

**Marine Vertebrate Biology (MVB)****Major in Marine Vertebrate Biology****School of Marine and Atmospheric Sciences (SoMAS)**

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**Marine Vertebrate Biology (MVB)**

The Marine Vertebrate Biology major provides students with a solid background in basic biology with an emphasis on marine vertebrate organisms such as fish, sharks, birds, turtles and marine mammals. It provides a more intensive zoology background than the Marine Sciences degree.

Students are encouraged to participate in research and internships. Opportunities for experiential learning are available through field and laboratory courses taught at or near the Stony Brook campus and from a field station at the Stony Brook Southampton campus.

Most students who wish to have a career in research related to the marine environment will need to plan for graduate study. Career possibilities include research, education, or work in government agencies or non-profit organizations. The Marine Vertebrate Biology major is also good preparation for the Master of Arts in Teaching high school biology program or a pre-vet or pre-med program. A few additional courses are required for admission to the MAT program or for veterinary or medical school admission.

The Marine Vertebrate Biology major is administered by the School of Marine and Atmospheric Sciences, one of the leading oceanographic and atmospheric institutions in the nation.

The School of Marine and Atmospheric Sciences (SoMAS) is Stony Brook University's center for education, research, and public service in the ocean, atmospheric, and environmental sciences. Housed within the SoMAS are the Marine Sciences Research Center (MSRC) and the Institute for Terrestrial and Planetary Atmospheres (ITPA). MSRC is the only state-designated center for marine research, education, and public outreach within the State University of New York system. The SoMAS is one of the nation's leading coastal oceanographic and atmospheric institutions, and the expertise of the SoMAS faculty places SBU at the forefront of addressing and answering questions about regional environmental problems, as well as problems relating to the global ocean and atmosphere. The primary focus of the SoMAS faculty is on fundamental research designed to increase understanding of the processes that characterize the coastal ocean and the atmosphere. The SoMAS is also committed to applying the results of research to solve problems arising from society's uses and misuses of the environment. The SoMAS also includes mission-oriented institutes in several major areas: the Institute for Terrestrial and Planetary Atmospheres, the Living Marine Resources Institute, the Institute for Ocean Conservation Science, the Long Island Groundwater Resource Institute, and the Waste Reduction and Management Institute. The institutes and many research projects add a wealth of varied resources to education and research at Stony Brook.

The SoMAS offers undergraduate majors in atmospheric and oceanic sciences, environmental studies, marine sciences, and marine vertebrate biology, and minors in environmental studies and marine sciences. See the separate entries for atmospheric and oceanic sciences (ATM), environmental studies (ENS), and marine sciences (MAR) in the alphabetical listings of Approved Majors, Minors, and Programs. The SoMAS also offers several cooperative programs in both marine and environmental sciences with departments in the College of Arts and Sciences (Chemistry, Geosciences) and the College of Engineering and Applied Sciences (Chemical and Molecular Engineering).

Research opportunities in marine sciences, atmospheric sciences, and waste management are available to undergraduates. Information on research opportunities may be found by contacting faculty directly or on the SoMAS Web site at <http://www.somas.stonybrook.edu>

All students should consult with the director of undergraduate studies to design and approve an acceptable course of study before declaring the major.

**Requirements for the Major in Marine Vertebrate Biology (MVB)**

The major in Marine Vertebrate Biology leads to a Bachelor of Science degree. Completion of the major requires between 69 and 74 credits. Of these no more than one course (4 credits) with a grade lower than C can be credited to the major.

**I. Foundation Courses (43-46 credits)**

BIO 201 Organisms to Ecosystems

BIO 202 Molecular and Cellular Biology

BIO 203 Cellular and Organ Physiology

BIO 204 Fundamentals of Scientific Inquiry in the Biological Sciences I

BIO 205 Fundamentals of Scientific Inquiry in the Biological Sciences IIA (see Note 4)

CHE 131/CHE 133, CHE 132/CHE 134 General Chemistry and Lab (see Note 1)

CHE 321 Organic Chemistry

MAT 125, MAT 126 Calculus (See Note 2)

ENS 119/PHY 119 Physics for Environmental Studies and MAR 352 Introduction to Physical Oceanography and MAR 353 Physical Oceanography Laboratory, or PHY 121/PHY 123, PHY 122/PHY 124 Physics for Life Sciences and labs (see Note 3)  
AMS 102 or AMS 110 Statistics

