virginia Sea Grant Program: Serves as a liaison between commercial and recreational marine related industries providing them with access to the university system.

Chesapeake Bay National Estuarine Research Reserve System: VIMS is the lead agency in Virginia with four designated sites preserved for estuarine research, monitoring, education, and conservation of key resources.

Center for Coastal Management and Policy (CMAP): In association with the Public Policy Program at William and Mary, CMAP combines education and research efforts with members of the College’s law school, business school, and departments of economics and government. The program also maintains a Comprehensive Coastal Inventory to generate a constantly updated inventory of tidal shorelines in Virginia.

Oyster Hatchery / Algae Culture Lab: Provides breed stock for class labs, research, conditioning and selective breeding experiments. Specimens of any specified size are provided year-round. This lab also houses the largest algae culture lab on the East Coast. Virtually any kind of algae can be produced for research or as a food source.

Nutrient Lab: Provides analytical services to both students and scientists. Water samples can be analyzed for physical measures, suspended solid concentrations, and concentrations of chlorophyll and nutrients. Sediment and tissue samples can be analyzed as well.

Nunnally Hall: Completed in 1992, Nunnally houses the extensive fisheries collection that includes approximately 85,000 specimens in 247 families.
Dr. John Milliman, Dean of Graduate Studies, with student Shirley Baker.

Teaching assistantships as well as various workshops are available to students.
FACULTY
Counting oyster spat - part of the ongoing development of a comprehensive oyster aquaculture program.
School of Marine Science Faculty

Dennis L. Taylor, Dean and Acuff Professor of Marine Science. B.A., University of Pennsylvania; Ph.D., DSc., University of Wales. Biological Sciences.

John D. Milliman, Dean of Graduate Studies and Professor of Marine Science. B.S. University of Rochester; M.S., University of Washington (Seattle), Ph.D., University of Miami. Physical Sciences.

Henry Aceto, Jr., Associate Dean of Graduate Studies, Professor of Marine Science, and Professor of Biology. B.S., State University of New York, Albany; M.S., University of California, Berkeley; Ph.D., University of Texas. Environmental Sciences.

Herbert M. Austin, Professor of Marine Science. B.S., Grove City College; M.S., University of Puerto Rico; Ph.D., Florida State University. Fisheries Science.

John D. Boon, III, Professor of Marine Science. B.A., Rice University; M.A., Ph.D., College of William and Mary. Physical Sciences.

Eugene M. Burreson, Professor of Marine Science. B.S., Eastern Oregon College; M.S., Ph.D., Oregon State University. Fisheries Science.

Robert J. Byrne, Director for Research and Advisory Services and Professor of Marine Science. M.S., Ph.D., University of Chicago. Physical Sciences.

Mark E. Chittenden, Jr., Professor of Marine Science. B.A., Hobart College; M.S., Ph.D., Rutgers University. Fisheries Science.

William D. DuPaul, Professor of Marine Science. B.S., Bridgewater State College; M.A., Ph.D., College of William and Mary. Fisheries Science.

Robert J. Huggett, Professor of Marine Science. M.S., Scripps Institution of Oceanography; Ph.D., College of William and Mary. Environmental Sciences.

Stephen L. Kaattari, Professor of Marine Science. B.S., Ph.D., University of California, Davis. Environmental Sciences.

Albert Y. Kuo, Professor of Marine Science. B.S., National Taiwan University; M.S., University of Iowa; Ph.D., The Johns Hopkins University. Physical Sciences.

Joseph G. Loesch, Professor of Marine Science. B.S., University of Rhode Island; M.S., Ph.D., University of Connecticut. Fisheries Science.

William G. MacIntyre, Professor of Marine Science. B.S., M.S., Ph.D., Dalhousie University. Physical Sciences.

Roger L. Mann, Professor of Marine Science. B.S., University of East Anglia; Ph.D., University of Wales. Fisheries Science.

John A. Musick, Professor of Marine Science. A.B., Rutgers University; M.A., Ph.D., Harvard University. Fisheries Science.

Morris H. Roberts, Jr., Professor of Marine Science. B.A., Kenyon College; M.A., Ph.D., College of William and Mary. Biological Sciences.

Gene M. Silberhorn, Professor of Marine Science. B.S., Eastern Michigan University; M.S., West Virginia University; Ph.D., Kent State University. Resource Management and Policy.

N. Bartlett Theberge, Jr., Professor of Marine Science. B.S., J.D., College of William and Mary; L.L.M., University of Miami. Resource Management and Policy.

Kenneth L. Webb, Chancellor Professor of Marine Science. A.B., Antioch College; M.S., Ph.D., Ohio State University. Biological Sciences.

Richard L. Wetzel, Professor of Marine Science. B.S., M.S., University of West Florida; Ph.D., University of Georgia. Biological Sciences.

L. Donelson Wright, Professor of Marine Science. B.A., University of Miami; M.A., University of Sydney; Ph.D., Louisiana State University. Physical Sciences.

Mohamed Faisal Abdel-Kareem, Associate Professor of Marine Science. B.V. Sci., M.V. Sci., Cairo University; D.V.M., University of Ludwig-Maximillian. Environmental Sciences.

John M. Brubaker, Associate Professor of Marine Science. A.B., Miami University; Ph.D., Oregon State University. Physical Sciences.

Fu-Lin Chu, Associate Professor of Marine Science. B.S., Chung Chi College; M.S., University of Rochester; Ph.D., College of William and Mary. Environmental Sciences.

Robert J. Diaz, Associate Professor of Marine Science. B.A., LaSalle College; M.S., Ph.D., University of Virginia. Biological Sciences.

David A. Evans, Associate Professor of Marine Science. B.A., M.A., Cambridge University; Ph.D., Oxford University. Physical Sciences.

Robert C. Hale, Associate Professor of Marine Science. B.S., B.A., Wayne State University; Ph.D., College of William and Mary. Environmental Sciences.

John M. Hamrick, Associate Professor of Marine Science. B.C.E., Georgia Institute of Technology; M.S., Massachusetts Institute of Technology; Ph.D., University of California, Berkeley. Physical Sciences.

Carl H. Hershner, Associate Professor of Marine Science. B.S., Bucknell University; Ph.D., University of Virginia. Resource Management and Policy.

Howard I. Kator, Associate Professor of Marine Science. B.S., Harpur College; Ph.D., Florida State University. Biological Sciences.

James E. Kirkley, Associate Professor of Marine Science. B.S., M.S., Ph.D., University of Maryland. Fisheries Science.

Steven A. Kuehl, Associate Professor of Marine Science. B.A., Lafayette College; M.S., Ph.D., North Carolina State University. Physical Sciences.
Romuald N. Lipcius, Associate Professor of Marine Science. B.S., University of Rhode Island; Ph.D., Florida State University. Fisheries Science.

Robert J. Orth, Associate Professor of Marine Science. B.A., Rutgers University; M.A., University of Virginia; Ph.D., University of Maryland. Biological Sciences.

Mark R. Patterson, Associate Professor of Marine Science. A.B., Harvard College; A.M., Ph.D., Harvard University. Biological Sciences.

James E. Bauer, Assistant Professor of Marine Science. B.A., Boston University; M.S., State University of New York, Stonybrook; Ph.D., University of Maryland. Physical Sciences.

Elizabeth A. Canuel, Assistant Professor of Marine Science. B.S., Stonehill College; Ph.D., University of North Carolina. Physical Sciences.

Rebecca M. Dickhut, Assistant Professor of Marine Science. B.S., St. Norbert College; M.S., Ph.D., University of Wisconsin, Madison. Physical Sciences.

John E. Graves, Assistant Professor of Marine Science. B.S., Revelle College, University of California, San Diego; Ph.D., Scripps Institution of Oceanography, University of California, San Diego. Fisheries Science.

Jerome P.-Y. Maa, Assistant Professor of Marine Science. B.S., University of Taiwan; M.S., Cheng-Kong University; Ph.D., University of Florida. Physical Sciences.

Linda C. Schaffer, Assistant Professor of Marine Science. B.A., Drew University; M.A., Ph.D., College of William and Mary. Biological Sciences.

Peter Van Veld, Assistant Professor of Marine Science. B.S., University of North Carolina, Chapel Hill; M.A., College of William and Mary; Ph.D., University of Georgia. Environmental Sciences.

Virginia Institute of Marine Science Faculty

All School of Marine Science faculty are also Virginia Institute of Marine Science faculty.

Maurice P. Lynch, Professor of Marine Science. A.B., Harvard University; M.A., Ph.D., College of William and Mary. Resource Management and Policy.

Frank O. Perkins, Professor of Marine Science. B.A., University of Virginia; M.S., Ph.D., Florida State University. Fisheries Science.

Leonard W. Haas, Associate Professor of Marine Science. A.B., Dartmouth College; M.S., University of Rhode Island; Ph.D., College of William and Mary. Biological Sciences.

Evon P. Ruzecki, Associate Professor of Marine Science. A.B., Knox College; M.S., University of Wisconsin; Ph.D., University of Virginia. Physical Sciences.

Beverly A. Weeks-Perkins, Associate Professor of Marine Science. B.A., Winthrop College; M.S. Tulane University; Ph.D., North Carolina State University. Environmental Sciences.

Thomas A. Barnard, Jr., Assistant Professor of Marine Science. B.A., Milligan College; M.A., College of William and Mary. Resource Management and Policy.
Carl H. Hobbs, III, Assistant Professor of Marine Science. B.S., Union College; M.S., University of Massachusetts. Physical Sciences.

John E. Olney, Assistant Professor of Marine Science. B.S., M.A., College of William and Mary. Biological Sciences.


Jon A. Lucy, Instructor in Marine Science. B.S., University of Richmond; M.A., College of William and Mary. Fisheries Science.

Robert J. Lukens, Instructor in Marine Science. B.S., Massachusetts Institute of Technology. Physical Sciences.

Kenneth A. Moore, Instructor in Marine Science. B.S., Pennsylvania State University; M.S., University of Virginia. Biological Sciences.

Walter I. Priest, III, Instructor in Marine Science. B.S., Virginia Military Institute; M.S., Old Dominion University. Resource Management and Policy.

Martha W. Rhodes, Instructor in Marine Science. B.S., Virginia Polytechnic Institute and State University; M.A., Medical College of Virginia, Virginia Commonwealth University. Biological Sciences.

Jacques van Montfrans, Instructor in Marine Science. B.S., Florida State University; M.S., Florida Atlantic University. Fisheries Science.

Gary F. Anderson, B.S., Southampton College of Long Island University; M.A., College of William and Mary. Physical Sciences.


Mark W. Luckenbach, B.S., University of North Carolina; Ph.D., University of South Carolina. Biological Sciences.

James E. Perry, III, B.S., Murray State University; Ph.D., College of William and Mary. Resource Management and Policy.


Craig L. Smith, A.B., The Johns Hopkins University; Ph.D., University of Florida. Environmental Sciences.

Michael A. Unger, B.S., Michigan State University; M.S., Ph.D., College of William and Mary. Environmental Sciences.

Wolfgang Vogelbein, B.S., Southampton College; M.S., California State University; Ph.D., Louisiana State University. Environmental Sciences.
Emeritus


Michael Castagna, Professor Emeritus of Marine Science. B.S., M.S., Florida State University. Biological Sciences.

George C. Grant, Professor Emeritus of Marine Science. B.S., University of Massachusetts; M.A., College of William and Mary; Ph.D., University of Rhode Island. Biological Sciences.

William J. Hargis, Jr., Professor Emeritus of Marine Science. A.B., M.A., University of Richmond; Ph.D., Florida State University. Biological Sciences.


Maynard M. Nichols, Professor Emeritus of Marine Science. B.S., Columbia University; M.S., Scripps Institution of Oceanography; Ph.D., University of California at Los Angeles. Physical Sciences.


J. Ernest Warinner, III, Assistant Professor Emeritus of Marine Science. B.S., M.A., College of William and Mary. Environmental Sciences.

Frank J. Wojcik, Assistant Professor Emeritus of Marine Science. B.S., University of Massachusetts; M.S., University of Alaska. Fisheries Science.
Satellite transmitters are utilized to track migrations of Loggerhead and Kemp's ridley sea turtles.

Processing samples for benthic contaminant flux studies.
Identifying squid larvae - research that has often been elusive to date.
Graduate Study Programs

The primary orientation of SMS faculty research and expertise includes coastal and marine environments from estuaries to the continental shelf. In addition to their teaching and basic research, many of the faculty are actively engaged in applied research of direct concern to industry and regulatory/management agencies. As such, students often find that their assistantship duties and/or research topics bring them into close contact with researchers in other departments, marine related industries, and state, regional, and federal management agencies.

Based on the primary academic and research disciplines represented at SMS/VIMS, graduate studies are offered in five areas.

