August, 1983

Note: This catalog provides announcements for the 1983-1984 academic year. It is current until August, 1984. The College reserves the right to make changes in the regulations, charges, and curricula listed herein at any time.

Catalogs are issued for other 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

Senior citizens of Virginia who wish to take advantage of fee waiver privileges for attending courses at William and Mary are invited to contact the Office of Admission for full details.
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College of William and Mary

SCHOOL OF MARINE SCIENCE

Calendar 1983-84

1983

FIRST SEMESTER

Registration of Graduate Students

August 24   A - H (Names starting with) (Wednesday)
August 25   I - P (Names starting with) (Thursday)
August 26   Q - Z (Names starting with) (Friday)
August 29-30 New Student Orientation (Monday-Tuesday)
September 1 Beginning of Classes: 8 a.m. (Thursday)
September 15 Last day to add courses (Thursday)
October 10-11 Fall Break (Monday-Tuesday)
October 21   Mid-Semester (Friday)
November 23 Beginning of Thanksgiving Holiday:
                1 p.m. (Wednesday)
November 28   End of Thanksgiving Holiday:
                8 a.m. (Monday)
December 9   End of Classes: 5 p.m. (Friday)
December 10-13 Reading Period (Saturday-Tuesday)
December 14-21 Examination (Wednesday-Wednesday)
December 21   Last date to submit theses and dissertations for December con-
                ferral of degrees (Wednesday)

1984

SECOND SEMESTER

Registration of Graduate Students

January 9   A - H (Names starting with) (Monday)
January 10   I - P (Names starting with) (Tuesday)
January 11   Q - Z (Names starting with) (Wednesday)
January 12   New Student Orientation (Thursday)
January 16   Beginning of Classes: 8 a.m. (Monday)
January 30   Last day to add courses (Monday)
February 4   Charter Day (Saturday)
March 2      Beginning of Spring Vacation
                (Friday-Monday)
March 12     End of Spring Vacation
                8 a.m. (Monday)
March 12     Mid-Semester (Monday)
April 25     End of Classes: 5 p.m. (Wednesday)
April 26-29  Reading Period (Thursday-Sunday)
April 30 - May 8   Examinations (Monday-Tuesday)
May 7       Last day to submit theses and dissertations
                for May Commencement (Monday)
May 13      Commencement (Sunday)
SUMMER SESSION

May 23-June 1  Registration of Graduate Students
June 4       Beginning of First Term (Monday)
July 6       End of First Term (Friday)
July 9       Beginning of Second Term (Monday)
August 10    End of Second Term (Friday)
August 10    Last day to submit theses and dissertations for
                     August conferrel of degrees (Friday)

BOARD OF VISITORS

Herbert V. Kelly '40 ............................................. Rector
Anne Dobie Peebles '44 ..................................... Vice Rector
Jerry K. Jebo '67 .............................................. Secretary

Edward E. Brickell '50                            Lewis L. Glucksman '45
Sharon A. Coles '75                                 The Honorable A. Linwood Holton
Colin R. Davis '50                        LL.D. '72
The Honorable Richard J. Davis '42                Jeanne S. Kinnamon '39
Milton L. Drewer, Jr.                               A. Addison Roberts '39
Caroline T. Egelhoff '46                          Harriet N. Storm '64
Robert J. Faulconer '43                            Henry T. Tucker, Jr. '22
                                                 Raymond T. Waller '40

OFFICERS OF ADMINISTRATION

Thomas A. Graves, Jr. ........................................... President
George R. Healy ........................................... Vice President for
                                 Academic Affairs
Duane A. Dittman ........................................... Vice President for
                                 University Advancement
Lawrence W. Broomall, Jr. ........................................... Vice President
                                 for Business Affairs
Frank O. Perkins ........................................... Dean of School of
                                 Marine Science
John M. Zeigler ........................................... Associate Dean of
                                 School of Marine Science
Thomas J. Kuchinka ........................................... Associate Director
                                 for Finance and Administration
THE FACULTY OF THE
SCHOOL OF MARINE SCIENCE

Frank Overton Perkins, Dean and Professor of Marine Science. B.A.,
University of Virginia; M.S., Ph.D., Florida State University.

John M. Zeigler, Associate Dean and Professor of Marine Science. B.A.,
University of Colorado at Boulder; Ph.D., Harvard University.

Jay Donald Andrews, Professor Emeritus of Marine Science. B.S., Kansas
State College; M.A., Ph.D., University of Wisconsin.

Michael E. Bender, Professor of Marine Science. B.A., Southern Illinois
University; M.S., Michigan State University; Ph.D., Rutgers University.

Robert J. Byrne, Professor of Marine Science. M.S., Ph.D., University of
Chicago.

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

William Jennings Hargis, Jr., Professor of Marine Science. A.B., M.A.,
University of Richmond; Ph.D., Florida State University.

Dexter S. Haven, Professor of Marine Science. B.S., M.S., Rhode Island
State College.

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

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

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

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

Maynard M. Nichols, Professor of Marine Science. B.A., Columbia Univer-
sity; M.S., Scripps Institution of Oceanography; Ph.D., University of
California at Los Angeles.

Willard Abraham Van Engel, Professor of Marine Science, Ph.B., Ph.M., University of
Wisconsin.

Marvin Leroy Wass, Professor Emeritus of Marine Science. B.S., Winona
State College; M.S., Florida State University; Ph.D., University of Florida.

Kenneth L. Webb, Professor of Marine Science, A.B., Antioch College; M.S.,
Ph.D., Ohio State University.
Lynn Donelson Wright, Professor of Marine Science. B.A., University of Miami; M.A., University of Sydney; Ph.D., Louisiana State University.

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

Rudolf H. Bieri, Associate Professor of Marine Science. Dr.rer.nat. Johann Gutenberg University.

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

Michael Castagna, Associate Professor of Marine Science. B.S., M.S., Florida State University.

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

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

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

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

Bruce J. Neilson, Associate Professor of Marine Science. B.A., M.S.E., M.A., Princeton University; Ph.D., The Johns Hopkins University.

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

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

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

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

Craig L. Smith, Associate Professor Emeritus of Marine Science. A.B., The Johns Hopkins University; Ph.D., University of Florida.

N. Bartlett Theberge, Jr., Associate Professor of Marine Science. B.S., J.D., College of William and Mary; LL.M., University of Miami.
Beverly A. Weeks, Associate Professor of Marine Science. B.A., Winthrop College; M.S., Tulane University, School of Medicine; Ph.D., North Carolina State University.

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

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

Carl F. Cerco, Assistant Professor of Marine Science. B.S., Newark College; M.S., University of North Carolina and Massachusetts Institute of Technology; Ph.D., College of William and Mary.

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

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

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

Carl Hershner, Assistant Professor of Marine Science. B.S., Bucknell University; Ph.D., University of Virginia.

Carl H. Hobbs, III, Assistant Professor of Marine Science. B.S., Union College; M.S., University of Massachusetts.

Paul V. Hyer, Assistant Professor of Marine Science. B.S., University of Notre Dame; Ph.D., University of Maryland.

Howard Kator, Assistant Professor of Marine Science. B.S., Harpur College; Ph.D., Florida State University.

Polly A. Penhale, Assistant Professor of Marine Science. B.A., Earlham College; M.S., Ph.D., North Carolina State University.