## 2. Zoology and Marine Vertebrate Core (13 credits)

BIO 344 Chordate Zoology

BIO 354 Evolution or BIO 320 Genetics

Two of the following:

MAR 370 Marine Mammals

MAR 376 Biology and Conservation of Sea Turtles

MAR 377 Biology and Conservation of Seabirds

MAR 380 Ichthyology

## 3. Marine Biology (12-14 credits)

MAR 349 Biological Oceanography or BIO 353 Marine Ecology

Three electives from below:

BIO 328 Mammalian Physiology

BIO 343 Invertebrate Zoology

BIO 351 Ecology

BIO 359 Behavioral Ecology

MAR 301 Environmental Microbiology or MAR 302 Marine Microbial Ecology

MAR 303 Long Island Marine Habitats

MAR 305 Experimental Marine Biology

MAR 315 Conservation Biology

MAR 366 Plankton Ecology

MAR 385 Fisheries Biology

MAR 487 Research or MAR 488 Internship (maximum of three credits can be used for required elective)

Other classes may be substituted with permission of undergraduate director

## 4. Upper-Division Writing Requirement

All students in the major must submit two papers from any upper division course in the major to the director of undergraduate programs for evaluation by the end of the junior year.

Notes:

1. CHE 141/CHE 143, CHE 142/CHE 144 Honors Chemistry and Lab may be substituted for CHE 131/CHE 133, CHE 132/CHE 134

2. MAT 131, MAT 132 or MAT 141, MAT 142 or MAT 171 may be substituted for MAT 125, MAT 126

3. PHY 125, PHY 126, PHY 127 or PHY 131/PHY 133, PHY 132/PHY 134 or PHY 141, PHY 142 may be substituted for the two-semester physics sequences listed above

4. BIO 207 may be substituted for BIO 205

## Honors Program in Marine Vertebrate Biology

Graduation with departmental honors in Marine Vertebrate Biology requires the following:

1. Students are eligible to participate in the Honors Program if they have a 3.50 GPA in all courses for the major by the end of the junior year.

Students should apply to the SoMAS undergraduate director for permission to participate.

2. Students must prepare an honors thesis based on a research project written in the form of a paper for a scientific journal. A student interested in becoming a candidate for honors should submit an outline of the proposed thesis research project to the SoMAS undergraduate director as early as possible, but no later than the second week of classes in the last semester. The student will be given an oral examination in May on his or her research by his or her research supervisor and the undergraduate research committee. The awarding of honors requires the recommendation of this committee and recognizes superior performance in research and scholarly endeavors. The written thesis must be submitted before the end of the semester in which the student is graduating.

3. If the student maintains a GPA of 3.5 in all courses in their major through senior year and receives a recommendation by the undergraduate research committee, he or she will receive departmental honors.

## Sample Course Sequence for the Major in Marine Vertebrate Biology

Freshman Fall	Credits	Spring	Credits
First Year Seminar 101		1 First Year Seminar 102	1
D.E.C. A	3	D.E.C. A	3
CHE 131	4	CHE 132	4
CHE 133	1	CHE 134	1
MAT 125	3	MAT 126	3
D.E.C.	3	Total	12
Total	15		

<b>Sophomore Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
BIO 201 and BIO 204	5	BIO 202 and BIO 205	5
AMS 110	3	BIO 344	4
CHE 321	4	D.E.C.	3
D.E.C.	3	D.E.C.	3
D.E.C.	3	Total	15
Total	18		
<b>Junior Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
MAR Vertebrate Core Elective	3	BIO 203	3
ENS/PHY 119	3	BIO 354	3
MAR Biology Elective	3	MAR 349	4
D.E.C.	3	Elective	3
Upper-Division D.E.C.	3	Upper-Division D.E.C.	3
Total	15	Total	16
<b>Senior Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
MAR 352/353	3	MAR Vertebrate Core Elective	3
MAR Biology Elective	3	MAR Biology Elective	3
Elective	3	Elective	3
Elective	3	Elective	3
Upper-Division D.E.C.	3	Upper-Division D.E.C.	3
Total	15	Total	15

# MAR

## Marine Sciences

### MAR 101 - E: Long Island Sound: Science and Use

An introduction to one of the region's most important coastal marine environments - Long Island Sound. The course traces the origin and development of the Sound; presents an overview of the natural physical, biological, chemical, and geological processes that characterize it; explores its importance to society and assesses how society's uses of the Sound have affected it; evaluates attempts to manage it; and looks at the future of the Sound. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