**Biological Sciences**

The Department of Biological Sciences includes a blend of biologists and ecologists in a variety of disciplines from microbiology and taxonomy to ecosystem modeling. Scientists in the department are engaged in research aimed at elucidating patterns and processes both in space and time in benthic, nektonic, and planktonic systems. The research is oriented toward understanding the basic driving forces in these communities on local and global scales.

**Research Focus**

**Major research programs:**

**Benthic Ecology:** Studies investigate benthic invertebrate ecology, population dynamics and community interactions. Present research focuses on animal-sediment interactions and the processes governing recruitment, secondary production, trophic dynamics and the functional importance of production in ecosystems, and benthic boundary layer processes.

**Microbial Ecology and Environmental Microbiology:** Includes basic process-oriented research to define elements of the microbial food web, rates of energy and material flow among these components, and ecological controls over the composition and function of these food webs. Research in environmental microbiology addresses the ecology and fate of allochthonous microorganisms in estuarine waters and their use as bioindicators, the responses of estuarine microorganisms and microbially-mediated processes to organic and inorganic pollutants, and the impact of landuse practices on the microbiology of surface, ground, and estuarine waters.

**Plankton Processes:** Studies stress interdisciplinary approaches to research. Long-term trends in species composition and/or abundance are studied in relation to eutrophication and nutrient enrichment. Short-term changes in phytoplankton processes, including trophic relationships, are investigated. In cooperation with Fisheries scientists, research also focuses on processes related to larval fishes.
Macrophyte Ecology: Studies concentrate on submerged and emergent macrophyte species that dominate marine seagrass to tidal, freshwater marsh communities. Current research includes studies on plant distribution and abundance, plant response to environmental variability, plant growth and productivity, carbon and nitrogen cycling and ecosystem simulation modeling. The program encourages multi-investigator and multi-institutional collaborative efforts.

Nutrient Cycling: Studies include determining the spatial and temporal control of phytoplankton production by either phosphorus or nitrogen, addressing nitrogen cycling processes with the use of stable isotopes, and investigating the impact of these processes upon the food web. Sediment-related processes and exchange with overlying water also form a core research area within the program.

Physical Biology: Interdisciplinary studies utilize methods from fluid and solid mechanics, and heat and mass transfer theory, to investigate food capture, bioenergetics, primary and secondary production, and allometry in invertebrates and algae. On-going projects include the effects of internal waves on secondary production at seamounts (Gulf of Maine), flow modulation of coral bleaching (Caribbean), organism-sediment-flow interactions (Chesapeake Bay), and impact of sponges on water column processes (Lake Baikal).

Ecosystem Modeling: The program, formalized in 1991, develops and uses digital computer simulation models as an integrative and synthesis tool in ecosystem's analysis. Current programs include modeling studies of both temperate and tropical seagrasses, the dynamics of littoral zones in estuaries, estuarine plankton-nutrient interactions, sediment nitrogen cycling processes with an emphasis on microbial transformations. Computing resources include DOS, UNIX and MacIntosh operating systems, local and international networking, and various mathematical, statistical, data management, graphics and wordprocessing software. Working with hydrodynamic and water quality modelers, a general goal of the program is to work toward linked models that address both basic and applied ecological management questions.


Research Facilities

The School is well equipped with modern laboratory and field instrumentation in support of Biological Sciences. Various laboratories are equipped with running salt water. Examples of major equipment include a gas chromatograph, a $^{15}$N-emission spectrometer, computer-assisted image analysis hardware, a remote sensing imaging processor, spectroradiometer, Li Cor light sensors and data loggers, spectrophotometer, sediment profile cameras, box corer and benthic grabs, underwater video, hydrolabes, and a seawater flume. Greenhouses are available for research on macrophytes.
Preparatory Studies

Generally, a solid background in modern biology and basic science courses is required. This background should include mathematics through calculus, a year of statistics, physics and chemistry including organic and biochemistry, as well as contemporary biology courses. A foreign language such as German, French, Russian or Spanish is recommended.

Typical Course of Study

Students in this area must include in their programs the required courses (introduction to physical, chemical, geological and biological oceanography and statistics) as well as the advanced biological course. Additionally, courses related to the student's area of specialization should be included as appropriate, e.g. plankton and microbiology for specialization related to small planktonic organisms; marine benthos and secondary production of invertebrates for those interested in benthic specializations. Theoretical ecology, ecological modeling and computer applications should be included in any biological program which will rely on modeling or theoretical mathematical formulations.
Environmental Sciences

The Department of Environmental Sciences combines the expertise of chemists and biologists to study the fate and effects of hazardous substances in estuarine and marine systems. Within the Department, faculty backgrounds include environmental chemistry, biochemistry, toxicology, histopathology and immunology. Collaboration within this multidisciplinary group provides both faculty and students the opportunity to obtain a more complete understanding of how toxic chemicals move through the environment, what reactions they undergo, and what effect they elicit when aquatic organisms are exposed.

Research Programs

The primary focus of this research area is on the fate and effects of pollutants in the estuarine and marine environments. Understanding underlying mechanisms is emphasized although much of the research performed has direct practical applications. By their nature, many pollution-related problems require an interdisciplinary approach. As a consequence, students from a variety of fields work in this area.

Major research programs:

**Environmental Chemistry:** Studies of the sources, distribution, transport, fate and bioavailability of pollutants in marine and estuarine environments, including water and sediment. Interactions of toxic chemicals with marine life are also explored; processes such as bioaccumulation, toxicokinetics, and metabolism are studied.

**Analytical Chemistry:** New techniques to determine identities and concentrations of anthropogenic compounds and their breakdown products are investigated. Computer programs aimed at improved data collection, manipulation and retrieval are developed.

**Biochemistry:** Laboratory and field investigations focus on biochemical responses of marine organisms to pollutants and their environment. Specific examples include characterization of enzyme systems, protein composition and physiological condition.

**Toxicology:** Studies examining the influence of toxic chemicals on critical biological pathways and the health of organisms are performed. Examples of effects studied include disruption of immunocompetence and alterations in cell growth, reproduction and survival.

**Pathobiology and Histology:** Studies of abnormalities in structure and function at the cellular and organismal level are conducted. Techniques include gross examination, as well as detailed electron and light microscopic studies aimed at elucidating critical impacts and their causes.
Research Facilities

The Environmental Sciences Department has all the normal equipment and instrumentation found in chemistry or toxicology laboratories, such as explosion-proof fume hoods, balances and ovens. In addition, there are three mass spectrometers equipped with high resolution gas chromatographs, and eight other high-resolution gas chromatographs with either flame ionization, flame photometric, electron capture or electrolytic conductivity detectors. All are interfaced through analog to digital converters to a central data system. Other items include three high performance liquid chromatographs, a refrigerated centrifuge, a gel permeation chromatograph and a transmission and a scanning electron microscope. The toxicologists maintain several “wet” laboratories with flowing seawater for holding aquatic plants and animals as well as conducting bioassays. Facilities for cell culture are maintained.

Preparatory Studies

Strong written communication skills, one year of organic chemistry, basic training in statistics and familiarity with computer usage recommended.

Typical Course of Study

Environmental science research is interdisciplinary in nature, requiring a knowledge of biology and chemistry but familiarity with other fields as well, e.g. geology. Students entering this discipline should have a bachelor’s degree in biology or one of the physical sciences. In addition to the core courses required of all School of Marine Science students, the Department of Environmental Sciences requires courses in environmental chemistry and environmental biology. The student then selects courses that support his or her area of specialty. For instance, aquatic toxicology and immunology study would be required for Environmental Science students concentrating in toxicology. The student is encouraged, however, to diversify as much as possible since the interdisciplinary nature of the field requires a broad background to meet the challenge required of environmental professionals.
Fisheries Science

This program encompasses a broad range of studies in ecology, population biology, pathology and genetics. While traditional organismal biology continues to be the mainstay of activities, molecular biology plays an increasing role in departmental research. The fisheries genetics programs address a variety of problems from regional to global in scope. The integration of the ever expanding databases produced by these studies provides the opportunity to improve understanding of individual stocks for management purposes and synthetic multispecies models to define more clearly the roles of these organisms in marine ecology.

Research Programs

Major research programs:

Crustacean Ecology: Behavioral ecology, population dynamics and recruitment mechanisms of blue crabs in Chesapeake Bay, and of spiny lobsters in the Caribbean. Emphasis on predator-prey interactions, with additional concentration on population and fisheries modeling, the ecology of natural and artificial reef systems, and the ecology of tropical fish and queen conch.

Bivalve Ecology: Studies on recruitment of bivalves, particularly oysters, and effects of the environment on physiology and behavior of larval oysters and other bivalves; oyster population assessments and development of disease-resistant hybrids.

Fisheries Oceanography: Studies of the effects of environmental variables (weather and climate) on survival, recruitment, and distribution of fishes and other marine organisms.

Fish and Shellfish Pathology: Systematics, life cycles, ecology, pathology and control of important disease agents in the Chesapeake Bay region. Emphasis is on protozoan parasites of oysters, blue crabs and fish.

Finfish Ecology: Research on the population dynamics, recruitment, stock structure, and life history of marine, estuarine and anadromous fishes; based on sampling fisheries landings, extensive research surveys and tagging studies. Information collected in this program area is directly applied to fisheries management by state and regional agencies.

Chondrichthyan Biology: Studies of comparative morphology (drag reducing mechanisms, electroreception, etc.) of sharks and their relatives; population dynamics, reproduction, feeding strategies and energetics of coastal and deep-sea sharks; shark fishery management problems.

Sea Turtle Ecology: Research on distribution, abundance, ecology and energetics of sea turtles; behavior and migration studies using sonic, radio and satellite tracking; studies on nesting and sex ratios; population studies using aerial surveys. The SMS is the Sea Turtle Stranding Center for Virginia.
Marine Mammal Ecology: Studies on distribution, abundance and ecology of marine mammals; aerial surveys of marine mammals. The SMS serves as the Marine Mammal Strand ining Center for Virginia.

Systematics: Research on the morphology, evolution, taxonomy and zoogeography of various finfish groups. Studies involve both larval and adult characters. Available software includes various statistics and advanced morphometrics packages.

Population Genetics: Research using molecular genetics to define inter- and intraspecific relationships of fishes and other marine organisms for stock discrimination and phylogenetic studies. Current work focuses on sharks, marlin and other finfishes.

Research Facilities

The fish population laboratory has available automated fish measuring boards that electronically record and store length and bionomic data as they are being collected. The age and growth laboratory has computerized scale projectors and a Biosonics digitizing system used in ageing and morphometric studies. The larval fish laboratories house a reference collection containing over 120 families of marine, estuarine and freshwater fishes. Faculty and students in the Larval Fish Program utilize an in situ silhouette plankton camera as well as more traditional plankton gear in their field studies. The Crustacean Ecology and Bivalve Ecology programs also have dedicated laboratories.

Other major facilities include a modern molecular genetics laboratory with full capability for isozyme and mtDNA analysis, and a catalogued fish collection containing approximately 14,000 lots. This research and teaching collection incorporates extensive holdings from Chesapeake Bay, the Middle Atlantic Bight, and from Appalachian freshwater habitats as well as an internationally recognized deep-sea fish collection.

Two wet lab facilities are available to Marine Fisheries faculty and students. The general wet lab contains a flow-through system with several wet tables and tanks. In addition, a special greenhouse/wet lab houses the large sea turtle holding tanks, which are supplied with recirculated filtered sea water. Adjacent to the sea turtle greenhouse is a 7,560 gallon tank used for research and rehabilitation of small marine mammals.

Preparatory Studies

Students interested in graduate study in Vertebrate Biology and Marine Fisheries should have a solid undergraduate background in biology including: physiology, biochemistry, comparative morphology or developmental biology, histology or cytology, genetics, ecology and related topics, and evolutionary biology. College physics, chemistry (through organic) and math through calculus are required. Courses in statistics, marine biology and fishery biology may be helpful but are not prerequisites.
Typical Course of Study

In addition to the core courses required of all SMS graduate students, Fisheries students are required to take a second quantitative course such as Experimental and Quantitative Ecology (MS 613), Design and Analysis of Experiments (MS 619), Multivariate Analysis and Time Series (MS 635), or Applied Regression and Forecasting (MS 661); a third upper level quantitative course is also recommended. Among the courses offered by the Fisheries faculty are Fisheries Climatology (MS 606), Ichthyology (MS 608), Diseases of Marine Organisms (MS 612), Malacology (MS 617), Marine Fisheries Science (MS 618), Marine Invertebrate Physiology (MS 625), Early Life History of Marine Fishes (MS 630), Fisheries Population Dynamics (MS 640), and Marine Population Genetics (MS 662).