Nungjane Carl Shi, Assistant Professor of Marine Science. B.S., National Taiwan University; M.S., University of Washington; Ph.D., University of Washington.

Chih-Wu Su, Assistant Professor of Marine Science. B.S., Cheng Kung University; Ph.D., University of California.

Kenneth J. Sulak, Assistant Professor of Marine Science. B.A., Harvard University; M.S., University of Miami.

J. Ernest Warinner, III, Assistant Professor of Marine Science. B.S., M.A., College of William and Mary.
Richard L. Wetzel, Assistant Professor of Marine Science. B.S., M.S., University of West Florida; Ph.D., University of Georgia.

Frank J. Wojcik, Assistant Professor of Marine Science. B.S., University of Massachusetts; M.S., University of Alaska.

David E. Zwerner, Assistant Professor of Marine Science. B.S., George Washington University; M.A., College of William and Mary.

Thomas A. Barnard, Jr., Instructor in Marine Science. B.A., Milligan College; M.A., College of William and Mary.

Cynthia L. Bosco, Instructor in Marine Science. B.S., M.A., College of William and Mary.

Elizabeth A. Cornell, Instructor in Marine Science. B.S., University of Wisconsin; M.S., University of Rhode Island.

Mary C. Gibbons, Instructor in Marine Science. B.A., M.S., University of Delaware; Ph.D., State University of New York at Stonybrook.

Kevin P. Kiley, Instructor in Marine Science. B.S., Tufts University; M.A., College of William and Mary.

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

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

John E. Olney, Instructor in Marine Science. B.S., M.A., College of William and Mary.


Ginny H. Shaw, Instructor in Marine Science. B.A., M.S., College of William and Mary.
ASSOCIATE FACULTY

Roger D. Anderson, B.A., St. Olaf College; M.S., Texas A&M University; Ph.D., Texas A&M University; Executive Director, Gulf & South Atlantic Fisheries Development Foundation, Inc.

Robert E. Lee Black, A.B., William Jewell College; M.A., Ph.D., University of Washington. Professor of Biology and Marine Science, College of William and Mary.

Donald Boesch, B.S., Tulane University; Ph.D., College of William and Mary; Louisiana Universities' Marine Consortium.

Robert E. Lee Black, A.B., William Jewell College; M.A., Ph.D., University of Washington. Professor of Biology, College of William and Mary.

Ching Seng Fang, B.S., National Taiwan University; M.S., Ph.D., North Carolina State University.

Franklin H. Farmer, B.S., Tufts University; M.S., Ph.D., Virginia Polytechnic Institute and State University.

Michael L. Fine, B.S., University of Maryland; M.A., College of William and Mary; Ph.D., University of Rhode Island.

John J. Govoni, A.B., St. Anselm's College; M.S., Southeastern Massachusetts University; Ph.D., College of William and Mary.

Robert C. Harriss, B.S., Florida State University; M.A., Ph.D., Rice University; Senior Marine Scientist and Acting Head of the Marine Environments Branch, NASA Langley Research Center.

Harold J. Humm, B.S., University of Miami; M.S., Ph.D., Duke University; Professor of Marine Science, University of South Florida.

Gerald H. Johnson, B.S., M.A., Ph.D., Indiana University; Professor of Geology, College of William and Mary.

James A. Lanier, B.A., University of Virginia; M.S., Ph.D., College of William and Mary; Director, N. C. Marine Resources Center, Fort Fisher, North Carolina.

Martin L. Lenhardt, B.S., M.A., Seton Hall University; Ph.D., Florida State University; Associate Professor of Otolaryngology, Medical College of Virginia.

Victor A. Liguori, A.B., Haverford College; M.A., Ph.D., Princeton University; Associate Professor of Sociology, College of William and Mary.

Charlotte P. Mangum, A.B., Vassar College; M.S., Ph.D., Yale University; Professor of Biology, College of William and Mary.
James Glen Mead, B.S., Yale University; M.A., University of Texas; Ph.D., University of Chicago; Associate Curator of Mammals, Smithsonian Institution.

John V. Merriner, B.A., Rutgers University; M.S., Ph.D., North Carolina State University.

Thomas H. Probert, B.A., University of New Hampshire; ABT, Northeastern University; M.S., Ph.D., University of Massachusetts; Computer Scientist NOAA, Department of Commerce.

Carl N. Shuster, Jr., B.S., M.S., Rutgers, The State University of New Jersey; Ph.D., New York University; Environmental Biologist, Federal Energy Regulatory Commission.

Lamar Trott, A.A., St. Petersburg Junior College; B.A., M.A., Florida State University; Ph.D., University of California; Deputy Director, Office of Science and Environment, NMFS-NOAA.

Sheppard Y. Tyree, Jr. B.S., Ph.D., Massachusetts Institute of Technology; Professor of Chemistry, College of William and Mary.

Michael P. Weinstein, B.A., Hofstra University; M.S., Rutgers State University; Ph.D., Florida State University; Assistant Professor of Biology, Virginia Commonwealth University.

Scott C. Whitney, A.B., University of Nevada; LL.B., J.D., Harvard Law School; Professor of Law, George Mason University.

Lawrence L. Wiseman, A.B., Hiram College; M.A., Ph.D., Princeton University; Associate Professor of Biology, College of William and Mary.
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, or national origin, and provides reasonable accommodation for handicapped students. 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.
THE COLLEGE OF WILLIAM AND MARY

OBJECTIVES OF THE COLLEGE

Founded in 1693 as the second institution of higher education in the country, the College of William and Mary in Virginia is today a small, residential, full-time, coeducational university. It is a State university, drawing seventy percent of its over four thousand undergraduate students from the Commonwealth of Virginia. It is also national and international in character and contribution, enrolling students from throughout the nation, many foreign countries, and varied backgrounds.

William and Mary at the undergraduate level is dedicated to providing a liberal education that is rounded and thorough, preparing its students to live and to make a living. All students gain a broad base of understanding and knowledge in arts and sciences in their freshman and sophomore years. In their junior and senior years, they may pursue work toward the Bachelor of Arts or Bachelor of Science degrees in a full range of concentrations in arts and sciences or education, or they may enter a program of study in the School of Business Administration leading to the Bachelor of Business Administration degree.

The College also provides the opportunity for its students to pursue graduate work compatible with the liberal undergraduate program. Several departments in the arts and sciences offer advanced studies leading to the Master of Arts or Master of Science degrees. The History, Physics, and Psychology departments have programs leading to the Ph.D. and Psy.D. degrees. In the professional schools, the Marshall-Wythe School of Law offers the Juris Doctor degree; the School of Business Administration offers the M.B.A.; and the School of Education offers the Master of Arts in Education, the Certificate of Advanced Study, and the Doctor of Education. The School of Marine Science offers programs leading to M.A. and Ph.D. degrees.

The College's commitment in all programs to liberal education is the source of institutional coherence, William and Mary emphasizes, in its undergraduate, graduate and professional programs, the development of the student as a whole individual. The criterion of excellence in teaching and learning, in class and out of class, is at the heart of the educational process. With such objectives, and with a selective and limited enrollment, the College strives to provide its students with a high quality education, and to make a significant contribution to the Commonwealth of Virginia and to the nation through the development of independent, responsive individuals. Faculty, students, and administrators work closely together to create this educational environment, under the leadership of the Board of Visitors and with the support of the Board of the Society of the Alumni.