3 credits

### MAR 104 - E: Oceanography

An examination of the World Ocean and the chemical, geological, biological, and physical processes that control its major features and the life that inhabits it. Students will also explore human interactions with the marine environment. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

3 credits

### MAR 301: Environmental Microbiology

Microbiological mediation of natural processes in marine, freshwater, soil, and groundwater habitats, as well as public health issues and microbial potential for remediation of pollutants. Lectures include a survey of taxonomic and metabolic diversity, elementary cell biology, nutrition, environmental controls on physiology and adaptations, biogeochemical cycles, and modern methods of sampling and analysis. Labs introduce students to fundamental microbiological methods currently used in environmental, public health, and clinical settings. Not for credit in addition to MAR 302. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* BIO 202; CHE 131 or 141

4 credits

### MAR 302: Marine Microbiology and Microbial Ecology

Introduction to the evolution, diversity, and importance of micro-organisms in the sea. Lectures highlight the phylogenies, physiologies and ecological functions of each major microbial group (viruses, bacteria, fungi,

protozoans, algae). Particular emphasis is placed on the role of these micro-organisms in many of the elemental (geochemical) cycles of the oceans. Course explores the microbial ecology of most major marine habitats. Not for credit in addition to MAR 301.

*Prerequisites:* BIO 201 and BIO 202; CHE 132 or CHE 142

3 credits

### MAR 303: Long Island Marine Habitats

The study of six representative marine environments around Long Island. Students visit the sites on weekly field trips, measuring environmental parameters and identifying common plants and animals. Using qualitative and quantitative methods in the field and in laboratory sessions, the class determines major factors that control the biological community in each habitat. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* U3 or U4 standing; BIO 201

*Advisory Prerequisites:* AMS 110 or other statistics course; MAR 101 or 104 or 333

4 credits

### MAR 304 - E: Waves, Tides, and Beaches

A survey of water waves and tides, including both a description of the phenomena and the basic theory of waves and sediment transport. This background forms the basis for a description of shore processes including beaches, and coastal erosion. The variety of the world's coastal environments will be differentiated in terms of physical processes. The behavior of beaches also will be examined. This course is suitable for non-science majors as well as providing students majoring in geology, engineering or other sciences with the foundation for more advanced study.

*Prerequisites:* U3/U4 status or MAR 101 or MAR 104

*Advisory prerequisites:* MAR 101, MAR 104, or MAR 333

3 credits

### MAR 305: Experimental Marine Biology

Students design and conduct experiments in the laboratory and at local field sites, collect and analyze data, and use scientific literature to interpret and present results in papers and oral presentations. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* U3 or U4 standing; BIO 201.

*Advisory Prerequisites:* CHE 131 or 141; AMS

110 or other statistics course; MAR 101 or 104 or 333

3 credits

### MAR 308: Principles of Instrumental Analysis

The development of familiarity in the laboratory with the techniques and instrumentation used in environmental analytical chemistry, emphasizing determination of trace inorganic species. Primary emphasis on applications utilizing the absorption or emission of electromagnetic radiation. Topics include metal determinations in sediment and in river water using molecular ultraviolet-visible and atomic absorption spectrometry. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* CHE 132/134 or 142/144

3 credits

### MAR 315 - H: Marine Conservation

The fundamental concepts of Conservation Biology, a new synthetic field that incorporates principles of ecology, biogeography, population genetics, systematics, evolutionary biology, environmental sciences, sociology, anthropology, and philosophy toward the conservation of biological diversity. Examples drawn from the marine environment emphasize how the application of conservation principles varies from terrestrial, aquatic, and marine realms.

*Prerequisite:* BIO 351 or 353

3 credits

### MAR 318: Engineering Geology and Coastal Processes

Fundamental concepts of soil, sediment, and rock mechanics and the physics of surficial processes. Application is made to problems of geotechnical and coastal engineering. Topics include consolidation, loose boundary hydraulics, slope stability, underground excavations and beach and tidal inlet stability, and channel sedimentation. This course is offered as both GEO 318 and MAR 318.