Students on the annual "Roanoke Roundup" seining for freshwater specimens.
Physical Sciences

The overall objective of the Department of Physical Sciences is to generate, communicate, and apply knowledge concerning the physical, chemical, and geological processes that operate in the coastal ocean and estuaries. The emphasis of the physical oceanography group is to study water properties and water movement in estuarine, coastal, and continental shelf environments. Geological oceanography includes the study of morphodynamics as well as the processes of sediment erosion, transport, and accumulation. Marine chemistry emphasizes the study of marine biogeochemical, environmental fate and transport processes of natural and anthropogenic substances. Interdisciplinary studies are strongly emphasized in this department.

Research Programs

Major research programs:

Physical Oceanography: Research directions include observational, theoretical, and numerical modeling studies of small, intermediate, and large scale dynamical processes and their influence on biogeochemical processes and water quality. Focuses on the fluid dynamics of oceanographic processes range from small-scale turbulence and internal waves through continental shelf processes to basin and global scale circulation dynamics.

Geological Oceanography: Specific research interests include marine sedimentation, coastal morphodynamics, benthic boundary layers, multivariate and time-series analysis, and coastal and marine stratigraphy. The program also includes applied studies in shoreline stabilization and non-energy mineral resources. While most research deals with terrigenous sediments, there also is considerable interest in the biogeochemistry of sediments, particularly carbonates.

Marine Chemistry: Various aspects of marine and environmental chemistry include aqueous geochemistry, biogeochemistry, organic geochemistry, pollutant fate and transport processes, as well as surface chemistry. Chemical transport and transformation processes are examined on both large and small scales, and include determination of global fluxes, air/water exchange of chemicals, estuarine and ocean cycling, sediment diagenesis, particle/chemical interactions, and biologically mediated chemical reactions.

Research Facilities

The laboratory equipment includes a recirculating hydraulic flume and several calibration tanks. Field equipment includes current meters, and acoustic Doppler current profiler, tide gauges, CTD (conductivity, temperature, depth) profilers, fluorometers, dissolved oxygen meters and various small instruments. For bottom boundary layer studies we have two complete instrumented tetrapods each supporting arrays of five Marsh McBirney electromagnetic current meters (EMCMS) and five optical backscatterance turbidity sensors, pressure sensors, thermistors, and high frequency sonar altimeters. The recently developed VIMS seabed flume permits in situ measurement of critical bed stress for sediment entrainment. Additional field equipment includes a
digital side scan sonar system, multiple frequency subbottom profiling system, box corers, and a Kasten core. Major instrumentation available for chemistry research consists of gas chromatographs with a variety of detectors including electron impact, chemical ionization, and negative chemical ionization mass spectrometers, high performance liquid chromatographs, UV/visible spectrophotometers, transmission and scanning electron microscopes, liquid scintillation counters for radiotracer studies, a stable isotope ratio mass spectrometer coupled with a gas chromatograph and facilities for low level alpha and beta particle analyses and gamma-ray spectrometry. Instrumentation available through other College of William and Mary departments include: Infrared spectrometry, atomic absorption, and nuclear magnetic resonance (NMR) spectroscopy, and x-ray diffractometer.

Computation facilities include an HP 735 UNIX workstation dedicated for circulation and water quality modeling, and 3 SUN Sparcstations for general purpose use. A number of dynamic modeling packages including a general purpose three-dimensional estuarine and coastal ocean circulation model are supported on the network. The Physical Sciences network provides links to other computational resources of the Institute and access to Internet.

Preparatory Studies

In all aspects of the Department of Physical Sciences’ education and research programs, there is a heavy reliance on quantitative skills and our incoming students are expected to have a strong background in mathematics. Undergraduate majors providing appropriate preparation for graduate study in physical sciences include physics, applied mathematics, engineering, chemistry, and geology. Biological science majors interested in pursuing graduate work in physical sciences are encouraged to include introductory physics and calculus through ordinary differential equations in their programs.

Typical Course of Study

For students majoring in physical oceanography, a two course sequence in estuarine hydrodynamics provides an in-depth focus on estuarine physics and its influence of biogeochemical processes. A companion course explores the coupling of physical and biogeochemical processes in estuaries. A course in oceanic and atmospheric circulation modeling covering a broad range of spatial and temporal dynamic and coupled processes is available for students with interest in modeling.

Students interested in geological oceanography may pursue tracks emphasizing sedimentary environments and stratigraphy, sediment geochemistry, or physical transport/morphodynamic processes. Courses include marine sedimentation, coastal morphodynamics, benthic boundary layers, multivariate and time-series analysis, and coastal and marine stratigraphy. In addition, depending on a student’s particular emphasis, geological students may be required to take advanced courses in physical, chemical, or biological oceanography.

Graduate students in marine chemistry may specialize in any of the various aspects of marine and environmental chemistry. Required courses include Advanced Aquatic
Chemistry (MS 621) and Analytical Instrumentation and Methods (MS 663). Specialized course work in other aspects of marine and environmental chemistry may be selected through recommendation of the student's thesis committee.

Field studies are vital to sound research management and policy development.
Resource Management and Policy

Since 1940, SMS/VIMS has worked closely with representatives of the public, marine industries, state and federal agencies to integrate sound scientific principles into the management of marine resources. The new department of Resource Management and Policy serves to continue and strengthen this activity with a multidisciplinary approach to research, advisory service and education. The Department also manages the research and educational programs at the designated Estuarine Reserve (CB-NEERS) sites for the Commonwealth.

Resource Management and Policy’s educational program provides students exposure to the legal, political, theoretical, and institutional systems in which they will be working as well as incorporating perspectives of related disciplines such as economics and sociology affecting marine resources management.

Research Programs

The faculty and staff of the Department of Resource Management and Policy pursue both basic and applied research. Studies of the structure and function of wetlands, the identification and classification of land forms and land cover, and the relationship of landscape pattern and coastal system performance are among the ongoing basic research programs. Applied projects address everything from developing educational programs for resource managers, to tracing wetland ownership records, to analysis of use conflicts in coastal waters, to preparation of resource management plans for coastal parks and sanctuaries. The highlight of these efforts is their interdisciplinary character. Students working in the department will be involved in the ongoing process of synthesizing knowledge from many different fields including not only the core science disciplines, but also law, economics, government and sociology.

Major research programs:

**Fisheries:** Studies related to the management of commercial and recreational fisheries.

**Aquaculture:** Studies leading to the identification of legal, policy and institutional considerations affecting the development of aquaculture.

**Wetlands:** Studies leading to the development of effective management regimes for tidal and non-tidal wetlands.

**Geology:** Studies related to subaqueous minerals management, dredging and erosion.

**Coastal Zone Management:** Studies addressing resource use conflicts and public versus private ownership of resources.
Research Facilities

The Resource Management and Policy Department operates the Comprehensive Coastal Inventory laboratory which is a computer-based facility using the Geographic Information System and image processing software. The program also utilizes remote sensing data, satellite images and aerial photography. In addition, an up-to-date resource management/legal library is available within the department.

Preparatory Studies

Students interested in pursuing a career in resource management and policy will benefit by having a solid background in mathematics as well as competence with computers. Strong writing and verbal communication skills also are recommended.

Typical Course of Study

Students pursuing research programs in resource management and policy are required to take the School of Marine Science core courses in physical, chemical, geological, biological oceanography and statistics as well as two resource management courses, Principles and Theory of Resource Management (MS 604) and Law and Resource Management (MS 650). Students may elect to take only the two required courses or additional advanced courses. The following courses are offered or can be specially arranged with an instructor: Resources, Regulation and Science: The Management of Marine Resources in Virginia (MS 624), Satellite and Aerial Marine Remote Sensing (MS 642), Introduction to Marine Resource Economics (MS 648), Practical Application of Marine Resource Management Techniques (MS 652), and History of Marine Science (MS 658).

Additional related graduate coursework in public policy analysis, law, economics, government and business are available on the main campus and may be used as part of the School of Marine Science degree program.
Diversity offers students an opportunity to develop world perspectives on issues relating to marine science.

Researchers cleaning post-settlement oysters as part of an oyster-feeding study.
VIMS maintains a fleet of more than 40 vessels to support research as well as the development of specialized equipment.
Description of Courses

The courses presented below may be offered in a different format than listed under the course description if the number of students registering for the course is such that the listed format is inappropriate. For example, if only one student registers for a course listed as being taught in a lecture format, the instructor may decide the content is better presented through directed readings and one-on-one discussion.

501. Introduction to Physical Oceanography. Fall (3) Mr. Brubaker. Prerequisites: Undergraduate Physics, Differential and Integral Calculus.
Physical properties of seawater, descriptive oceanography, air-sea interactions, heat budget, methods and measurements, dynamics of circulation, waves and tides. Required of all students unless justification for exemption is approved by the Dean of Graduate Studies upon the recommendation of the appropriate faculty committee. Lectures and laboratory.

502. Introduction to Chemical Oceanography. Spring (3) Mr. MacIntyre, Ms. Dickhut, Mr. Hale. Prerequisite: Undergraduate Chemistry.
Major and minor components of seawater, the concept of residence time, solution chemistry of organic compounds, nutrient cycling, dissolved gases, radioactive dating, geochemical cycles, biosynthesis in marine environments, organic geochemistry, anthropogenic input. Laboratory demonstration of analytical methods for organic analysis. Required of all students unless justification for exemption is approved by the Dean of Graduate Studies upon the recommendation of the appropriate faculty committee.

503. Introduction to Biological Oceanography. Fall (3) Ms. Schaffner, Staff.
Introduction to biological oceanographic processes emphasizing primary production and nutrient cycling; plankton, nekton and benthic processes, including feeding and reproduction strategies and animal/sediment relations; population regulation; estuaries as ecosystems. Required of all students unless justification for exemption is approved by the Dean of Graduate Studies upon the recommendation of the appropriate faculty committee. Lectures and laboratory.

504. Introduction to Geological Oceanography. Spring (3) Mr. Boon, Mr. Wright.
Concepts of marine geology: coastal processes, sea-floor spreading and plate tectonics, sediments and sedimentation, shelf and canyon development. Required of all students unless exemption is approved by the Dean of Graduate Studies upon the recommendation of the appropriate faculty committee. Lectures and field trips.

506. Introduction to Marine Science. Summer (3) Mr. Loesch.
A general introduction to marine science, including biological, chemical, geological, and physical oceanography. Normally taught on the Williamsburg campus. Not open to graduate students in the School of Marine Science; credit earned cannot be applied to the School's degree program.
510. Invertebrate Zoology. Summer (4) Mr. Roberts, Ms. Schaffner, Mr. Diaz. Prerequisite: Undergraduate Biology.
Discussion of major invertebrate metazoan phyla, including basic taxonomy, anatomy, physiology, and the role of invertebrates in ecosystems. Emphasizes marine and estuarine species present in Chesapeake Bay and vicinity.

512. Marine Botany. Summer (4) Mr. Silberhorn, Staff.
This course is primarily a survey of the micro- and macroalgae and vascular vegetation of the coastal region of Virginia, with emphasis on the latter. Course of study is aimed to improve knowledge of the floristics, community structure, phytogeography and descriptive plant ecology of the area.

513. Coastal Botany. Fall (3) Mr. Silberhorn.
A general survey of maritime vascular plant communities. Marshes, swamps, beaches, dunes, maritime forests and submerged aquatic communities of the coastal region. Field trips, laboratory and lectures.

515. Environmental Chemistry. Fall (3) Ms. Dickhut, Staff. Prerequisite: Undergraduate Chemistry, Calculus, Physical Chemistry recommended.
Fundamentals of aquatic, atmospheric, and geo.soil chemistry. Introduction to aquatic microbial biochemistry and toxicological chemistry.

520. Scientific Writing and Information Sources. Spring (1-2) Mr. Lynch.
Instruction on content and use of selected bibliographic, abstracting, indexing, data and other information data bases useful to marine scientists (emphasis is on on-line bases). Structure and content of journal articles, theses, dissertations and technical reports. Emphasis is on writing; students prepare and are evaluated on several written assignments.

526. Principles of Biological Oceanography.* Fall, even years (evenings) (3) Staff.
Description of biological processes in marine waters with particular emphasis on primary production; nutrient cycling; feeding and reproduction; planktomic, nektonic and benthic life strategies; animal and plant habitat requirements and estuaries as an ecosystem. (This course is designed for individuals desiring a thorough understanding of the concepts of biological oceanography, but who do not plan on continuing for an advanced degree in marine science. Credit earned cannot be applied to the M.A. or Ph.D. in Marine Science offered by the School of Marine Science.)