Continuing exploration of and participation in innovative and experimental approaches to teaching and learning are a significant aspect of the College's forward movement, and emphasis on research and high quality graduate programs contribute strongly to the development of excellence at William and Mary.

The College is accredited by the Southern Association of Colleges and Schools. It offers a wide range of courses, seminars, and programs both for credit and non-credit, in the evening and during the day, at its Williamsburg campus, at the Virginia Associated Research Campus in Newport News, and at the Gloucester Point and Wachapreague campuses of the School of
Marine Science. This contribution to the educational enrichment of the citizens of Virginia throughout their careers is provided by the professional schools of education, business, and law, and by the faculty of arts and sciences. It is in keeping with the College's commitment as a State institution to community service and enhanced educational opportunities for the adult citizens of the Commonwealth, and for its more than 30,000 alumni.

William and Mary is a college community, small enough to provide for relationships that allow true teaching and learning, large enough to have the resources to achieve excellence. An important aspect of this community is the location of the College in the beautiful and historic city of Williamsburg, where it constitutes an integral part of the restoration of Colonial Williamsburg. The partnership of the College, the City, the Restoration, and the educational, cultural and recreational opportunities afforded to all students at the College by this partnership add to the quality of life and the quality of education at William and Mary.
The School of Marine Science had its inception in the establishment of the Virginia Fisheries Laboratory by the Commonwealth in 1940. From 1940 until 1959 the academic program of the Laboratory was conducted by the Department of Biology of the College of William and Mary.

In 1959 the program became the Department of Marine Science, and in 1961 the Board of Visitors established the marine training program as the School of Marine Science. The General Assembly in 1962 reestablished the Virginia Fisheries Laboratory as the Virginia Institute of Marine Science, an independent research and service institution providing educational offerings in the marine sciences. In 1979 the General Assembly merged the Institute with the College of William and Mary.

Laboratories of the Institute originally were on the main campus at Williamsburg and at Yorktown. In 1950 the first permanent building was erected on the present campus at Gloucester Point, across the York River from Yorktown. The School awarded its first master's degree in 1943, and in 1964 inaugurated a doctoral program in Marine Science.

Facilities

Students of Marine Science (including Marine Fisheries Science, Biological, Chemical, Geological, and Physical Oceanography, and certain other areas of concentration including Marine Resource Management), through offerings of the School of Marine Science, have the unusual opportunity to take advanced undergraduate and graduate training at an active, year-round center of marine research.

The principal marine campus is located at Gloucester Point on the York River, an important estuary with easy access to the Chesapeake Bay and the nearby Atlantic. The Institute and the School are admirably situated to conduct research and teaching the marine, estuarine, and freshwater biology, chemistry, geology, and physical oceanography and engineering. The campus of the Eastern Shore Branch Laboratory at Wachapreague, Virginia, offers access to the embayments, salt marshes, barrier beaches and coastal waters of Virginia's Eastern Shore. The Wachapreague facility has laboratories for mariculture and research as well as dormitory and classroom space.

The first permanent building, Maury Hall, constructed in 1950, is devoted primarily to administrative offices, a lecture and exhibit room and small display aquaria, and an extensive and growing reference library. Brooke Hall (1958) contains offices, and other laboratory facilities, and Davis Hall (1961) houses the scanning electron microscope. The second floor of Davis Hall (added in 1974) houses laboratories associated with the bacteriology program. Byrd Hall (1969) houses ecology-pollution, chemistry, physiology, data processing, several lecture rooms and laboratories. Jefferson Hall (which was purchased in 1966 and enlarged in 1972) houses most of the marine fisheries science faculty and laboratories as well as the vertebrate and invertebrate collections of the Institute. Three buildings have flow-through saltwater systems providing additional experi-
mental facilities. Modern well-equipped chemical laboratories allow scientists and students to pursue marine chemistry with state-of-the-art facilities. The small-boat basin and Newport Building are located at the Franklin Marine Center. The Division of Physical Sciences and Ocean Engineering is quartered in several buildings about the campus as well as at the Franklin Marine Center. In early 1983, construction began on Waterman's Hall, an education and administration building that will include greatly expanded library and classroom facilities, a 273-seat auditorium, and administrative offices.

The Institute has an extensive complement of modern scientific equipment including a mass spectrometer, two electron microscopes (both scanning and transmission) and a sophisticated electronic computing center. Also on campus is a marine science library containing approximately 31,000 volumes and 1,500 serial titles. A hydraulic flume is housed in the Franklin Marine Center. In addition to these, a hydraulic model of the James River, located at Vicksburg, Mississippi is available for research by qualified students.
PROGRAM

The program of the School of Marine Science is primarily intended for the student who wishes to specialize in Marine Science or Oceanography at the graduate level. The degrees offered are the Master of Arts and Doctor of Philosophy in Marine Science. Majors in Biological, Physical, Chemical or Geological Oceanography, Marine Fisheries Science, and Marine Resource Management are available. Within these general areas, there are several specialties which may be studied—such as: Marine Pollution Biology, Wetlands Ecology, Benthic Ecology and Coastal Processes. The curriculum available to students working toward either degree is comprised of some 60 formal courses, 2 problems courses, 2 seminar courses, and 2 thesis courses.

Students who wish to enter into the Doctoral Program must hold a Master's degree from an accredited institution; however, it is possible to by-pass the Master's degree for students in residence with the approval of the Academic Status and Degrees Committee and the Dean.

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 may enroll in suitable 500 level courses. An undergraduate major in Chemistry, Geology, Physics, or Psychology may work on a marine problem in the field of specialization. Consent of the Chairman of the student's major department is required for an undergraduate student to take problems courses in Marine Science.

As in most marine institutions, activities are accelerated during the summer. Qualified undergraduate students may take advanced training in Invertebrate Ecology, Marine Fisheries Science, Physiology, and other subjects as scheduled. Several scientists are usually added to the research and teaching staff. In addition to the regular academic courses offered, special summer research courses in Marine Science may be arranged.

The faculty is heavily engaged in research as well as teaching. Students have an unusual opportunity to become intimately familiar with the field. This advantage is increased by the fact that the student's entire training program is carried out on the coast. Time is not lost in traveling from an inland campus to the sea; and the sea itself, is a constant classroom companion.

Approved marine science courses are offered at Williamsburg, but most are conducted on the campus of the School of Marine Science at Gloucester Point, Virginia. Accordingly, students commuting between campuses must schedule classes so as to allow time between them. Usually, thirty minutes are required to make the passage.
PREPARATORY STUDIES

Students who are seriously interested in Marine Science as a profession should consult with the Dean of the School as early in their college careers as possible regarding an academic program to be followed.

In general, all science is becoming more quantitative as the twenty-first century approaches. Regardless of one’s field of concentration, a solid background in mathematics through differential equations, a year of statistics, physics, and chemistry, and familiarity with computers is highly recommended. The sooner one can begin these subjects, the better. Students interested in Biological Oceanography or Marine Fisheries Science should plan to take such undergraduate subjects as Genetics, Comparative Anatomy of Vertebrates, Comparative Anatomy of Invertebrates, Histology, Embryology, Systematic Botany, Microbiology and Physiology.