*Prerequisites:* GEO 122 or GEO 102 and 112; MAT 127 or 132 or 142 or 171 or AMS 161

3 credits

### MAR 320: Limnology

The physical, chemical, and biological aspects of lakes and ponds. The morphology of lake basins, physics of water movement, water chemistry, and ecology of organisms are explored through lecture and laboratory instruction. The laboratory portion of the course includes field sampling to investigate temporal variation in water chemistry and

plankton biology, and laboratory experiments to demonstrate important concepts. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* BIO 201; CHE 131 or 141

4 credits

### **MAR 333 - H: Coastal Oceanography**

Aspects of physical, biological, chemical, and geological processes that characterize coastal marine environments. Topics include such natural phenomena as upwelling, particle transport, benthic/pelagic coupling, and barrier island processes, as well as the impacts of society on the Coastal Ocean.

This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* MAT 125 or 131 or 141 or AMS 151; completion of D.E.C. category E

3 credits

### **MAR 334 - E: Remote Sensing of the Environment**

A study of the theory of remote sensing and its application in the fields of atmospheric science and oceanography. A discussion of the interaction of electromagnetic radiation with rough surfaces and the atmosphere is followed by a treatment of sensors and platforms. The remainder of the course is devoted to data processing techniques involved in remote sensing.

*Prerequisite:* One of the following: ENS/PHY 119, PHY 127, PHY 132/134, or PHY 142

3 credits

### **MAR 336: Marine Pollution**

A review of the sources, transport, and fate of toxic and non-toxic contaminants in the ocean. The interactions of biological, chemical, and physical processes that control the cycling and toxicity of contaminants are considered. Contaminants include metals, oil, halogenated hydrocarbons, radioactive wastes, excess nutrients, plastics, and solid wastes.

*Prerequisites:* BIO 201; CHE 131 or CHE 141  
*Advisory Prerequisite:* MAR 104 or MAR 333

3 credits

### **MAR 340 - H: Environmental Problems and Solutions**

A detailed examination of the scientific, social, and legal aspects of important environmental problems, including global climate change, the depletion of atmospheric ozone, acid rain, rain forests and the loss of biodiversity, and energy conservation, as well as case histories of problems such as the use of

DDT, environmental carcinogens, and lead poisoning.

*Prerequisites:* U3 or U4 standing; one course in chemistry or biology

3 credits

### **MAR 346: Marine Sedimentology**

A study of sedimentology in the marine environment, including an introduction to fluid mechanics, sediment transport theory, quantitative models of sedimentation, and dynamic stratigraphy.

*Prerequisites:* GEO 102 or 122; PHY 126 or 132/134 or 142

3 credits

### **MAR 349: Introduction to Biological Oceanography**

An examination of the processes which produce and maintain the abundances, composition, and temporal variations of organisms in the ocean. The roles of biological processes in global cycles and the food chain, beginning with microbes and progressing through fisheries, are also covered. Weekly three-hour laboratory or field sessions present methods used in observational and experimental studies. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* CHE 131 and 132; BIO 201

4 credits

### **MAR 350: Introduction to Ocean Physics**

An introduction to hydrodynamics, contemporary ideas on ocean circulation, and the application of acoustics and optics to ocean technologies. Not for credit in addition to MAR 352.

*Prerequisites:* ENS/PHY 119 or PHY 121/123 or 125 or 131/133 or 141; MAT 127 or 132 or 142 or 171 or AMS 161

2 credits

### **MAR 351: Introduction to Ocean Chemistry**

Chemical principles applied to the study of the oceans. How chemical tracers are used to determine the geological, physical, and biological characteristics of present and past oceans. Other topics include physical marine chemistry, nutrient and carbon cycling, organic geochemistry, isotope geochemistry, sediment chemistry and diagenesis, air-sea exchange and controls on carbon dioxide, and estuarine geochemistry.

*Prerequisite:* CHE 132 and one MAR course

3 credits

### **MAR 352: Introduction to Physical Oceanography**

An introduction to the physical properties, motion of, and forces that drive the movement of fluids (air and water) on the earth. Physical oceanographic processes that range in scale from several mm to 1000s of km will be studied. This course will introduce the student to the physics of the marine environment and the tools (physical, mathematical, scientific) to study these waters. Environments ranging from pelagic to estuarine will be examined. Not for credit in addition to MAR 350. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites:* MAT 126, MAT 132, or MAT 142; PHY 119, PHY 121, PHY 125, PHY 131 or PHY 141

3 credits

### **MAR 355: Coastal Cultural Experience**

An experiential learning course designed to introduce students to the rich coastal marine culture of New York and the northeastern United States. Through targeted readings and participation in weekly faculty-led field trips in the greater Long Island area, students will develop an understanding of how the coastal environment and maritime traditions have shaped the region's culture.