527. Principles of Chemical Oceanography.* Fall, odd years (evenings) (3) Staff.
Description of chemical processes in marine and estuarine waters. Emphasis on structure, components and properties of water; origin, behavior and fate of inorganic and organic compounds in the aquatic environment. (This course is designed for individuals desiring a thorough understanding of the concepts of chemical oceanography, but who do not plan on continuing for an advanced degree in marine science. Credit earned cannot be applied to the M.A. or Ph.D. in Marine Science offered by the School of Marine Science.)
528. Principles of Geological Oceanography.* Spring, even years (evenings) (3) Staff.
Overview of geological concepts, earth history and geological research methods. Basic introduction to modern plate tectonic theory, sea floor spreading and the development of ocean basins including major topographic features such as mid-ocean ridges and continental margins. Discussion of earth dynamics including global and sea level change, ocean processes with emphasis on coastal environments and the evolution of coastal features including beaches, estuaries, marshes and lagoons. (This course is designed for individuals desiring a thorough understanding of the concepts of geological oceanography, but who do not plan on continuing for an advanced degree in marine science. Credit earned cannot be applied to the M.A. or Ph.D. in Marine Science offered by the School of Marine Science.)

529. Principles of Physical Oceanography.* Spring, odd years (evenings) (3) Staff.
Physical properties of seawater, descriptive oceanography, air-sea interaction, heat budget, methods and measurement, dynamics of circulation, waves and tides. (This course is designed for individuals desiring a thorough understanding of the concepts of physical oceanography, but who do not plan on continuing for an advanced degree in marine science. Credit earned cannot be applied to the M.A. or Ph.D. in Marine Science offered by the School of Marine Science.)

530. Probability and Statistics for Marine Scientists. Fall (3) Mr. Evans.
Introduction to probability, discrete and continuous distributions; sample statistics; parameter estimation and hypothesis testing: functions of a random variable; student’s t-test; one way analysis of variance; and distribution fitting. Required for all students undertaking a marine science degree program, unless specifically exempted.

545. Marine Sedimentation. Fall, even years (3) Mr. Kuehl. Prerequisite: Permission of the instructor.
Characteristics of marine sediments including texture, mineralogy, and chemical and biological properties. Principles of clastic and carbonate sedimentation: hydrodynamic parameters; bedforms; primary and secondary bedding structures; regional distribution of sediments and modern depositional environments. Two lecture and two laboratory/field hours. Field project required for three credit hour option.

560. Thesis. Fall, Spring, and Summer (hours to be arranged).
Original research in biological, physical, chemical or geological oceanography, marine fisheries science and marine resource management. Project to be chosen in consultation with the student’s major professor and the Dean of the School.

* MS 526, 527, 528 and 529 may be substituted for MS 501, 502, 503 and 504 by students enrolled in the program leading to an M.A.Ed. in Secondary School Teaching with an emphasis in Marine Science. See the current catalog for the School of Education graduate programs.
597. Problems in Marine Science. Fall, Spring, and Summer (1-4) Staff.
Supervised projects selected to suit the need of the graduate student. Projects are
chosen in consultation with the student’s supervising professor and the instructor.
Credit hours depend upon the difficulty of the project and must be arranged with the
instructor in advance of registration. (See MS 697).

598. Special Topics in Marine Science. Fall, Spring, and Summer (1-3) Staff.
This is the avenue through which subjects not covered in other formal courses are
offered.

These courses are offered on an occasional basis as demand warrants. Subjects will
be announced prior to registration. Hours to be arranged.

601. Marine Science Seminar. Fall and Spring (1-3) Staff.
Multidisciplinary review of significant areas of marine science. The topic will vary
each semester. Guest speakers will present a variety of views. Course participants will
organize and present talks related to the seminar theme. Credit will be determined by
the level of participation. One credit hour (pass/fail only) for attendance and participa-
tion at seminars; two credits (pass/fail or grade option) for additional participation
by contribution to discussions and presentation of seminar; three credits (pass/fail or
grade option) for additional submission of written critical literature review/synthesis.

602. Fate and Transport Processes for Organic Contaminants. Fall, even years (3) Ms.
Dickhut.
Overview of the partitioning, transport, and transformation processes controlling the
environmental fate of organic contaminants. Fundamentals of thermodynamics and
chemical kinetics relevant to organic chemical fate and transport mechanisms. Ele-
mentary mass transfer equations and application to chemical transport in the environ-
ment.

603. Wetland Ecology: Structure, Classification and Delineation. Fall (2 or 3) Mr.
Perry. Prerequisite: Consent of instructor.
Introduction to physical and biological structures of tidal and nontidal wetlands,
taxonomic schemes for classifying wetland types, and applied methods of wetland
identification and delineation. Emphasis on field indicators, map and aerial photog-
raphy interpretation, and use of federal delineation manuals. Laboratory.

An introduction to the history of the management of natural resources and a survey of
principles and theories associated with resource management. Although the course
addresses general concepts, marine oriented materials and examples will be empha-
sized. Required of all students in Resource Management and Policy.

606. Fisheries Climatology. Fall, odd years (3) Mr. Austin. Prerequisite: MS 501 or
MS 618.
Concept of the effects of natural environmental variability on the recruitment, avail-
ability (yield), abundance and behavior of living marine resources. Application to
real-time fishing operations and climate scale analysis of fishery fluctuations. Instruc-
tion in basic meteorology and climatology with application to the ocean. Two lecture
hours and one laboratory hour.
607. Marine Microbiology. Spring, even years (4) Mr. Kator, Staff. Prerequisite: Biology 301 or equivalent.
Morphology, physiology, ecology, taxonomy, and methods of isolation, cultivation environmental variability and identification of micro-organisms encountered in the marine environment. Three lecture and four laboratory hours.

608. Ichthyology. Spring (3 or 5) Mr. Musick.
Functional morphology, behavior, ecology, zoogeography and evolution of fishes. Seven lecture, laboratory and field hours. Three credits without laboratory; five credits with laboratory.

609. Oceanographic Instrumentation. Summer, even years (2 or 3) Staff.
General description, physical characteristics, capabilities and limitations of oceanographic instruments are discussed and demonstrated. Emphasis is on instruments used to obtain physical data with inclusion of selected chemical and geological instruments. Operation, deployment and data retrieval are emphasized. This course will be taught in a long summer session. Two credits for lecture, with an optional one hour for laboratory and field work.

611. Quality Assurance for Water Quality Studies. Spring, even years (1) Mr. Neilson.
Design of quality assurance plans, data quality objectives, sampling protocols, selection of analytical methods, precision, accuracy, method detection limits, quality control procedures, standard reference materials, and quality assurance of data files. The course will be offered as a three hour laboratory. Students will work with a data set provided to them or they may use their own data with the consent of the instructor.

612. Diseases of Marine Organisms. Fall, odd years (4) Mr. Burreson, Staff.
Identification, life cycles, pathology and control of disease agents, including viruses, bacteria, protozoa, helminths and arthropods in marine fishes and shellfishes. Three lecture and two laboratory hours.

613. Experimental and Quantitative Ecology. Fall or Spring (3-5) Mr. Lipeius. Prerequisite: MS 530 or equivalent.
The design, conduct, analysis and interpretation of field and laboratory experiments in ecology and behavior. Includes lectures, discussion and supervised field and laboratory projects designed to illustrate the diversity of experimental approaches in use by ecologists and ethologists. Topics include experimental design, advanced statistical techniques, modeling, predator-prey dynamics, recruitment phenomena, life history tactics, intraspecific competition, benthic processes and others emphasizing recent ecological and behavioral advances. Lecture and laboratory.

614. Coastal Morphodynamic Processes. As required (3) Wright. Prerequisites: MS 501 and 504 or consent of instructor.
Sedimentary processes of erosion, transportation and deposition in response to energy by currents, waves, organisms and man. Character of sedimentary features in a range of environments: estuaries, lagoons, marshes, tidal flats and the continental shelf. Readings of classics, field trips and seminars with discussion of recent advances and controversial questions.
616. Analysis of Discrete Data. Fall (3) Mr. Diaz. Prerequisite: MS 530 or equivalent.
Design, analysis and interpretation of field and laboratory studies that rely on discrete or count data, including rates and proportions. Models based on Chi-squared and other nonparametric distributions for uni-, bi-, and multi-variate data will be covered. Topics include sample size experimental design, single and cross classification, covariate inference, and numerical classification techniques. Lecture and computer laboratory.

617. Malacology. Spring, even years (3) Mr. Mann.

618. Marine Fisheries Science. Fall, even years (3) Mr. Austin.
Principles and techniques, including the theory of fishing, age and growth, definition of stocks, catch statistics, description of world fisheries, goals and problems in managing a common property resource. Six lecture, laboratory and field hours.

619. Design and Analysis of Experiments. Spring (3) Mr. Loesch. Prerequisite: MS 530 or equivalent.
Concepts and methods of experimental statistics. Topics in analysis of variance (single- and multifactor) and associated analyses and statistics (tests of assumptions, power, relative efficiency, and multiple comparisons). Analysis of covariance, regression (models I and II), and an introduction to multiple regression will be presented; other models as time permits.

620. Aquatic Toxicology. Fall (3) Mr. Van Veld. Prerequisite: College Biology and Chemistry.
Major classes of aquatic toxicants. Factors influencing their fate and behavior in aquatic ecosystems. Mechanisms involved in their uptake, distribution, metabolism and clearance by aquatic organisms. Effects of toxicants on aquatic organisms and current methods of toxicity testing.

621. Advanced Aquatic Chemistry. As required (3) Mr. MacIntyre, Ms. Dickhut. Prerequisites: Chemistry 202, Math 203, and Physics 102.
Discussion of the principles of aquatic chemistry focusing on the chemistry of natural water systems and including quantitative problem solving. Topics will include: principles of solution chemistry, acid-base chemistry, precipitation-dissolution complexation, redox reactions, chemical kinetic and equilibrium principles.

Overview of evolution of Chesapeake Bay and its major living and non-living resources including the effects of man's recent impingement bringing into focus political, socio-economic and legal aspects of resource management. Description of laws passed to protect and manage marine resources with specific case studies using contemporary management problems. Class observations of the existing management structure with required policy analysis paper. Credit varies depending upon the extent of preparation of issue papers and participation in class project.
625. **Marine Invertebrate Physiology.** Spring, odd years (3) Mr. Mann. Prerequisite: Permission of instructor.
Quantitative methods used in whole animal studies: biochemical composition, respiration, excretion, histology, histochemistry. Quantitative microscopy. Laboratory based course with strong emphasis on development of methods from first principles, experimental and instrument design.

628. **Biological Oceanographic Processes.** Fall (3) Staff. Prerequisite: MS 503 or consent of instructor.
Lecture and discussion of contemporary concepts in oceanographic processes emphasizing microbial-plankton interactions, zooplankton, benthic processes, population dynamics, nutrient cycling and systems and simulation modeling. Required of all students in Biological Oceanography.

629. **Introduction to Benthic Boundary Layers and Sediment Transport.** As required (3) Mr. Wright, Mr. Maa.
Physical and geological aspects of coastal and estuarine benthic boundary layers, their dynamic forcings and the associated suspension and transport of granular sediments. Principles of waves, tides and currents are introduced with emphasis on shallow-water processes. Boundary layer structure and shear stress on the seabed, wave boundary layers and turbulence are considered in relation to the coastal environment. Forces on sediment particles, initiation of sediment movement and principles of sediment transport are treated at an intermediate level.

630. **The Early Life History of Marine Fishes.** Fall, odd years (3) Mr. Olney. Prerequisite: MS 608 or consent of instructor.
Ontogeny, systematic, physiology, behavior and ecology of egg, larval and juvenile stages of fishes with special reference to adaptations for survival. Population dynamics and the importance of early life history in the recruitment process are emphasized. Ichthyoplankton sampling methods are outlined. In the laboratory, eggs and/or larvae of 100+ families of teleostean fishes are examined, and characters useful in identification are presented. Two lecture and two laboratory hours.

631. **Estuarine Hydrodynamics I.** As required (3) Mr. Kuo. Prerequisite: Consent of instructor.
Classification of estuaries, time scales of motions, tidal dynamics in estuaries, non-tidal circulation, mechanism of arrested salt wedge, gravitational circulation, diffusion induced circulation, turbulence in stably stratified flows.

632. **Estuarine Hydrodynamics II.** As required (3) Mr. Kuo, Mr. Hamrick. Prerequisite: MS 631.
Zero-, one- and two-dimensional descriptions of estuaries, salt intrusion, pollutant flushing, sediment transport through estuaries, field experience in estuaries, model laws for estuarine models.

635. **Multivariate Analysis and Time Series.** Spring (3) Mr. Boon, Mr. Evans.
Eigenvector methods, principal component analysis and factor analysis; regression methods; Fourier and stochastic models applied to geophysical and other time series data sets. Two lecture hours and one hour of computer laboratory with assigned problems.
636. Ecological Modeling and Simulation and Analysis. Fall, as required (3) Mr. Wetzel. Prerequisite: Consent of instructor.
Theoretical and practical aspects of conceptualizing, simulating and analyzing digital computer models of estuarine and marine ecosystems. Systems theory, control and optimization is presented in terms of ecological processes. Computer modeling project required.