The prospective physical oceanographer should have an undergraduate major in Chemistry, Physics, Meteorology, Geology, Engineering or Mathematics. It is assumed that any one of these physical science degrees includes the quantitative courses discussed above, but particularly helpful are courses in fluid mechanics, time series analysis and thermodynamics.
DESCRIPTION OF COURSES

501. Introduction to Physical Oceanography. Fall (3) Mr. Ruzecki. Prerequisites: Undergraduate Physics, Undergraduate Math.

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 the School of Marine Science upon the recommendation of the appropriate faculty committee. Lectures and laboratory.

502. Introduction to Chemical Oceanography. Spring (3) Mr. Huggett, Mr. Bieri. 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 the School of Marine Science upon the recommendation of the appropriate faculty committee. Three (3) lecture hours.

503. Introduction to Biological Oceanography. Fall (3) Mr. Roberts.

Introduction to principles and concepts of marine ecology; characteristics of the oceans and estuaries as ecosystems. Occurrence and distribution of marine organisms in relation to hydrography. Required of all students unless justification for exemption is approved by the Dean of the School of Marine Science upon the recommendation of the appropriate faculty committee. Lectures and laboratory.

504. Introduction to Geological Oceanography. Spring (3) Mr. Boon, Mr. Hobbs, Mr. Wright.

Concepts of marine geology: coastal processes, sea-floor spreading and continental drift, sediments and sedimentation, shelf and canyon development. Required of all students unless exemption is approved by the Dean of the School upon the recommendation of the appropriate faculty committee. Lectures and field trips.

505. Problems in Marine Science. Fall, Spring and Summer (1-4) Staff.

Supervised projects selected to suit the need of the graduate student. This is the avenue through which subjects not covered in other formal courses are offered. 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 603).

506. Introduction to Marine Science. Summer Session (5); Evening College (3); Fall and Winter (3 or 5) Staff.

A general introduction to marine science, including biological, chemical, geological, physical oceanography and the interactions between marine science and society. Lectures, laboratory and field trips, twenty-six hours per week for five weeks in summers. Evening College courses limited to
three (3) lecture hours and three (3) semester hours credit. Fall and Winter courses may include lectures, laboratory and field trips. Laboratory sessions will be presented at the discretion of the instructor. If all three are included, students may register for either three (3) hours (lecture and field trips only), or five (5) hours (lecture, field trips and laboratory) of credit.

507. Statistics for Marine Scientists I. Fall (3) Mr. Diaz.
Application of statistical methods to analysis of biological and physical data. Binomial and chi-square distributions, normal distribution. Hypothesis testing, introduction to analysis of variance and regression analysis. Three lecture hours. Required of all students unless justification for exemption is approved by the Dean of the School of Marine Science upon the recommendation of the appropriate faculty committee.

508. Introduction to Computer Programming for Marine Scientists. Fall (1) Ms. Shaw.
Introduction to time-sharing and use of terminals; introduction to computer language, elements of FORTRAN 77 including flow charts and program documentation, writing interactive programs, file creation and access. One (1) lecture hour, assigned laboratory problems using the VIMS PRIME 750 computer system.

509. Program design and Data Structures Using PASCAL. Spring (1) Mr. Lukens.
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 750.

Classification and identification, adaptation, ecology, life histories. Local marine, estuarine and freshwater forms emphasized. Lectures, laboratory and field trips, twenty-six hours per week for five weeks.

A general introduction to the ecology and systematics of algae and tracheophytes encountered in the marine environment. Lectures, laboratory and field trips, twenty-six hours per week for five weeks.

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.

516. Mathematical Review for Marine Scientists. 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: elementary algebraic manipulation, linear and quadratic equations, simultaneous equations, trigonometry, analytical geometry, binomial theorem, exponents and logarithms, elementary differential and integral calculus, simple differential equations, vectors, matrices (linear algebra). Three (3) lecture hours.

519. Computer Applications in Marine Science. As required (1) Staff.
Course designed primarily for students who require special programming for analysis of their research data. Following instruction in basics of programming language, each student will develop, with guidance one or more computer programs pertinent to his or her thesis research. One (1) lecture hour.

520. Literature Search and Scientific Writing. Spring (1) Mr. Grant, Ms. Barrick.
Instruction in use of selected abstracting and indexing services appropriate to marine science, and development of search strategy techniques applicable to on-line data bases. Step-by-step analysis of the preparation of a journal article; structure and content of research and thesis proposals. One (1) lecture hour.

522. Research Budget Planning and Tracking. Fall (2) Mr. Hershner.
The details of calculating line items for proposal budgets, including: mechanics of fringe benefit and indirect cost development; calculation and projection of salaries; computation and identification of matching funds; and preparation of calendar and fiscal year budgets. Course also examines the relationship between institutional and research budgets.

A method and laboratory supplement to MS 504. The course is intended for persons concentrating in Geological Oceanography and offers them experience in field and laboratory techniques which they will need during their careers. Seminars, laboratory, and field trips.

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.

601. Marine Science Seminar. Fall and Spring (1) Staff.
The organization and presentation of scientific data. Oral discussion and written outlines and critiques of selected seminar topics are required.

602. Advanced Biological Oceanography. As required (3) Staff.
Lecture and selected seminar topics covering broad concepts, principles and patterns in biological oceanography. Emphasis is on coastal and oceanic ecosystems. Recommended for advanced graduate students.
603. Advanced 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 505.

605. Radiobiology. As required (4) Mr. Warinner.
The principles of tracer techniques and procedures for radio-assay determinations in marine studies, including autoradiography, liquid scintillation, and gamma ray spectroscopy. Lecture and laboratory.

606. Fisheries Oceanography. Fall (3) Mr. Austin. Prerequisites: Physical Oceanography or Marine Fisheries Science.
Concept of the effects of natural environmental variability on the recruitment, availability (yield), abundance and behavior of living marine resources. Application to real-time fishing operations and climate scale analysis of fishery fluctuations. Two lecture hours and one laboratory hour.

607. Marine Microbiology. Spring, even-numbered years (4) Mr. Kator, Staff. Prerequisite: Biology 301 or equivalent.
Morphology, physiology, ecology, taxonomy, and methods of isolation, cultivation and identification of micro-organisms encountered in the marine environment. Three lecture and four laboratory hours.

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

609. Oceanographic Instrumentation. As required (1) Mr. Ruzecki.
General description and function of field sensors, instrument suites and sampling equipment used to study the marine environment to include meteorological, hydrographic, geological, geophysical, chemical and biological measurements. Deployment, retrieval, general maintenance and cost of equipment is stressed. Lecture and demonstration.

610. Pollution Biology. As required (3) Mr. Bender.
Study of the various types of pollutants, domestic and industrial wastes, soils, insecticides and radioactive materials and their effects on the marine environment. Three lecture hours.

611. Advanced Analytical methods for Water Quality Studies. Summer (1) Mr. Neilson, Staff.
Analytical methods used in assessing water quality conditions in the estuarine and marine environment will be presented. Techniques presented will include basic and specialized physical, chemical, geological, and bacteriological measurements. Related topics, such as NPDES regulations, standardization of procedures and analytical quality control, will be discussed. Three laboratory hours.
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. Marine Biogeography. Fall (3) Mr. Sulak.

614. Coastal Processes. Fall (3) Mr. Nichols.
Sedimentary processes of erosion, transportation and deposition in response to energy by currents, waves, tides, organic action and man. Character of sedimentary features in a range of coastal environments: estuaries, lagoons, bays, marshes, tidal flats and the continental shelf. Reading, discussion and seminars.