*Pre- or corequisite:* MAR 356

*Advisory Prerequisite:* Enrollment in the Semester by the Sea Program

2 credits

### **MAR 356 - K: Maritime Traditions of New England**

This class will survey the traditions and historical development of the sea, with an emphasis on the fishing, whaling, and seafaring history and rich contemporary coastal culture of the Northeastern United States. Students will examine how we have understood our roles in connection with the ocean by reading and discussing selections from numerous historical journals, books and primary sources as well as literature in which seafaring traditions are discussed and/or demonstrated. Excursions in the co-required Coastal Cultural Experience course allow students to explore the maritime setting of the works discussed in the course.

*Pre- or corequisite:* MAR 355

3 credits

### **MAR 366: Plankton Ecology**

An introduction to the biology of the plant and animal plankton present in the sea. Techniques of collection, enumeration, and identification of phytoplankton and zooplankton are

described. Life histories are studied and factors that influence seasonal changes in species and biomass are examined.

*Prerequisites: BIO 201 and 202*

3 credits

### **MAR 370: Marine Mammals**

The biology of the major groups of marine mammals, including cetaceans, pinnipeds, and sirenians. Topics include evolutionary history and adaptation, thermoregulation, locomotion and foraging, diving physiology and behavior, communication and sensory systems, social behavior, reproduction, energetics, distribution patterns, exploitation, and conservation.

This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites: BIO 201 and 203*

3 credits

### **MAR 373: Marine Apex Predators: Ecology and Conservation**

The removal of apex predators is one of the most pervasive impacts of humans on Earth's ecosystems. In the past few decades we have started to recognize how the loss of these species has caused substantial changes in terrestrial ecosystem diversity and function, mediated by changes in prey population dynamics and behavior. It is only recently that we have realized that changes in the abundance of apex predators in the ocean (e.g., sharks, marine mammals, tuna and other large predatory bony fish) may be causing similar changes in coastal and pelagic marine ecosystems. In this course we will (1) review the biology of key marine apex predators, (2) explore how 'top down' processes (predation and intimidation of prey) can influence marine ecosystems and (3) review the status of marine apex predators and how this relates to the current state of ocean ecosystems. We will draw from the primary literature, from both the terrestrial and marine realms, and host outside speakers who study these animals in the field.

*Prerequisite: BIO 201 and either BIO 202 or BIO 203*

3 credits

### **MAR 375: Marine Mammal and Sea Turtle Rehabilitation**

An intensive hands-on course designed to introduce students to the topics of marine mammal and sea turtle biology as they relate to rehabilitation and research. Students will be exposed to marine mammal and sea turtle ecology, conservation issues, management, and research in the context of wildlife rehabilitation. Through active participation in the rehabilitation activities at the New

York State's only marine mammal rescue facility, instructive lectures, writing, reading assignments, quizzes, tests, and research, students will be offered the opportunity to be thoroughly immersed in the field of marine mammal and sea turtle rehabilitation. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisite: BIO 201 or permission of instructor*

3 credits

### **MAR 376: Biology and Conservation of Sea Turtles**

This course provides an overview of the biology of sea turtles, and highlights different solutions to challenges these organisms face while living in the marine environment. We begin by discussing biological adaptations and ecological processes, and will then examine these concepts in relation to conservation and management issues facing different sea turtle species. This course will be primarily lecture-based, although we will take advantage of additional learning opportunities, such as necropsies conducted with the Riverhead Foundation. MAR 376 may not be taken for credit in addition to MAR 371.

*Prerequisite: BIO 201*

*Advisory prerequisite: BIO 203*

3 credits

### **MAR 377: Biology and Conservation of Seabirds**

This course provides an overview of the biology of seabirds, covering basic and applied aspects of seabird biology. We examine specific biological adaptations (e.g., morphological and physiological adaptations for diving and flying) in the first third of the course, and review population-level processes and behavioral patterns (e.g., population ecology and migration) in the second part of the course. The last third of the course applies this knowledge of seabird biology and ecology to current conservation issues and management efforts, both within the United States and internationally. MAR 377 may not be taken for credit in addition to MAR 371.