637. Wetlands Ecology. Spring (2-4) Mr. Hershner. Prerequisite: Consent of instructor.
Classical and recent work on wetlands ecology, primarily in tidal marshes. Emphasis on the analysis of the marsh system at the community level. Introduction and practical experience in common research techniques, including vegetation mapping, sediment coring and faunal sampling methods. Individual research project and/or paper expected. Lectures and field trips.

639. Estuarine Water Quality Models. Fall, even years (3) Mr. Kuo, Mr. Neilson. Prerequisite: MS 631.

640. Fisheries Population Dynamics. Fall, even years (4) Mr. Chittenden.

641. Waves and Their Analysis. As required (3) Mr. Maa, Mr. Boon. Prerequisite: MS 501.
Introduction to linear wave theory and shoaling wave transformations, wave dispersion, radiation stress, refraction and reflection. Mechanisms of wave generation in the ocean, including wind waves, seiches and tides. Discussion of ocean wave spectra and methods of wave analysis.

642. Satellite and Aerial Marine Remote Sensing. Fall, odd years (2) Mr. Kiley. Prerequisite: MS 501.
Theory and techniques in satellite and aerial marine remote sensing and associated image processing operations. Emphasis on analysis of remotely-sensed sea-surface features (color, temperature, salinity, etc.), wetlands, shorelines and nearshore areas. Laboratory sessions will employ interactive image processing equipment for analysis, enhancement and display of remotely-sensed marine data. Lecture and laboratory.

646. Marine Plankton Ecology. Spring, odd years (3) Staff. Prerequisite: MS 501, 502, 503, 504 and 628.
Contemporary topics in cellular, population, community and ecosystem level ecology of marine plankton, including bacteria, protists, phytoplankton and zooplankton.
647. Marine Benthos. Spring (3) Ms. Schaffner, Mr. Diaz. Prerequisite: MS 503.
Ecology of marine and estuarine benthos. Emphasis is placed on determining how ecological processes effect function and structure of benthic communities. Consideration is given to interactions among autotrophs, microheterotrophs and larger metazoans and interactions between these organisms and their physical-chemical environments.

An introduction to economic theories and principles which determine the exploitation, utilization, and management of marine resources. The course presents theories and principles in mathematical terms, but the interpretation and understanding of policies and solutions are emphasized. The objective of the course is to provide a balanced understanding of the underlying economics of conflicting marine resource based industries and user groups. Topics include the economics of commercial and recreational fisheries, aquaculture, coastal development, environmental degradation, and international trade in fisheries.

649. Marine Science in Public Affairs. As required (2) Staff.
Consideration of the methods by which public policy and programs regarding marine resources and the environment are established and executed and the role of marine science in those activities. The structure, functioning and management of modern marine research and advisory institutions. Interaction between science and technology, public environment, and resource management activities. Discussion of the problems and premises of marine science in public affairs. Lecture, discussion and observation.

650. Law and Resource Management. Spring (1-3) Mr. Theberge.
An interdisciplinary course designed to examine the interrelationships between scientific and legal concepts. Issues, legislation, and institutions associated with coastal zone management, outer continental shelf development, fisheries, and other questions related to marine resource management will be examined. Required of all students in Resource Management and Policy.

652. Practical Application of Marine Resource Management Techniques. As required (1-4) Staff. Prerequisite: MS 650.
This course is designed to offer students possessing management fundamentals an opportunity to participate in real world management activities under the guidance of involved faculty members and association and consultation with members of various levels of government. Such activities will possibly include but not be limited to issue identification and resolution, committee involvement at local, regional, state, interstate, and federal levels of government, development of management plans, drafting position papers, developing draft legislation and exposure to policy making mechanisms. Student requirements may vary significantly depending on the management issue(s) addressed. Students will be evaluated on participation, written work (memoranda, position papers, etc.) and knowledge gained as evidenced by interaction with staff and by other means. Students may repeat the course provided the instructor determines there is no duplication of material. Credit, which must be arranged in advance of registration, will depend upon difficulty of the assignment.
653. Secondary Production of Invertebrates. Spring (3) Mr. Diaz.
Principles and theories of secondary production. Physical and biological factors influencing production, role of habitat complexity, implications for community structure, estimation of trophic resources and techniques of measuring secondary production.

654. Oligochaete Biology. As required (2) Mr. Diaz.
Taxonomy of aquatic and marine oligochaetes, life history strategies and ecology, and the role of oligochaetes in benthic communities.


656. Seagrass Ecosystems. As required (1-2) Mr. Orth.
A lecture-seminar course covering topics related to seagrass ecosystems. Emphasis on the structure and function of seagrass communities, submerged angiosperm physiology, primary and secondary production, and integration of seagrass communities to the marine environment. Students will be assigned projects to complete. Credit, which must be arranged in advance of registration, will depend upon difficulty of the assignments.

Principles from the physical sciences (fluid and solid mechanics, mass and heat transfer theory) applied to the analysis of form, function, and evolution of marine organisms. Engineering methods and measurement techniques appropriate for investigations in physical biology will be presented.

658. History of Marine Science. As required (3) Staff.
Comprehensive review and evaluation of the major events, personages, and organizations involved in the development of marine science and marine resource management, the acquisition of knowledge of the World Ocean, its coastal waters and tributaries, and the ability to work on and in the sea and make use of its resources and amenities, with consideration of the impacts of the resources and amenities of the ocean on the affairs of men. Lecture, discussions and reading. All students will be required to prepare and submit a suitable course-related term paper.

659. Molluscan Biology. Fall (3) Ms. Chu. Prerequisites: undergraduate Biology or consent of instructor.
Emphasis is placed on marine and estuarine molluscan bivalves. Factors affecting reproduction, reproductive physiology and biochemistry; nutrition and larval ecology, including feeding and diets; energy reserves and metabolism; mechanisms of internal defense and host-parasite interaction, including seasonal environmental and toxic effects. Methodologies for measurements of defense-related cellular and humoral components and quantitative and qualitative analyses of lipids and fatty acids.
660. Dissertation. Fall, Spring and Summer (hours to be arranged).
Original research in biological, physical, chemical or geological oceanography, marine
fisheries science, or marine resource management. Project to be chosen in consultation
with the student’s major professor with the approval of the Dean of Graduate Studies.

661. Applied Regression and Forecasting. Spring (3) Mr. Kirkley. Prerequisite: Calculus, MS 530 or equivalent.
Course introduces theory and practice of quantitative methods in marine science. Methods of regression and time-series analysis will be emphasized. Topics include linear and nonlinear regression, model validation and testing, univariate and multivariate models, transfer functions, intervention analysis, and forecasting.

662. Marine Population Genetics. Spring (5) Mr. Graves. Prerequisite: Undergraduate Genetics or permission of instructor.
A study of the evolutionary processes responsible for the intra- and interspecific genetic relationships of various marine organisms with an emphasis on current molecular methodologies.

663. Analytical Instrumentation and Methods. Spring, even years (3) Ms. Dickhut, Staff.
Discussion and demonstration of analytical instrumentation and methods including chromatography, mass spectrometry, electrophoresis, atomic absorption spectrophotometry, and related techniques. Discussion of sample preparation, quality control, and quantification.

665. Immunology of Marine Organisms. Spring (3) Mr. Kaattari.
A course dealing with fundamental concepts in immune responses. The development of cellular and humoral immune responses and their regulation are considered in relation to infectious disease, allergy, tissue transplantation, neoplasia, autoimmune disease and immunodeficiency. Also considered are the properties of antigens and immunoglobulins, immunologic specificity and methods for monitoring immune responses. Acquired and innate immunity and the structure and function of the lymphoreticular system of fish will be considered in detail.

667. Coastal and Marine Stratigraphy and Facies. Spring, even years (3) Staff. Prerequisite: MS 545 or consent of instructor.
Analysis and interpretation of clastic facies, facies relationships, and stratigraphy emphasizing deposits produced in coastal and marine sedimentary environments. Study and comparison of coastal plain and modern sediments. Instruction in the interpretation and use of high resolution, marine, seismic reflection systems and sidescan sonar. Two lecture hours, laboratory and field exercises.

669. Ocean Dynamics I. Fall (3). Mr. Hamrick. Prerequisite: Consent of instructor.
670. Ocean Dynamics II. Spring (3) Mr. Brubaker. Prerequisite: MS 669 or consent of instructor.
Dynamics of coastal waters and the open ocean, with systematic development of the role of density stratification and the earth’s rotation. Gravitational adjustment and various classes of free-wave motion, including internal waves. Influence of coastal boundaries: Kelvin and shelf waves, upwelling. Wind-driven circulation, including western boundary currents.

671. Oceanic and Atmospheric Circulation Modeling. Spring (3) Mr. Hamrick. Prerequisite: MS 669 or APSC 536 or consent of instructor.

697. Problems in Marine Science. Fall, Spring and Summer (1-4) Staff.
Supervised projects selected to suit the needs of the graduate student. Projects to be chosen in consultation with the student’s major professor and the instructor. Acceptable research outlines and project reports are required. Amount of credit depends upon difficulty of course. Hours to be arranged with instructor prior to registration. The degree of difficulty and requirements of this course surpass those of MS 597.

698. Special Topics in Marine Science. Fall, Spring and Summer (1-3) Staff.
This is the avenue through which subjects not covered in other formal courses are offered. These courses are offered on an occasional basis as demand warrants. Subjects will be announced prior to registration. Hours to be arranged.
Undergraduate Courses

401. Introduction to Physical Oceanography. Fall (3) Mr. Brubaker. Prerequisites: Undergraduate Physics, Differential and Integral Calculus, consent of instructor.
Physical properties of seawater, descriptive oceanography, air-sea interactions, heat budget, methods and measurements, dynamics of circulation, waves and tides. Lectures and laboratory.

402. Introduction to Chemical Oceanography. Spring (3) Mr. MacIntyre. Prerequisite: Undergraduate Chemistry, consent of instructor.
Major and minor components of seawater, the concept of residence time, solution chemistry of inorganic compounds, nutrient cycling, dissolved gasses, radioactive dating, geochemical cycles, biosynthesis in marine environments, organic geochemistry, anthropogenic input. Laboratory demonstration of analytical methods for organic analysis. Three lecture hours.

403. Introduction to Biological Oceanography. Spring (3) Mr. Burreson. Prerequisite: Consent of instructor.
Introduction to biological oceanographic processes emphasizing primary production and nutrient cycling; plankton, nekton and benthic processes, including feeding and reproduction strategies and animal/sediment relations; population regulation; estuaries as ecosystems. Lectures and laboratory.

404. Introduction to Geological Oceanography. Fall (3) Mr. Boon, Mr. Wright. Prerequisite: Consent of instructor.
Concepts of marine geology; coastal processes, seafloor spreading and plate tectonics, sediments and sedimentation, shelf and canyon development. Lectures and field trips.

A general introduction to marine science, including biological, chemical, geological, and physical oceanography. Three lecture hours. Offered at night at the Williamsburg campus. Not open to graduate students in the School of Marine Science.

408. Applied Computing for Marine Scientists. Fall (1) Mr. Anderson.
An introduction to the use of computers in scientific research. Topics covered include software systems for data analysis, spatial analysis, word processing, and graphics. Class assignments will be carried out in the microcomputer laboratory and on various computing platforms across VIMS campus-wide network. The role of computing and information resources on the Internet will also be discussed. One lecture hour and two laboratory hours weekly.

409. Program Design and Data Structures Using Pascal. Spring (2) Staff.
Structured programming techniques are presented using the Pascal programming language. Elementary data structures are presented with attention to forms which are useful in scientific programming. Practical applications are stressed with emphasis on graphics in the latter portion of the course. The linkage of system and user-written libraries to Pascal programs is covered. Class assignments are carried out on the VIMS PRIME 9955 Model II System.
410. Invertebrate Zoology. Summer (4) Mr. Roberts, Ms. Schaffner, Mr. Diaz. Prerequisite: Undergraduate Biology.
Discussion of major invertebrate metazoan phyla, including basic taxonomy, anatomy, physiology, and the role of invertebrates in ecosystems. Emphasizes marine and estuarine species present in Chesapeake Bay and vicinity.

412. Marine Botany. Summer (4) Mr. Silberhorn, Staff.
This course is primarily a survey of the micro- and macroalgae and vascular vegetation of the coastal region of Virginia, with emphasis on the latter. Course of study is aimed to improve knowledge of the floristics, community structure, phytogeography, and descriptive plant ecology of the area.