615. Coastal and Estuarine Morphodynamics. Alternate years (3) Mr. Wright. Prerequisites: Marine Science 501 and 504.
Dynamics of process-form interaction, co-adjustment and morphological changes. Principles of coastal hydrodynamics, sediment transport and morphodynamic adjustment are illustrated with application to continental shelves, nearshore and beach systems, dunes and beach ridges, estuaries and tidal flats, marshes and swamps. Lecture, reading, discussion, and field trips.

616. Depositional Environments and Stratigraphic Models. As required (3) or (4) with laboratory. Staff. Prerequisite: Marine Science 614 or 615.
Modern and Quaternary depositional products of shelf, coastal and estuarine waters and their relationships to contrasting environments and subenvironments. Primary sedimentary structures and the processes which form them will be considered together with other environmentally diagnostic features such as grain-size distributions, grain shapes, and benthic fauna. Stratigraphic models of shelves, barrier complexes, deltas, bays, and estuaries will be compared. Lecture, reading, and discussion. An optional laboratory may be taken for (1) extra credit.

617. Biology of Estuarine Fishes. Spring (3) Mr. Sulak. Prerequisite: Marine Science 608.
Life history, ecology and zoogeography of typical fish taxa inhabiting estuaries along the Atlantic seaboard. Emphasis on behavioral and morphological adaptations in response both to contemporary ecology and the evolutionary history of individual species. Research project on a selected species required. Enrollment limited. Three (3) lecture hours and field trips.

618. Marine Fisheries Science. As required (4) Staff.
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. Statistics for Marine Scientists II. Spring (3) Staff. Prerequisite: Marine Science 507 or equivalent, or permission of instructor.
An introduction to the design of experiments. Analysis of variance, regression and correlation, analysis of covariance and factorial arrangements. Three lecture hours.

620. Organic Geochemistry of the Marine Environment. As required (2) Mr. Bieri, Mr. Kator. Prerequisite: Organic Chemistry.
The course will provide an overview of both non-biogenic and biogenic aspects of diagenetic processes in recent marine sediments. Basic concepts discussed include the importance of physical-chemical conditions, characteristic changes in molecular structure, and the role of microorganisms in the diagenetic process.

621. Advanced Chemical Oceanography. As required (3) Mr. MacIntyre. Prerequisites: Chemistry 202; Math 203; Physics 102.
Physical chemistry of electrolytic solutions. Study of equilibrium and nonequilibrium models of chemical processes occurring at water-sediment, water-organism, and water-atmosphere boundaries. Three lecture hours.

622. Mass Spectrometry of Organic Molecules I. Fall (2) Mr. Bieri. Prerequisite: Consent of instructor.
Ionization of atoms and molecules, the deflection of charged particles by electric and magnetic fields. Discussion of different methods of mass to charge separation. Description of several types of mass spectrometers and special requirements for GS-MS systems. Other subjects including vacuum techniques and detection methods.

623. Mass Spectrometry of Organic Molecules II. Spring (1) Mr. Bieri. Prerequisite: Marine Science 622 or consent of instructor.
Interpretive aspects of mass spectra, General discussion of fragmentation. Systematic trends linked to molecular structure will be treated and explained through the use of key examples. Active participation of the student is expected.

624. Advanced Marine Ecology. Fall, odd numbered years (3) Mr. Wetzel, Mr. Diaz. Prerequisites: General Ecology, Marine Science 507 and consent of instructor.
Past and contemporary issues in marine ecology are presented through formal lectures, group discussions and selected laboratory exercises. Topics include unifying principles in ecology; species interactions via genetic, physiological and behavioral mechanisms; structural and functional classifications of marine populations and communities; and formalisms for ecological data reduction, presentation and interpretation. The underlying theme will be both theoretical and applied issues relevant to each topic. Three (3) lecture and laboratory hours.

625. Hydromechanics. Fall (3) Mr Hyer, Mr. Cerco. Prerequisites: Math 302, Physics 102 or equivalent.
Basic principles and equations, flow patterns, energy and momentum principles, dimensional analysis and dynamical similitude, potential flow,
viscous flow, turbulence. Gradually varied flow, rapidly varied flow, introduction to coastal hydraulics. Three lecture hours.

627. Advanced Physical Oceanography. As required (3) Mr. Brubaker. Prerequisite: Marine Science 625 or consent of instructor.
Momentum, continuity, vorticity, and energy equations. Influence of rotation, stratification, bottom topography, coastal and basin constraints. Hydrostatic, Boussinesq, linear, and inviscid approximations, scaling. Parameterization of boundary and internal stresses. Selected examples of transient flow, wave motion, and steady circulation.

629. Introduction to Sediment Transport. Fall (3) Mr. Byrne, Mr. Boon. Prerequisite: Marine Science 631 or consent of instructor.
Classical and recent work on sediment transport due to unidirectional and wave-induced motion in fluids. Topics include particle settling velocity, incipient motion criteria, bedload and suspended load transport formulations and bedform regimes. Two lecture hours.

630. The Early Life History of Marine Fishes. Fall, as required, Mr. Olney.
Development, physiology, behavior, and ecology of egg, larval, and juvenile stages with special reference to adaptations for larval survival in the sea, larval characteristics useful in identification, techniques in larval rearing, and egg and larval sampling methods will be outlined. Two lecture and four laboratory hours.

631. Estuarine Hydrodynamics I. As required (3) Mr. Kuo, Mr. Hyer. Prerequisite: Marine Science 625.
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. Three lecture hours.

632. Estuarine Hydrodynamics II. As required (3) Mr. Kuo, Mr. Cerco. Prerequisite: Marine Science 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. Three lecture hours.

633. Remote Sensing of Environment. As required, (3) Staff. Prerequisite: Introductory physics or consent of instructor.
Principles, methods and application of remote data collection and analysis. Cameras, infrared scanners, microwave, radiometers, and radar as used on aircraft and earth satellites. Photo-interpretation, analysis and enhancement, applications to oceanography and other disciplines.

634. Scientific Information Resources. Spring, odd numbered years (1) Mr. Lynch.
A review of available data bases, referral systems, federal information programs, etc., which would aid scientists or environmental managers in obtaining information relative to their research or management needs.
636. Ecosystem Model Simulation and Analysis. Fall, odd numbered years (5) 
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. Five lecture and laboratory hours.

Classical and recent work on wetland 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.

638. Turbulent Diffusion and Dispersion. As required (3) Mr. Kuo, Mr. Burbaker. Prerequisite: Marine Science 625. (Hydromechanics).
Principle of mass conservation, gradient transport theories, turbulent transport and concept of eddy diffusivity, mixing-length theory, dispersion in shear flow, in oscillatory flow and in stratified flow, applications of dispersion theories in estuaries and open seas. Three lecture hours.

Water quality parameters, application of mass-balance equation, dissolved oxygen modeling, ecosystem modeling, finite difference approximations, finite element techniques, numerical integrations, time scales and spatial dimensions. Survey of different types of models.

640. Population Dynamics. Fall, even numbered years (4) Mr. Loesch.
Absolute, relative and instantaneous rates of mortality and growth; production and biomass; computations of yield; estimates of population size; relationship between recruitment and size of stock; examples from important fisheries.