*Prerequisite: BIO 201*

*Advisory prerequisite: BIO 203*

3 credits

### **MAR 380: Ichthyology**

The biology of fishes. This course focuses on the diversity of fishes and the physiological, anatomical, ecological, and behavioral adaptations that allow them to populate a wide range of niches and environments. Field and laboratory work provide students with practical

experience in collecting, identifying, and studying fish. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisite: U3 or U4 standing; BIO 201 and BIO 203*

3 credits

### **MAR 384: Diseases of Aquatic Organisms**

Fundamental and current issues pertaining to host/pathogen interactions in the aquatic environment. By the end of this course, students should have a basic understanding of disease processes in aquatic organisms; knowledge of the tools used for disease diagnosis; and an appreciation of disease management tools available today. This course will emphasize the role of the environment as an important player in infectious and non-infectious diseases. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites: BIO 202 and 203*

3 credits

### **MAR 385: Principles of Fishery Biology and Management**

The theory, techniques, history, and practical problems of fishery management, with emphasis on Long Island fisheries. Three field trips outside regularly scheduled class meetings are required. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisites: BIO 201; MAT 125 or 131 or 141 or AMS 151*

3 credits

### **MAR 388: Tropical Marine Ecology**

This travel course surveys organisms (invertebrates, fishes and algae) and habitats (coral reefs, sea grass meadows and mangrove forests) within tropical marine coral reef ecosystems. The course consists of formal lectures, demonstrations and instructor-led field trips and involves snorkeling, SCUBA diving, reefwalking and underwater photography. Students will develop individual research projects requiring field observations and collecting data and will write a research proposal and final research papers.

*Prerequisites: BIO 201 and permission of instructor*

4 credits

### **MAR 392 - H: Waste Management Issues**

Conventional and innovative approaches to waste reduction, recycling, and reuse. The environmental impacts of waste on the terrestrial and marine environment are introduced as are the complex social, political, and scientific issues of making sound policy decisions.

*Prerequisites: GEO 101; CHE 131 or ENS/PHY 119*

*3 credits*

### **MAR 393: Waste Treatment Technologies**

This course examines technologies such as wastewater management, solid waste practices, and drinking water treatments that minimize the effects of human wastes. Pollution prevention, especially for marine environments, is also discussed.

*Prerequisites: EST 202; or MAT 123 and one D.E.C. category E course*

*3 credits*

### **MAR 394 - H: Environmental Toxicology and Public Health**

Principles of toxicology are presented and problems associated with major classes of toxic chemicals to human and environmental health are examined. Case studies dealing with current waste management issues are also discussed. This course is offered as both BCP 394 and MAR 394.

*Prerequisites: BIO 201; CHE 131 or 141*  
*Advisory Prerequisite: CHE 321*

*3 credits*

### **MAR 395: Topics in Marine Environmental Sciences**

May be repeated as the topic changes. This course has an associated fee. Please see [www.stonybrook.edu/coursefees](http://www.stonybrook.edu/coursefees) for more information.

*Prerequisite: One upper-division MAR course*

*3 credits*

### **MAR 447: Readings in Marine Science**

Tutorial readings in the marine sciences. These courses may be repeated but no more than 3 credits may be used toward Marine Science or Marine Vertebrate Biology major requirements.

*Prerequisite: Permission of instructor and SoMAS undergraduate director*

*1-3 credits, S/U grading*

### **MAR 475: Undergraduate Teaching Practicum**

A practicum in the techniques of teaching marine sciences courses. Each student assists a faculty member in a regularly scheduled

class. The student may be required to attend all classes and meets with the faculty member at regularly scheduled times. Students may assist in laboratories, hold recitation or review sessions, propose questions for examinations, and review already graded assignments.

*Prerequisites: U3 or U4 standing; permission of instructor and SoMAS Undergraduate Programs Director*

*3 credits, S/U grading*

### **MAR 487: Research in Marine Sciences**

A student may conduct research for credit. May be repeated.

*Prerequisite: Permission of instructor and SoMAS Undergraduate Programs Director*

*0-6 credits*

### **MAR 488: Internship**

Participation in research at off-campus laboratories or in the activities of public and private agencies and organizations. May be repeated up to a limit of 12 credits.

*Prerequisites: Permission of instructor and SoMAS Programs Director*

*0-6 credits, S/U grading*