413. Coastal Botany. Fall (3) Mr. Silberhorn. Prerequisite: Consent of instructor.
A general survey of maritime vascular plant communities. Marshes, swamps, beaches, dunes, maritime forests and submerged aquatic communities of the coastal region. Field trips, laboratory and lectures.

416. Mathematical Review for Marine Scientists I. As required (3) Mr. Evans.
A review of mathematical techniques and concepts with which a student in marine science is expected to be familiar. A pragmatic approach to the topics is adopted with examples of applications of mathematical notions whenever possible. Topics to be covered include: elementary algebraic manipulation, linear and quadratic equations, simultaneous equations, trigonometry, analytical geometry, binomial theorem, exponents and logarithms, and elementary differential calculus.

417. Mathematical Review for Marine Scientists II. As required (3) Mr. Evans.
A review of mathematical techniques and concepts with which a student in marine science is expected to be familiar. A pragmatic approach to the topics is adopted with examples of applications of mathematical notions wherever possible. Topics to be covered include: integral calculus, simple differential equations, vectors, matrices (linear algebra).

445. Marine Sedimentation. Fall, even years (2-3) Mr. Kuehl. Prerequisite: Permission of the instructor.
Characteristics of marine sediments including texture, mineralogy, and chemical and biological properties. Principles of elasic and carbonate sedimentation; hydrodynamic parameters; bedforms; primary and secondary bedding structures; regional distribution of sediments and modern depositional environments. Two lecture and two laboratory/field hours. Field project required for three credit hour option.

497. Problems in Marine Science. Fall, Spring and Summer (1-4) Staff.
Supervised projects selected to suit the need of the graduate student. Projects are chosen in consultation with the student’s supervising professor and the instructor. Credit hours depend upon the difficulty of the project and must be arranged with the instructor in advance of registration.

498. Special Topics in Marine Science. Fall, Spring and Summer (1-3) Staff.
This is the avenue through which subjects not covered in other formal courses are offered. These courses are offered on an occasional basis as demand warrants. Subjects will be announced prior to registration. Hours to be arranged.
In 1992, a student/faculty research team successfully cultivated Perkinsus cells. This landmark achievement opens significant avenues for studying oyster diseases.
Academic Program

General Program Description

The academic program of the School of Marine Science is intended primarily for the student who wishes to specialize in marine science at the graduate level. Degrees offered are the Master of Arts and Doctor of Philosophy in Marine Science. The school offers research opportunities and instruction at the graduate level in five general areas: Fisheries Science, Biological Sciences, Environmental Sciences, Physical Sciences, and Resource Management and Policy.

Though the courses offered by the School are primarily for graduate students, advanced undergraduates (juniors and seniors) may participate. For instance, biology, chemistry, and physics majors can enroll in suitable 400 level marine science courses for credit toward the bachelor's degree provided certain conditions (see College of William and Mary Undergraduate Program Catalog) are met. Undergraduates also may enroll for research credit to work on problems in marine science. The student is responsible for making the necessary arrangements with an individual School of Marine Science faculty member, and the consent of the chairperson of the student’s major department is also required.

General Preparatory Requirements

Students who are seriously interested in pursuing marine science as a profession should consult with their academic advisor or the Dean of Graduate Studies, School of Marine Science, early in their college careers concerning an academic program that will prepare them for graduate study in marine science.

Students interested in biological sciences or fisheries science should have a strong background in basic sciences, including a suite of contemporary biology courses, physics and chemistry (through organic), and mathematics through calculus and differential equations. The prospective chemical, geological, or physical oceanography student should have an undergraduate degree with appropriate course work in chemistry, geology or related geophysical science, physics, meteorology, mathematics or engineering and a solid quantitative background. Course work in statistics and competence with computers are particularly important for prospective resource management and policy students, but also are considered beneficial to students in all other fields of concentration as well.
Degree Requirements

General

Students generally are bound by the requirements stated in the catalog in effect when they enter the School. The following are usually the minimum requirements. The department in which the student specializes and individual advisory committees may prescribe additional requirements for their students.

Residency

To fulfill the full-time academic residency requirement of the School of Marine Science, students must enroll for one of the following:

1. Twelve credit hours in the fall semester and twelve hours in the following spring semester;
2. Twelve hours in the spring semester and twelve hours in the following fall semester;
3. Twelve hours in the spring semester, followed by six hours in Summer Session I and six hours in Summer Session II; or
4. Six hours in Summer Session I, six hours in Summer Session II, and twelve hours in the following fall semester.

Satisfactory Progress

To continue in a degree program, a student must make satisfactory progress toward the degree. If the faculty of a program in which a student is enrolled determines that satisfactory progress is not being made, a student may be required to withdraw because of academic deficiency. A student may appeal to the Academic Status and Degrees Committee.

Comprehensive Exam

Each student must satisfactorily complete a comprehensive examination within one regular semester, excluding summer sessions, following completion of the core courses. Comprehensive examinations may be written or oral.

Registration Requirements

All active students (i.e. those working toward completion of a degree program who have not been granted leave), whether in residence or not, must register for a minimum of three paid hours each semester, and one paid hour for each term of the summer session. Students must be registered in the semester during which they graduate.
System of Grading and Quality Points

The grades A (excellent), B (good), C (satisfactory), P (pass), in certain courses, D (unsatisfactory), and F (failure) are used to indicate the quality of work in a course. "W" indicates that a student withdrew from the College before mid-semester or dropped a course between mid-semester and the last day of class and was passing at the time that the course was dropped.

For each semester credit in a course in which a student is graded A, 4 quality points are awarded; B, 3; C, 2. P carries credit but is not included in a student's quality point average; D and F carry no credit but the hours attempted are included in the student's average.

In addition to the grades A, B, C, P, D, F, and W, the symbols "G" and "I" are used on grade reports and in the College records. "G" indicates that the instructor has deferred reporting the student's grade since there is insufficient evidence on which to base a grade. "I" indicates that because of illness or other major extenuating circumstances, the student has postponed, with the explicit consent of the instructor, the completion of certain required work. "I" automatically becomes "F" at the end of the next semester if the postponed work has not been completed.

Transfer of Graduate Credit

On the recommendation of the Academic Status and Degrees Committee and the approval of the Dean of Graduate Studies, a regular student may apply up to six hours of graduate credit earned at another accredited institution of higher learning toward an advanced degree at the College of William and Mary, School of Marine Science. The credits must have been earned in courses appropriate to the student's program in the School and must fall within the time specified by the general college requirements for degrees. Credit may be transferred only for courses in which the student received a grade of "B" or better and may not be counted in compiling his or her quality point average at William and Mary.

Retaking a Course

Degree credit is granted only for coursework in which a student earns a grade of "C" or above. A graduate student may repeat one course in which a grade of "C" or lower is received; however, the initial grade earned remains a part of the student's record and is included in computations of quality point requirements. Any student receiving more than one "D" or "F" in a program of study will not be permitted to continue in the School of Marine Science.

Changes in Registration

All changes in students' schedules after the close of registration require approval of the instructors involved and the Dean of Graduate Studies. Students may not add courses after the last day for changes in registration as indicated in the calendar. If the student drops a course or courses before mid-semester but remains registered for other academic work, the course or courses dropped will be removed from the student's
If the student drops a course or courses after mid-semester through the last day of classes but remains registered for other academic work, the grade of “W” or “F” will be awarded by the instructor in the course depending upon whether or not the student was passing at the time the course was dropped.

A student wishing to withdraw from a course (or courses) due to medical reasons after mid semester may apply to the Academic Status and Degrees Committee for approval. If the Academic Status and Degrees Committee verifies the legitimacy of the medical reason for withdrawal, a grade (or grades) of “W” will appear on the transcript.

Students may not drop a course after the last day of classes. If for medical reasons a student does not complete a course, “W” with appropriate notation will be entered on the record upon approval of the Dean of Graduate Studies and the appropriate authorities at the College.

**Leave of Absence**

A student may request a leave of absence from the program for a specific period of time. Leaves of absence will relieve the student of the obligation of paying tuition while still remaining as a student in good standing. A student must terminate the leave of absence and be a registered student in the semester in which his or her degree requirements are completed or in which he or she graduates.

**Probation**

A student will be placed on probation for: receipt of a grade below a C (< 2.0) or a cumulative average less than a B (< 3.0).

Probation will last until a student’s cumulative average is raised to at least a B (3.0), and will in no circumstances last longer than one calendar year.

If, during probation, the student receives a grade less than C (<2.0), receives a semester average less than a B (<3.0), or fails to raise cumulative average to at least a B (3.0), the penalty is automatic dismissal from the School of Marine Science, with the possibility of appeal to the Committee on Academic Status and Degrees for reinstatement.

**Withdrawal from the Program**

Withdrawal from the program constitutes termination of the student’s program of study in the School of Marine Science. Withdrawal may be voluntary on the part of the student or be imposed by the School of Marine Science for reasons of academic deficiency. A student who fails to register for a regular semester (fall or spring) once the student has begun his or her graduate study, who has not requested a leave of absence or permission to withdraw, will be placed on a leave of absence for one semester by the Dean of Graduate Studies. If the student has not applied for a leave of absence prior to the end of registration for the next regular semester, or if the Dean of Graduate Studies is not able to justify continuing the leave of absence, the student’s record will be marked withdrawn unofficially.
If the student withdraws from the College before mid-semester, a grade of “W” will appear on the record for each course in progress at the time of withdrawal. After mid-semester through the last day of classes, students who withdraw from the College will be awarded a “W” or “F” by the faculty member teaching each course in progress at the time of withdrawal.

**Reinstatement After Withdrawal**

A student wishing reinstatement after withdrawal must reapply to the School of Marine Science under the procedures in effect at the time of reapplication.

**Extension of Time Limit**

Classified (regular) students who have exceeded the time limit for degree completion and who have not been granted a time extension will not be permitted to register in the School of Marine Science.

**Required Courses**

**All students**

By the end of a student’s second year in the School, the student either must be granted an exemption from or have passed the following core courses, MS 501, MS 502, MS 503, MS 504, MS 530 (another approved statistics course may be substituted for MS 530).

**Students in Biological Sciences**

MS 628.

**Students in Fisheries Science**

MS 619 (A different course may be substituted with approval of the student’s committee).

**Students in Resource Management and Policy**

MS 604 and MS 650.

**Language Requirement**

Reading knowledge of one foreign language is required for either the M.A. or Ph.D. degree. Candidates for the doctorate who have passed a language examination for the master’s degree in the School of Marine Science need not take another language examination. Individual committees may adopt additional language requirements at their discretion.
The student may fulfill the language requirement by completing one of the following:

1. At least six (6) semester hours in one pertinent foreign language (German, French or Russian are recommended) at the college sophomore level or above with grade of C or better; or

2. Obtain a score no lower than the forty-fifth percentile in the Educational Testing Service Foreign Language Examination; or

3. Pass an examination administered by a member of the Department of Modern Languages who is competent in the language.

Students whose native language is not English may, with the permission of the Dean of Graduate Studies, use English to fulfill the foreign language requirement. Proficiency in the use of the English language may be demonstrated by the completion of twelve credit hours of formal class work with grades of B or higher in the School of Marine Science. Upon recommendation of the Academic Status and Degrees Committee of the faculty, the Dean of Graduate Studies may approve alternate methods.

**Degree of Master of Arts Requirements**

The steps to be accomplished and requirements for the degree are:

1. As soon after initial registration as possible, the student must select a major professor, an advisory committee and a research project. The major professor, working with the committee, will prescribe the student’s program which will include the required courses.

2. The major professor and Advisory Committee, chosen by the student and approved by the Dean of Graduate Studies, direct the student’s program. The Advisory Committee consists of at least five members, the majority of which must be from the School of Marine Science. Committee members from outside of the School of Marine Science must possess the qualifications appropriate for status on the committee. For students with a concentration in biology or fisheries science, at least one of the members must be from the discipline of physical or environmental science. For students with a concentration in physical or environmental science, at least one member must be from the discipline of biological sciences or fisheries science. For students with a concentration in resource management and policy, one member must be from the discipline of physical or environmental science and at least one member from either the discipline of biological sciences or fisheries science.

3. At least one year of each student’s program must be spent as a full-time resident student as defined in the general degree requirements.

4. At least 30 semester credits of advanced work, of which at least 12 credits must have been earned in courses numbered 600 or above, with a grade average of 3.0 or better, are required for the M.A. degree. In addition, a student must have registered for thesis (MS 560) for at least one semester. No more than six thesis credits may be counted toward the minimum 30 credits required for
the M.A. Thesis hours credited to a student in Research Graduate Status, above and beyond those for which they have paid, may not be counted for the minimum number of thesis credits required for the degree.