641. Waves and Their Analysis. As required (3) Mr. Wright, Mr. Boon, Mr. Shi. Prerequisite: Marine Science 501.
Introduction to linear wave theory and shoaling wave transformations; wave dispersion, radiation stress, refraction, reflection, and topographic trapping. Mechanisms of wave generation in the coastal boundary layer including oscillations at infragravity, tidal, and transtidal frequencies. Time series analysis, interpretation of wave records using harmonic and spectral methods with computer labs on the VIMS PRIME 750 System.

642. Coastal Engineering. As required (3) Staff. Prerequisite: Marine Science 625.
645. Marine Phytoplankton. Spring, even numbered years (3) Mr. Haas, Staff. Prerequisite: Marine Science 501, 502, 503, and 504.

Contemporary problems in marine phytoplankton investigations. Factors controlling the distribution, abundance, and production of planktonic organisms. Five lecture and laboratory hours.

646. Marine Zooplankton. Spring, odd numbered years (3) Mr. Grant.
The morphology, adaptations, distribution, taxonomy and ecology of marine zooplankton with attention to interrelationships with the remaining biota. Five lecture and laboratory hours.

647. Marine Benthos, Spring, odd numbered years (3) Mr. Diaz, Prerequisites: Marine Science 503, 510 or equivalent.
Ecology of marine benthic organisms. Factors affecting distribution, benthic habitats, structure and function of communities, biotic interrelationships and analytical techniques. Three lecture hours.

649. Marine Science in Public Affairs. As required (2) Mr. Hargis, 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 and public environmental and resource management activities. Discussion of the problems and premises of marine science in public affairs. Lecture, discussion, and observation.

650. Environmental Law and Marine Affairs I, Fall and II, Spring (1 to 3) Mr. Theberge.
An interdisciplinary course offered to law and science students and designed to examine the interrelationships between scientific and legal concepts. Issues, legislation, and institutions associated with coastal zone management, outer continental shelf development, fisheries management and other questions related to marine resources will be examined. Selected guest lecturers will speak on topics within their areas of competence.

651. Natural History of the Chesapeake Bay - Physical. Spring (3) Mr. Zeigler.
This course is a non-mathematical summary of the Chesapeake Bay. It stresses the origin of the Bay, its features and dynamics of circulation, sedimentation, stratigraphy and their interrelation with biology and man's use of the system.

652. Practical Application of Marine Resource Management Techniques. Fall and Spring (1 to 4) Staff. Prerequisites: Marine Science 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. As required (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. Fall, odd numbered years (1-2) Ms. Penhale, Mr. Wetzel.

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.

657. Light Microscopy for Marine Scientists. As required (2) Mr. Hargis, Staff.

Principles and practice of various techniques of light microscopy in research and teaching in the marine sciences and related scientific fields. Two lectures and laboratory hours. Research project required.

658. History of Marine Science. As required (3) Mr. Hargis.

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.
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 and the Dean of the School.
DEGREE REQUIREMENTS

General

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

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

1. Twelve 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.
5. Receipt of a grade below C generally presages dismissal from the School.
6. Each student must satisfactorily complete a written comprehensive examination. This examination must be taken the first time it is offered following the student's completion of the core courses.
7. By the end of a student's second year in the School, the student either must be granted an exemption from or earn a grade of at least B in core courses, MS 501, 502, 503, 504, and 507.

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 (3) hours each semester, and one (1) hour for each summer session. Students must be registered in the semester during which they graduate.

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 masters degree in the School of Marine Science need not take another language examination. Subfaculties and individual committees may adopt additional language requirements at their discretion.

The student working toward the doctorate must satisfy the language requirement prior to admission to candidacy. Minimum standards and procedures for demonstrating sufficient knowledge are administered by the Academic Status and Degrees Committee of the faculty.

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 must have been completed with grades of C or better; or

2. The student must pass the Educational Testing Service Foreign Language Examination with a score no lower than the thirty-fifth percentile in his subject option; or
3. With prior approval of the Dean, the student must 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, use English to fulfill the foreign language requirement. Proficiency in the use of the English language may be demonstrated by the completion of twelve (12) 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 may approve alternate methods.

Degree of Master of Arts

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

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, direct the student's program. The advisory committee consists of five faculty members (three full members and two examining members) from the School of Marine Science. For students with a concentration in biology oceanography or marine fisheries science, at least one of the members must be from physical, chemical or geological oceanography. For students with a concentration in physical, chemical or geological oceanography at least one member must be from biological oceanography or marine fisheries science. For students with a concentration in marine resource management, one member must be from physical, chemical or geological oceanography and one from either biological or marine 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 presented above.

4. At least twenty-four (24) semester credits of advanced work, of which at least one-half must have been earned in courses numbered 600 or above and with a grade average of B or better, are required for the M.A. degree. In addition master's students are required to register for at least six (6) semester hours of MS 560 (Thesis).

5. Upon a favorable recommendation of the student's advisory committee and the Academic Status and Degrees Committee, followed by a majority vote of the faculty of the School of Marine Science and the approval of the Dean, a student may be admitted to candidacy after completion of a minimum of ten (10) hours of graduate work at the School of Marine Science.

6. The student must present and defend a thesis approved by major professor, advisory committee and Dean. 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 should be obtained from the Office of the Dean.

7. All requirements for the degree must be completed within six (6) calendar years after commencing graduate study. In exceptional cases time extensions, if recommended by the appropriate faculty committee, may be approved by the Dean.

Degree of Doctor of Philosophy

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

1. The student must select a suitable major professor as soon as possible following admission. The student and the major professor will choose an advisory committee, which must be approved by the Dean. The major professor and advisory committee direct the student's program.

2. Course requirements will be established and approved by the student's major professor, in cooperation with the advisory committee, and approved by the Dean.

3. The advisory committee must consist of at least five members, one of whom must be from outside the School of Marine Science. The major professor, who must be a faculty member of the College, will serve as the committee's chairman. A majority of the committee must be faculty members of the College, although qualified persons from outside the College may be included. For students with a concentration in biological oceanography or marine fisheries science, one member must be from physical, chemical or geological oceanography. For students with a concentration in physical, chemical or geological oceanography, one member must be from biological oceanography or marine fisheries science. For students with concentration in marine resource management, one member must be from physical, chemical or geological oceanography and one from biological or marine fisheries science.

4. A minimum of three years of graduate study beyond the baccalaureate is required. At least one academic year beyond the first must be spent in residence as a full-time 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 written 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. Upon a majority vote of the faculty of the School of Marine Science, a favorable recommendation of the appropriate faculty committee, and the approval of the Dean of the School of Marine Science, a student may be admitted to candidacy. Prior to admission to candidacy, the student must have begun investigations on a dissertation research project approved by the student's advisory committee and satisfactorily completed the requirements for reading knowledge of one foreign language, the written comprehensive examination, and the qualifying examination.

7. The dissertation must be submitted to the college two weeks before the date of commencement.
8. Each candidate must successfully defend the dissertation in a final examination before it can be accepted by the College. 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 (7) 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.

10. All 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 of $25 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.

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 $888 per semester for residents of Virginia and $2,345 per semester for others.

SPECIAL NOTE. Effective September 1, 1981, any incoming student registered for NINE (9) hours or more in 500-level courses or above, or for TWELVE (12) hours or more at any level, was considered a full-time student and charged the full-time rates approved by the Board of Visitors of the College of William and Mary.