5. Upon a favorable recommendation of the student’s Advisory Committee and the Committee on Academic Status and Degrees, followed by a majority vote of the faculty of the School of Marine Science and the approval of the Dean of Graduate Studies, a student may be admitted to candidacy after completion of the following requirements:

a. The student must have achieved a grade point average of B (3.0) or better, averaged over all courses taken for credit at the time of application for admission to candidacy.

b. All core courses required by the School of Marine Science, including MS 501, MS 502, MS 503, MS 504 and statistics, must be passed or officially exempted, and all other courses specifically required by the student’s Advisory Committee must be completed.

c. The language requirement and the comprehensive examination must be satisfactorily completed.

6. The student must present a seminar to the marine science faculty, staff and students on a thesis topic approved by the major professor, the Advisory Committee and the Dean of Graduate Studies, and must defend this thesis before his or her major professor and committee. The defense of the thesis shall be separate from any other examination. The thesis must be submitted in final form to the College two weeks before the student expects to receive the degree. The degree will not be granted until 5 copies (approved and signed by the major professor and the committee and prepared for binding), one of which is the original, have been presented by the student to the authorities as required by the College. Detailed information regarding procedures for submission of the thesis can be obtained from the Office of the Dean of Graduate Studies.

7. All requirements for the degree must be completed within six calendar years after commencing graduate study. In exceptional cases, if recommended by the appropriate faculty committee, time extensions may be approved by the Dean of Graduate Studies.
Degree of Doctor of Philosophy Requirements

The steps to be accomplished and the requirements are:

1. The student must select a suitable major professor, who must be a faculty member of the School of Marine Science, as soon as possible following admission. The student and the major professor will choose an Advisory Committee, which must be approved by the Dean of Graduate Studies. The major professor and Advisory Committee direct the student’s program.

2. Doctoral candidates must complete the course requirements (except thesis) for the Master of Arts degree in the School of Marine Science, or have fulfilled similar requirements at another equivalent institution. Course requirements beyond those required for a Master’s degree will be established and approved by the student’s major professor and Advisory Committee.

3. The Advisory Committee, chosen by the student and approved by the Dean of Graduate Studies, must consist of at least five members, at least one of whom must be from outside the School of Marine Science. A majority of the committee’s members must be members of the faculty of the School of Marine Science, although persons with appropriate qualifications from outside the School of Marine Science may serve on the committee. For students with a concentration in biology or fisheries science, at least one member must be from the discipline of physical or environmental science. For students with a concentration in physical or environmental science, at least one member must be from the discipline of biological science or fisheries science. For students with a concentration in resource management and policy, at least one member must be from the discipline of physical or environmental science and at least one member must be from the discipline of biological science or fisheries science.

4. A minimum of three years of graduate study beyond the baccalaureate is required. At least one academic year must be spent in residence as a full-time M.A. or Ph.D. student of the College of William and Mary at either the Williamsburg or the Gloucester Point campus, or both, as defined in the general requirements above.

5. In addition to and separate from the comprehensive examination, the student must satisfactorily complete a qualifying examination to demonstrate factual and theoretical knowledge in the student’s field of specialization and in other subject areas as required by the student’s advisory committee.

6. Admission to candidacy is the same as listed in Degree of Master of Arts section except that the separate qualifying examination also must be satisfactorily completed.

7. The dissertation must be submitted to the College two weeks before the date of commencement.
8. Each candidate must present a seminar to the marine science faculty, staff and students on his or her dissertation and must successfully defend the dissertation in a final examination before it can be accepted by the School of Marine Science. This examination may be written or oral at the discretion of the School of Marine Science and shall be open to the faculty and to such outside persons as may be invited. This examination shall be separate from any other examination.

9. All graduate work in the School of Marine Science must be accomplished within seven calendar years after beginning work for the doctoral degree. In exceptional cases, if recommended by the appropriate faculty committee, extensions may be approved by the Dean of Graduate Studies.

10. Dissertations will be published by having a master microfilm negative made from each original dissertation. These negatives will be stored and serviced by "University Microfilms" of Ann Arbor, Michigan, and positive microfilms, or enlarged prints, will be produced to order at the standard rate for other scholars who desire access to any dissertation. Each dissertation, when submitted, must be accompanied by two copies of an abstract of not more than 350 words. This abstract, or summary, will be published in Microfilm Abstracts for national distribution. No dissertation will be accepted without this abstract. A fee for the above services must be paid by the candidate for the Doctor of Philosophy degree before it is conferred. All dissertation research should be planned, conducted and reported with a view toward publication of the results in a legitimate scientific journal.
The Institute’s DeHavilland-Beaver aircraft.

Intense field study.
POLICIES
The VIMS/SMS 40-member dive team logged 663 dives in 1992.
General Statement of Policy

Within the limits of its facilities and its obligations as a state university, the College of William and Mary opens the possibility of admission to all qualified students without regard to sex, race, color, age, religion, national origin, sexual orientation, or handicap.

The facilities and services of the College are open to all enrolled students on the same basis, and all standards and policies of the institution, including those governing employment, are applied accordingly.

Senior citizens of Virginia who wish to take advantage of fee waiver privileges in order to attend courses at William and Mary are invited to contact the Office of Admissions for full details.

The College reserves the right to make changes in the regulations, charges, and curricula listed herein at any time.

Honor System

The Honor System, first established at William and Mary in 1779, remains as one of the College’s most cherished traditions. It assumes that principles of honorable conduct are familiar and dear to all students and hence dishonorable acts will not be tolerated. Students found guilty of cheating, stealing, or lying are subject to dismissal. The principles of the Honor System and the method of administration are described in the Student Handbook.
Graduate Regulations

Application for Admission

Requests for application forms and completed application materials should be sent to:

Dean of Graduate Studies
School of Marine Science
College of William and Mary
Gloucester Point, Virginia 23062

Students are encouraged to apply for admission during the winter of each calendar year with a closing date of February 15. Applicants will be notified after March 15 and no later than April 1. Admission will be valid for matriculation for the following summer, fall and winter semesters. Most students should anticipate a fall matriculation. The Dean of Graduate Studies should be contacted prior to submitting applications at any other time or regarding any special circumstances the student’s application or matriculation might present.

The following are required of applicants to the School of Marine Science:

1. One (1) copy of the completed application form.

2. A non-refundable processing fee of $20. This fee is not credited to the student’s account. There is no fee for application for admission as an unclassified (post-baccalaureate) student.

3. Three (3) letters of recommendation.

4. Official transcripts of all college work. (Final degree transcripts are required of admitted students before they matriculate.)

5. Official Scores of the Verbal and Quantitative sections of the Graduate Record Examination (GRE).

Scores in an Advanced section of the Graduate Record Examination in the applicant’s undergraduate major field or an area appropriate to the applicant’s proposed concentration in marine science are informative but not essential. GRE scores which are more than 5 years old are not acceptable and the examination must be retaken. Applicants are encouraged to take the Graduate Record Examination at scheduled dates which will allow for receipt of scores by the aforementioned closing date. Applications lacking GRE scores or other critical materials after the closing date can not be evaluated by the Faculty.
International Students

International applicants whose primary language is not English must submit the results of the GRE English Language Proficiency Test, Test of English as a Foreign Language (TOEFL).

In general, the minimum acceptable TOEFL score is 550. The TOEFL requirement may be waived if the applicant has completed an undergraduate or graduate degree at an accredited U.S. institution or other appropriate institution in which the language of instruction is English. Students with marginal proficiency in English will be required to register for an appropriate English course offered at the Williamsburg campus. A reduced level of graduate courses is suggested for these students.

Transcripts, certificates of degrees, and similar documents submitted by international applicants must be accompanied by an English translation and must include titles of all courses taken and the grade received in each course.

International students admitted to the School must present proof that they have available funds sufficient to meet all costs they will incur while studying at the School of Marine Science. The form I-20 will not be mailed until this proof of financial support is received. For those students offered financial aid by the School of Marine Science, such aid may be included as a source of funds. For additional information, please contact the International Student Coordinator.

Admission Information

Applicants are encouraged to visit the campus to contact faculty members about specific research interests, funding opportunities, and program information.

Admission to the School of Marine Science is highly competitive and accordingly the Faculty carefully evaluates criteria of performance which include GRE scores, overall GPA and GPA in area of concentration, the difficulty of the applicant’s educational program, the applicant’s statement of purpose, letters of recommendation, and prior experience. Although it is neither possible nor desirable to provide absolute values of criteria that will ensure admission, the table on the following page shows GRE and GPA scores of applicants offered admission in Fall, 1993.

Classified Students

Students are admitted as regular or provisional graduate students. For matriculation as a regular graduate student, an applicant must have completed the requirements for a bachelor’s degree at an accredited college, with a record of high performance, and must have the recommendations of the Faculty and officials of the School of Marine Science.

Applicants judged deficient in preparatory studies or other areas may be admitted as provisional students. A provisional student may petition for regular student status after successful completion of those requirements stipulated in his or her notification of
GPA and GRE statistics of applicants offered admission for the Fall semester, 1993

<table>
<thead>
<tr>
<th>GPA</th>
<th>&lt;900</th>
<th>900-999</th>
<th>1000-1099</th>
<th>1100-1199</th>
<th>1200-1299</th>
<th>1300-1399</th>
<th>≥1400</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.0</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2.0-2.4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>2.5-2.9</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>3.0-3.4</td>
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<td>1</td>
<td>7</td>
<td>9</td>
<td>7</td>
<td>2</td>
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<tr>
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<tr>
<td>Totals</td>
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<td>3</td>
<td>2</td>
<td>14</td>
<td>19</td>
<td>15</td>
<td>9</td>
<td>63</td>
</tr>
</tbody>
</table>

Petition for change in status shall be reviewed by the Committee on Academic Status and Degrees, using as criteria overall academic performance and performance standards previously specified on the student’s notification of admission. Graduate credit earned by a provisional student will be applied toward the graduate degree upon conversion to regular student status.

Students may be admitted to either the Master of Arts or Doctor of Philosophy programs. Direct admission into the Doctor of Philosophy program is available to qualified applicants without a Master’s degree. Applicants requesting this option should indicate this choice in the appropriate section of the application form. Direct admission must be granted and therefore requires an evaluation by the Admissions Committee. The following guidelines are employed by Admissions for this purpose: (1) direct admission is considered for applicants of exceptional promise and superior academic performance, and (2) the applicant must have the support of an appropriate faculty member who agrees to mentor the applicant over the course of study. Identification of a faculty mentor usually requires that the applicant visit campus to interview appropriate SMS faculty. Admissions’ actions on requests for direct admission are transmitted to the Dean of Graduate Studies for final action. Following completion of the course requirements for the M.A. degree in Marine Science, a student initially admitted to the master’s program may petition for permission to bypass the master’s degree and proceed directly toward the doctorate, assuming the student has met all requirements. The petition, which must be submitted to the Academic Status and Degrees Committee, should not be submitted until the student has successfully completed the comprehensive examination and must have support of the student’s advisory committee. The advisory committee must support this petition with a written statement confirming that the student has begun work on a research project acceptable as the basis for a doctoral dissertation, and that it is the consensus of the committee that the student has demonstrated a level of excellence to proceed directly to the doctorate. Following review of the petition and supporting documents and consideration of all faculty approved requirements for bypass, the Academic Status and Degrees Committee will recommend to the Dean of Graduate Studies whether or not permission
to bypass should be granted. Authority for the final decision rests with the Dean of Graduate Studies.

Students completing an M.A. degree in the School of Marine Science who desire to enter the Ph.D. program are required to submit a formal application for admission.

**Unclassified Students**

Students who have received a bachelor’s degree from an accredited college or university and who wish to take courses in the School of Marine Science but who are not entering an advanced degree program, may apply for unclassified student status (post-baccalaureate). Graduate credit earned as an unclassified student may be applied toward the graduate degree upon matriculation as a regular graduate student.

*Two School of Marine Science faculty are using innovative genetic techniques to examine stock characteristics of the spring lobster.*
Financial Information

Tuition and Fees

The College reserves the right to make changes in its charges for any and all programs at any time, after approval by the Board of Visitors.

The tuition and general fee for full-time students in the School of Marine Science is $2,207 per semester for residents of Virginia and $6,302 per semester for others.

Special Note: All incoming students registered for nine hours or more in 500-level courses or above, or for twelve hours or more at any level, are considered full-time students and charged the full-time rates unless qualified to be a Research Graduate Student.

Tuition for part-time students, at both the undergraduate and graduate levels, is as follows:

$145 per semester hour for Virginia residents.

$390 per semester hour for out-of-state students.

Regularly enrolled degree-seeking students of the College will be charged these rates during the regular session for part-time work, based on their established domiciliary status.

Rates for students who enroll in the Summer Session will be charged on the same basis.

Part-time students who are not regularly enrolled at the College of William and Mary, and for whom, therefore, no domiciliary status previously has been determined, will be charged on the basis of their satisfactorily established domiciliary status. (See statement regarding Eligibility for In-state Tuition Rate).

Auditing fees are the same as those specified for part-time students, unless the auditor is a full-time student. Permission to audit must be obtained from the instructor.

Graduate Assistantships

Graduate research and graduate teaching assistants work an equivalent of twenty hours a week. For graduate research assistants, every effort will be made to ensure that assistantship duties are relevant to the student’s course of study and research program. Graduate assistants must satisfactorily carry out the duties assigned by the School of Marine Science, must make satisfactory progress on their programs as defined by the College degree requirements and the regulations of the School of Marine Science, and may not hold any other employment or appointment of a remunerative nature during the term of their assistantships without approval of the Dean of Graduate Studies. Failure to comply with these conditions will lead to revocation of appointments.
Graduate Fellowships

A limited number of outstanding applicants are awarded fellowships that consist of "tuition remission" in addition to a graduate assistantship. These fellowships are awarded via a priority ranking system within the group which qualifies and are for up to three years depending upon satisfactory performance.

Research Graduate Student Status

Upon the recommendation of a student’s major professor, advisory committee, and the Committee on Academic Status and Degrees, the Dean of Graduate Studies may approve a student obtaining Research Graduate status if the following conditions have been met:

1. The student has completed all required coursework.
2. The student is not employed significantly in any activity other than research and writing in fulfillment of degree requirements.
3. The student is present on the campus or is engaged in approved field work related to his or her thesis or dissertation.

While classified as a Research Graduate, a student may register for a maximum of 12 credit hours of Thesis or Dissertation per regular semester upon payment of the part-time rate for only three credit hours of Thesis/Dissertation. The student may elect to utilize up to two (2) of the three paid credit hours for formal coursework.

A Research Graduate student may register for additional course credit only upon payment of the generally applicable additional part-time tuition.

A Research Graduate student is eligible for services (e.g. student health and athletic events) only if required fees are paid.

Eligibility for In-state Tuition Rate

To be eligible for the lower tuition rate available to in-state students, a student must meet the statutory test for domicile set forth in Section 23-7.4 of the Code of Virginia. Domicile is a technical legal concept, and a student’s status is determined objectively through the impartial application of established rules. In general, to establish domicile students must be able to show (1) that for at least one year immediately preceding the first official day of classes their permanent home was in Virginia and (2) that they intend to stay in Virginia indefinitely after graduation. Residence in Virginia primarily to attend college does not establish eligibility for the in-state tuition rate.

On admission to the College an entering student who claims domiciliary status is sent an application form and instructions on how to fill it out. The Office of the Registrar evaluates the application and notifies the student of its decision. A student re-enrolling in the College after an absence of one or more semesters must re-apply for domiciliary status and is subject to the same requirements as an entering student. A matriculating
student whose domicile has changed may request reclassification of out-of-state to in-state; since reclassification is effective only prospectively, however, it must be applied for before the beginning of the academic semester. Any student may ask for written review of an adverse decision, but a change in classification will be made only when justified by clear and convincing evidence. All questions about eligibility for domiciliary status should be addressed to the Office of the Registrar.

Payment of Accounts

Charges for the tuition and general fee are payable in advance by the semester. Registration is not complete until all fees due the Treasurer's Office are paid. Any unpaid balance on an individual's account could result in cancellation of registration. Remittance being made by check should be drawn to the College of William and Mary. Checks returned by the bank for any reason will constitute nonpayment of fees and will result in subsequent cancellation of registration.

Refunds to Students Who Withdraw from the College

Subject to the following regulations and exceptions, all charges made by the College are considered to be fully earned upon completion of registration by the student. Due to administrative procedures, refunds will not be processed until six (6) weeks after classes begin.

1. A student who withdraws within the first five-day period immediately following the first day of classes is entitled to a refund of all charges, with the exception of $50 which shall be retained by the College to cover the costs of registration, subject to Item No. 5, below. (Such refunds shall not include any deposits or advance payments which may have been required by the College as evidence of the student's intention to enroll.)

2. A student who withdraws at any time within the next following 25 days after the first day of classes shall be charged 25% of the tuition and general fee, subject to Item No. 5 below.

3. A student who withdraws at any time within the second 30-day period after the first day of classes shall be charged 50% of the tuition and general fee, subject to Item No. 5 below.

4. A student who withdraws at any time after 60 calendar days following the first day of classes shall be charged the full tuition and general fee, subject to Item No. 5 below.

5. No refunds will be made to a student who has been required by the College to withdraw, regardless of the date of withdrawal.

6. No refunds will be made to a student who withdraws unofficially.
7. A registration fee of at least $50 will be deducted from the amount due and paid by a part-time student who withdraws within 60 calendar days immediately following the first day of classes, except in the case of an in-state student who is registered for only one credit hour. In such a case, the student will receive no refund.

If the total amount due and paid is more than $100, a maximum of 50% of the total will be refunded. The graduated refund policy noted for full-time students will not apply to part-time students.

No refund will be granted to a part-time student who withdraws after 60 calendar days immediately following the first day of classes; or who has been required by the College to withdraw, regardless of the date of withdrawal; or who withdraws unofficially.

At the graduate and/or law school level, a part-time student is one who is enrolled for eight (8) credit hours or less. An exception to this rule is noted under Tuition and Fees.

Withholding of Transcripts and Diplomas in Cases of Unpaid Accounts

Transcripts or any other information concerning scholastic records will not be released until College accounts are paid in full. Diplomas will not be awarded to persons whose College accounts are not paid in full.
On the deck - Page House student center.

Students at work?
STUDENT SERVICES
Student Facilities and Services

Housing

There is no student housing on the SMS/VIMS campus, and most students live in Gloucester Point or in surrounding communities. Rental housing is plentiful, and area rents generally range from $250 to $450 or more per month, depending on the accommodations. Students often elect to share housing in order to keep costs to a minimum.

A limited number of apartments for graduate students are available on the Williamsburg campus. Located next to the Marshall-Wythe School of Law, the Graduate Housing Complex is within walking distance of the College’s main campus and historic Colonial Williamsburg. Information and application forms may be obtained from the Office of Residence Hall Life, P.O. Box 8795, 206 James Blair Hall, Williamsburg, VA 23187-8795, (804) 221-4134.

Cultural Life at William and Mary

As part of the William and Mary community, School of Marine Science students may participate in a broad range of cultural activities on the Williamsburg campus. Under the auspices of the Committees on Concerts and Lectures and the Speakers Forum, the College provides its students opportunities to enjoy a full spectrum of public lectures and concerts. In recent years College audiences have enjoyed performances by nationally and internationally recognized theatre arts performers. In addition, the William and Mary Theatre annually presents four full-length plays in public performance. The Speakers Forum offers subscription series featuring prominent national personalities from the worlds of politics, entertainment, and the arts.

Under the sponsorship of the Fine Arts Department, the Campus Center, and the Muscarelle Museum of Art, exhibits in painting, sculpture, and architectural design, theatre and industrial arts are shown throughout the year.

Numerous small and large cities—including the major metropolitan areas of Norfolk, Virginia Beach, and Richmond—are within easy driving distance of Gloucester Point. Each provides a broad array of cultural and entertainment events throughout the year.

Campus Parking

Many students drive a motor vehicle to the SMS/VIMS campus, and parking can sometimes be at a premium. However, space is usually available in one of the 16 campus parking areas, including three lots near the Franklin Marine Center. All motor vehicles, including motorcycles and motorbikes, parked on SMS/VIMS property must be registered with Administrative Services in Watermen’s Hall. Registration includes the purchase of a College of William and Mary parking decal, which must be displayed
on or in the vehicle. Decals are also honored on the main campus in Williamsburg. Illegally parked or unregistered vehicles are subject to citation, and students with unresolved citations are not allowed to register for classes or to receive degrees.

A full description of campus motor vehicle regulations is contained in a booklet available from Administrative Services.

Outdoor Life and Athletics

With SMS/VIMS’ semi-rural setting in close proximity to the Chesapeake Bay and its many tributaries, and with the Blue Ridge Mountains only a few hours drive to the west, students enjoy diverse opportunities for outdoor activities ranging from sailing, canoeing, and kayaking to biking, hiking, and both fresh- and saltwater fishing.

Graduate students regularly participate in informal and organized soccer, basketball, and other team sports, and are eligible for reduced-rate health club memberships at community fitness centers in Gloucester and nearby Newport News.

The Williamsburg campus includes the 15,000-seat capacity Cary Field stadium used for competitive football, track, soccer, and lacrosse events, as well as providing space for intramural sports. William and Mary Hall has an indoor seating capacity of 10,000 for basketball, gymnastics and track. Graduate students who pay full tuition and general fees are admitted to all athletic contests by presenting their ID cards.

The Office of Recreational Sports provides a variety of leisure pursuits to all students through intramural, sport club, informal recreation, fitness/wellness and outdoor programs. Facilities include the Student Recreation Center, Adair Gymnasium, William and Mary Hall, Lake Matoaka and various other outdoor facilities. The Recreation Center and Adair Gymnasium each have a 25-yard indoor pool. Facilities are open seven days per week during the academic year and often during the break periods. Facility schedules and procedures for checking out equipment are available at any recreational facility or the Campus Center.

Intramurals are separated into co-rec, men’s and women’s divisions for most activities. Play is held for each of over 30 sports/activities during the year. Informal or open recreation, generally considered “free-play,” is offered in aerobics, swimming, racquetball and squash, basketball, weightlifting, canoeing and kayaking and other sports.

The Sport Club program consists of 23 clubs, each self-governing and self-supporting and dictated simply by participants’ interest in the activity. Clubs include badminton, crew, cricket, cycling, ice hockey, judo, men’s lacrosse, martial arts, outdoor, racquetball, rifle, men’s rugby, women’s rugby, running, sailing, scuba, men’s soccer, women’s soccer, squash, surfing, tennis and ultimate frisbee.

For information on any activity, program or service offered by Recreational Sports, the office may be contacted at 221-3310.
Student Health Service

Graduate students who have filed a history and physical examination form and carry at least nine credits per semester are eligible to use the College’s student health service, which is operated on the main campus in Williamsburg. Graduate students who carry fewer than nine credits per semester are eligible to use the health service if they are certified by the Dean of Graduate Studies as “full-time equivalent” students and pay the student health fee.

Any student who has not submitted his/her health history and physical examination form by the end of his/her first semester at the College will not be permitted to register for the next semester.

The health service is housed in the King Student Health Center, which includes an out-patient clinic, a dispensary, and a limited number of beds for overnight care. A variety of services, most of which are covered by the student health fee (a portion of the tuition and general fee), are provided by the King Student Health Center.

Center for Personal Learning and Development

Located on the Williamsburg campus offers professional assistance with psychological problems and problems involving social relationships and the understanding of oneself or others. Services are offered to students through individual psychotherapy, group psychotherapy, and personality testing and assessment. With the exception of national test services, all Center services are free to students. As a matter of policy, the Center does not deal with problems that require the prescribing of drugs, except in instances that warrant cooperative work with the Student Health Service. No information concerning an individual’s contact with the Center will be released without the written permission of the client. The Center also does not handle problems associated with course selection, job placement, career counseling, or remedial academic programs.

Career Services Center

Located in Blow Hall on the William and Mary campus, Career Services provides quality career planning and job search services. Numerous services including a comprehensive computerized career guidance system, career library, speakers series and seminars are provided to assist students.

The Graduate Student Association

The Graduate Student Association is a voluntary organization open to all graduate students in the School of Marine Science.

The purpose of the Association is to advance the academic and social interests of its members. Officers are elected each spring for the following academic year.
Gloucester Point Campus

1. WATERMEN'S HALL
2. MARINE CULTURE LAB
3. MAURY HALL
4. DAVIS HALL
5. FERRYPIER HOUSE
6. BROOKE HALL
7. BYRD HALL
8. SEDIMENT LAB
9. SERVICE CENTER & WET LAB
10. MAINTENANCE SHOP
11. REED HOUSE
12. MASEFIELD HOUSE
13. HOXTON HALL
14. HOLBEN HOUSE
15. WHITE HOUSE
16. STEVENSON HOUSE
17. MELVILLE HOUSE
18. CONRAD HOUSE
19. COASTAL INVENTORY FACILITY
20. RALEIGH HOUSE
21. JEFFERSON HALL
22. HALL HOUSE
23. BROWN HOUSE
24. WILLIAMS HOUSE
25. PAGE HOUSE
26. SAFETY OFFICE
27. CLAYTON HOUSE
28. FRANKLIN HALL
29. NEWPORT HALL
30. BOATSHED
31. OYSTER HATCHERY
32. SAV GREENHOUSE
33. TURTLE GREENHOUSE
34. DIVE LOCKER
35. NUNNALLY HALL