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

$57 per semester hour for Virginia students.
$146 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 Evening College or in Summer Session will be charged on the same basis.

The diploma fee is $20.00 for all degrees.

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 below regarding in-State, out-of-State classification for fee purposes).
Auditing fees are the same as those specified for part-time students, unless the auditor is a full-time student.

DEFINITION OF RESIDENCY: The legislative Act affecting residency, as it relates to calculation of charges for tuition and fees, is as follows:

Be it enacted by the General Assembly of Virginia, that the domicile of an unemancipated minor may be the domicile of either parent; provided, however, that if one parent has custody, the domicile of an unemancipated minor shall be the domicile of the parent having custody. If there is no surviving parent or the whereabouts of the parents are unknown, then the domicile of an unemancipated minor shall be the domicile of the legal guardian of such unemancipated minor if there are no circumstances indicating that such guardianship was created primarily for the purpose of conferring a Virginia domicile on such unemancipated minor.

No person in attendance at a State institution of higher education shall be entitled to reduced tuition charges unless such person is and has been domiciled in Virginia for a period of at least one year immediately prior to the commencement of the term, semester or quarter for which any such reduced tuition charge is sought.

A person who enrolls in any such institution while not domiciled in Virginia does not become entitled to reduced tuition charges by mere presence or residence in Virginia. In order to become so entitled, any such person must establish that, one year before the date of alleged entitlement, he or she was at least eighteen years of age or, if under the age of eighteen was an emancipated minor, and had abandoned his or her old domicile and was present in Virginia with the unqualified intention of remaining in Virginia for the period immediately after leaving such institution and indefinitely thereafter.

A person who is classified or classifiable at the date of his or her marriage as eligible to receive the privileges herein described, may receive or continue to receive such privileges until he or she abandons his or her Virginia domicile other than through any presumption of law attaching to the ceremony of marriage.

A student who is not a member of the armed forces and who is not otherwise eligible for reduced tuition charges and whose spouse or parent is a member of the armed forces stationed in this State pursuant to military orders shall be entitled to reduced tuition charges if such spouse or either parent, for a period of at least one year immediately prior to and at the time of the commencement of the term, semester or quarter for which reduced tuition charges are sought, has resided in Virginia, been employed full time and paid personal taxes to Virginia. Such student shall be eligible for reduced tuition charges through such parent under this section only if he or she is claimed as a dependent for Virginia and federal income tax purposes. Such student shall be entitled to reduced tuition charges so long as such parent or spouse continues to reside in Virginia, to be employed full time and to pay personal income taxes to Virginia.
Entitlement to reduced tuition charges must be established by convincing evidence and the burden of establishing entitlement shall be on the person claiming such entitlement.

IN-STATE TUITION ELIGIBILITY

Procedure for Determination of In-State Tuition Eligibility

I. Application for In-State Tuition Eligibility

The Registrar or his delegate shall provide appropriate forms to be completed by all persons who wish to claim eligibility for in-State tuition. Such forms shall be prepared and from time to time revised in consultation with the Chairman of the Status Appeals Board.

A. Entering Students—Such forms shall be furnished to entering students claiming eligibility for in-State tuition prior to their matriculation, and shall be completed and returned by them to the Registrar's Office. A student to whom such a form was sent who fails to complete and return such form not later than fifteen calendar days after the first day of classes of the semester for which in-State status is sought shall be deemed to have waived classification as an in-State student for the semester involved. A student claiming entitlement to in-State tuition to whom such a form was not furnished and to whom a bill for non-resident tuition was mailed or given, shall request such form, complete and return it not later than fifteen calendar days after the first day of classes of the semester for which the change in status is sought. Failure to do so shall likewise be deemed a waiver of classification as an in-State student for the semester involved.

B. Matriculated Students—Matriculated students who have been classified as ineligible for in-State tuition shall remain in that classification until changed. A student desiring a change in classification shall request the appropriate form from the Registrar's Office, complete and return it not later than fifteen calendar days after the first day of classes of the semester for which the change is sought. Failure to do so shall be deemed a waiver of classification as an in-State student for the semester involved.

C. Re-enrolling Students—Students who are returning to the College after being absent for one or more regular semesters and who claim entitlement to in-State tuition shall request, complete and return the appropriate form to the Registrar's Office not later than fifteen calendar days after the first day of classes of the semester for which in-State status is sought. Failure to do so shall be deemed a waiver of classification as an in-State student for the semester involved.

II. Initial Evaluation of Application for Classification

The Registrar or his delegate shall initially evaluate all requests for in-State tuition classification or re-classification according to Section 23-7 of the Code of Virginia, and shall inform the student of his classi-
fication by letter. Where the student's eligibility for in-State tuition is not clear, the Registrar or his delegate may refer the matter to the Status Reviewing Officer. A student who receives an adverse decision by the Registrar or his delegate may, within ten calendar days by written request, seek a review by the Status Reviewing Officer.

III. Review by the Status Reviewing Officer

The Status Reviewing Officer, who shall be appointed by the President and shall be legally trained, shall consider all status determinations referred to him pursuant to Section II above, and make such determinations as he may deem proper under Section 23-7 of the Code of Virginia, and shall communicate such determination in writing to the student with a copy to the Registrar's Office. If the determination be favorable to the student, the Registrar's Office may have five calendar days in which to request an appeal, which request shall be addressed to the Chairman of the Status Appeals Board. If the determination is unfavorable to the student he may, within 10 calendar days, request in writing an interview with the Status Reviewing Officer, which shall be awarded him, and at which time the student may be accompanied by counsel and may present such evidence or explanations as he deems appropriate. The Status Reviewing Officer shall thereupon, or as soon thereafter as is reasonably possible, and with due regard to matters brought out at the interview, affirm or modify his previous determination and inform the student of his action. If the matter is again determined adversely to the student, the Status Reviewing Officer shall inform the student of his right to appeal to the Status Appeals Board, which appeal must be made within 10 calendar days of the date of the final determination by the Status Reviewing Officer. Failure of any student notified of an adverse determination to request an interview or make an appeal within the time limits provided herein shall be deemed a waiver of classification for in-State tuition for the semester involved, unless a satisfactory excuse for the delay is presented and accepted by the Chairman of the Status Appeals Board.

IV. Appeal

The Status Appeals Board shall consist of three persons of faculty rank, none of whom shall be employed by the offices of the Vice President for Business Affairs. They shall be appointed by the President, who shall also designate a Chairman. Appeals to the Board shall be in writing and addressed to the Chairman, and need take no particular form. The Chairman shall, upon receipt of an appeal, schedule a hearing at a time convenient to the parties, and shall, in addition to consideration of whatever documents are deemed relevant, consider such statements as the appellant may wish to make and such evidence, oral or otherwise, as he may present. The hearing shall not be a review of the findings of the Status Reviewing Officer, but a hearing de novo. A student appellant may be represented by counsel. However, the Chairman may invite the Status Reviewing Officer to appear and communicate his evaluations and observations and/or may request a written statement from the Status Reviewing Officer regarding the reasons for his determinations. Upon completion of the hearing, the Board shall make such determination as is deemed proper and communicate the same in writing to the appellant with reasons therefor.
The determination of the Board shall be dispositive of the matter unless, in the case of a student appellant, an appeal is made in writing to the President within 5 calendar days of the determination by the Appeals Board. The President, or his impartial delegate acting in his behalf, in considering the appeal shall review only the documentary data involved unless an interview with the student is deemed appropriate. The President or his delegate shall thereupon decide the matter and make the final decision.

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 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 (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 $50.00 which shall be retained by the College to cover the costs of registration, subject to Item 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 5 below.

3. A student who withdraws at any time within the second thirty-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 sixty 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 $50.00 will be deducted from the amount due and paid by a part-time student who withdraws within sixty 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 $100.00, a maximum of 50% of that 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 sixty 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 8 credit hours or less. An exception to this rule is noted in the Financial Information section.

CREDITS ON ACCOUNTS OF HOLDERS ON SCHOLARSHIPS. Students holding scholarships are required to pay all fees less the value of the scholarship which they hold. In cases where scholarships exceed total charges, refunds will be processed upon written request of the student beginning six (6) weeks after classes begin.

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.

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 the appropriate notation will be entered on the record upon approval of the Dean and the appropriate authorities at the College.

ADMISSIONS

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

Dean's Office, Admissions
School of Marine Science
College of William and Mary
Virginia Institute of Marine Science
Gloucester Point, Virginia 23062

Applications close for the Fall term on March 1, for the Spring term October 1, and for the Summer Session on January 15. Successful applicants for fall admission will be notified by April 7, for spring admission by November 7. Late applications will be evaluated up until classes begin, but the process for late applicants is less programmed, and, therefore, no notification dates can be promised.

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

1. Two (2) copies of the completed application form.
2. A non-refundable processing fee of $20.00. 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.
5. Scores of the Verbal, the Quantitative, and at least one Advanced Graduate Record Examination (GRE).

Applicants must register for these tests directly with the Educational Testing Service, Princeton, New Jersey. The registration forms may be obtained from the Office of the Dean.
FOREIGN-EDUCATED STUDENTS. Additionally, foreign students must submit the results of the GRE English Language Proficiency Test. Test of English as a Foreign Language. (TOEFL).

In order to expedite evaluation of records of foreign-educated students, the transcripts of college records must include, titles of courses taken, the number of credits attempted and credits earned, and grades. Where transcripts do not give these details, they must be accompanied by an official statement explaining how the scholastic record may be compared to that of the College of William and Mary. Details must be given as to whether the courses are given on a semester basis (15 credits per semester, 30 per year, 120 for graduation), quarter basis (15 credits per semester, 45 per year, 180 for graduation) or other basis. In addition, the grading scale must be explained showing the grade equivalence in terms of A (highest) B, C, D (passing), F (failing).

ADMISSION. Students are admitted as regular or provisional graduate students, or as unclassified students (post-baccalaureate). For admission as a regular graduate student an applicant must have completed the requirements for a bachelor's degree at an accredited college, must have a quality point average of 2.5 on a 4.0 scale, or the equivalent on a 3.0 scale, and must have the recommendation of the appropriate committee and officials of the School.

An applicant with a bachelor's degree and with a deficiency in some area may be admitted as a provisional student. A provisional student may be admitted to regular student status upon completion of at least 10 semester hours of graduate work at the School of Marine Science and favorable recommendation of the Academic Status and Degrees Committee, followed by a majority vote of the faculty of the School of Marine Science and approval by the Dean. Graduate credit earned by a provisional student is applied toward the graduate degree upon admission as a regular graduate student.

Applicants who have received a bachelor's degree from an accredited college or university and who wish to take courses in the College but not to enter a program for an advanced degree, may apply for admission as unclassified students (post-baccalaureate). Graduate credit earned by an unclassified student is applied toward the graduate degree upon admission as a regular graduate student.

Students, except unclassified students, are admitted to either the Master of Arts or Doctor of Philosophy program. A superior student whose original acceptance was to the Master's program may petition for permission to bypass the Master's degree and proceed directly toward the Doctorate. The petition, which should be submitted to the Committee on Academic Status and Degrees, may not be submitted until the student has successfully completed the comprehensive examination and must have the support of student's advisory committee. At a minimum the student's advisory committee must demonstrate its support with a written statement that the student has begun work on a research project that the committee finds acceptable as the basis for a doctoral dissertation and that it is the consensus of the Committee that the student has demonstrated sufficient level of excellence to be allowed to proceed with work leading directly to the doctorate. After reviewing the petition and supporting documents, the Committee on Academic Status and Degrees will make a recommendation to the Dean as to whether or not permission to bypass the Master's degree should be granted. Authority for the final decision rests with the Dean.
GENERAL INFORMATION

FINANCIAL AID. Application for aid should be made on the application form for admission to graduate study. Awards are made on the basis of merit.

Graduate assistants work twenty hours a week. They must satisfactorily carry out the duties assigned by the School of Marine Science, must make satisfactory progress on their degree 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 the School of Marine Science. Failure to comply with these conditions will lead to revocation of appointments. Assistantships do not include a waiver of tuition and fees.

For information regarding the College Work-Study, National Direct Student Loan, and Guaranteed Student Loan Programs, write to: Director of Student Financial Aid, College of William and Mary, Williamsburg, Virginia 23185.

TRANSFER OF GRADUATE CREDIT. On the recommendation of the Academic Status and Degrees Committee and the approval of the Dean of the School, 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 William and Mary. 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.

CHANGES IN REGISTRATION. All changes in students' schedules after the close of registration will be initiated through the School, and require approval of the instructors involved and the Dean. 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 record. 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.

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 the withdrawal.

EXAMINATIONS. The examinations, given at the end of each semester, take place at the times announced on the examination schedule, which is posted at the beginning of the semester. Students are required to take all of their examinations at the time scheduled unless excused by the instructor or
Dean on account of illness or other sufficient reason. Whenever possible, students must make their request to be excused from an examination in advance of the examination. Permission to take a deferred examination must be obtained from the Instructor and the Dean. Students excused from an examination will have "I" entered on the record until they make up the examination. Deferred examinations must be made up by the end of the following semester.

THE HONOR SYSTEM is one of the College's most treasured traditions. Every student at the College is bound by its tenets, which are at the basis of all scholarship. The Graduate Student Association administers the system for graduate students of the School of Marine Science. The principles of the Honor System and the method of administration are described in the Student Handbook.

SUBMISSION OF THESES AND DISSERTATIONS. Detailed procedures regarding submission of theses and dissertations and payment of binding fees may be obtained from the Dean's Office.

NOTICE OF CANDIDACY FOR GRADUATION. Candidates for advanced degrees must submit a Notice of Candidacy for Graduation to the Registrar at the beginning of the semester in which they expect to receive the degree. If they subsequently fail to complete the requirements, they must cancel the notice at least two weeks before the date of Commencement and must resubmit the notice in whatever semester they complete the requirements. Students should pay the diploma fee at the Treasurer's Office. No bill for this fee will be sent separately to the student.

SYSTEM OF GRADING AND QUALITY POINTS. The grades A (excellent), B (good), C (satisfactory), or in certain courses, P (pass), 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; D, 1. P carries credit but is not included in a student's quality point average; F carries 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 not sufficient 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. In case of absence from the final examination for reasons of illness or other good grounds, "I" automatically becomes "F" at the end of the next semester if the postponed work has not been completed.