

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 3)
- CHE 131/CHE 133, CHE 132/CHE 134 General Chemistry and Lab (see Note 4)

- CHE 321 Organic Chemistry
- MAT 125, MAT 126 Calculus (See Note 1). If students do not place into MAT 125 or 131 on the basis of the math placement examination, MAT 123 is a required course for the major.
- ENS 119/PHY 119 Physics for Environmental Studies and MAR 352 Introduction to Physical Oceanography, or PHY 121/PHY 123, PHY 122/PHY 124 Physics for Life Sciences and labs (see Note 2)
- 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 373 Apex Predators
- 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 375 Marine Mammal and Sea Turtle Rehabilitation
- MAR 384 Diseases of Aquatic Organisms
- MAR 385 Fisheries Biology
- MAR 386 Ecosystem Science for Fisheries Management
- MAR 394 Environmental Toxicology and Public Health
- 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 register for the 0-credit MAR 459 and 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.

Students should consult with the department advisor to ensure that their plan for completing the Upper Division Writing Requirement is consistent with university graduation requirements for General Education. Students completing the Stony Brook Curriculum (SBC) must complete a course that satisfies the "Write Effectively within One's Discipline" (WRTD) learning objective to graduate. The Upper Division Writing Requirement is consistent in most cases with the SBC learning outcomes for WRTD.

Notes:

1. MAT 131, MAT 132 or MAT 141, MAT 142 or MAT 171 may be substituted for MAT 125, MAT 126
2. 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
3. BIO 207 may be substituted for BIO 205
4. CHE 129/130 may be substituted for CHE 131

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
A course planning guide for this major may be found here.

FRESHMAN

FALL	Credits
First Year Seminar 101	1
WRT 101	3
CHE 131	4
CHE 133	1
MAT 125	3
SBC	3
Total	15

SPRING	Credits
First Year Seminar 102	1
WRT 102	3
CHE 132	4
CHE 134	1
MAT 126	3
SBC	3
Total	15

SOPHOMORE

FALL	Credits
BIO 201 and BIO 204	5
AMS 110	3
CHE 321	4
SBC	3
Total	15

SPRING	Credits
BIO 202 and BIO 205	5
BIO 354	4
SBC	3
SBC	3
Total	15

JUNIOR

FALL	Credits
MAR Vertebrate Core Elective	3
ENS/PHY 119	3
MAR Biology Elective	3

Upper-division SBC	3
Upper-division SBC	3
Total	15

SPRING	Credits
BIO 203	3
BIO 344	3
MAR 349	3
Upper-division SBC	3
Upper-division SBC	3
Total	16

SENIOR

FALL	Credits
MAR 352	3
MAR Biology Elective	3
Upper-division SBC	3
MAR 458	0
Upper-division SBC	3
SBC	3
Total	15

SPRING	Credits
MAR Vertebrate Core Elective	3
MAR Biology Elective	3
MAR 459	0
Upper-division SBC	3
Upper-division SBC	3
Upper-division SBC	3
Total	15

MAR

Marine Sciences

MAR 101: 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.

DEC: E

SBC: SNW

3 credits

MAR 104: 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 when offered during the summer. Please see www.stonybrook.edu/coursefees for more information.

DEC: E

SBC: SNW

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 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 for more information.

Prerequisites: U3 or U4 standing; BIO 201
Advisory Prerequisites: AMS 110 or other statistics course; MAR 101 or 104 or 333

SBC: STEM+

4 credits

MAR 304: 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

DEC: E

SBC: STEM+

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 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

SBC: STEM+

3 credits

MAR 308: Environmental 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 for more information.

Prerequisites: CHE 132/134 or 142/144

SBC: STEM+, TECH

3 credits

MAR 315: 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

DEC: H

SBC: ESI, STAS

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

SBC: STEM+

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 for more information.

Prerequisites: BIO 201; CHE 131 or 141

SBC: STEM+

4 credits

MAR 333: 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 for more information.

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

DEC: H

SBC: STEM+

3 credits

MAR 334: Remote Sensing of the Environment

A study of the theory and practice 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

DEC: E

SBC: STEM+, TECH

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: 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

DEC: H

SBC: STAS

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 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

SBC: STEM+

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 for more information.

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

SBC: STEM+

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. This course has an associated fee. Please see

www.stonybrook.edu/coursefees for more information.

Pre- or corequisite: MAR 356

Advisory Prerequisite: Enrollment in the Semester by the Sea Program

SBC: ESI, EXP+

2 credits

MAR 356: 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

DEC: K

SBC: SBS, USA

3 credits

MAR 357: Unsinkable Technologies: History of Maritime Science and Technology

This course exposes students to advances in maritime science and technology. Students will learn to think critically about the processes in which contemporary societal needs and concerns both locally and globally influenced maritime technological as well as the ways in which advances in maritime science and technologies have shifted public attitudes through time. By understanding how societies and technology have impacted and shaped each other over time, students will have a broader understanding of regional and global communities. This course does permit completion of the WRTD requirement.

Prerequisite: U3/U4 status; WRT 101 or WRT 102

DEC: H

SBC: STAS

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; BIO 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 for more information.

Prerequisites: BIO 201; BIO 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 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. This course has an associated fee. Please see www.stonybrook.edu/coursefees for more information.

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 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 for more information.

Prerequisites: BIO 202 and 203

SBC: STEM+

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 for more information.

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

3 credits

MAR 386: Ecosystem Science for Fisheries Management

Provides an overview of the scientific basis behind and the models that are typically used to inform Ecosystem-based Fisheries Management (EBFM). The course will review single species fisheries models with which students should be familiar. Extensions of single-species models, multispecies models and full systems models will be introduced. Advantages and disadvantages of each approach will be presented and how to implement the science into Fisheries Management will be discussed. The course requires familiarity with quantitative methods,

but emphasizes current literature and case studies as main learning elements.

Prerequisite: MAR 385 or instructor approval
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

SBC: ESI, EXP+, STEM+

4 credits

MAR 390: Aquaculture

This course covers the fundamentals of aquaculture including basic seawater system design and setup, culturing techniques for both phytoplankton and zooplankton, and both historic and contemporary topics within the industry. Students will also witness natural and induced spawning events of various ornamental species, and raise the larvae acquired through stage one metamorphosis.

DEC: E

SBC: ESI, STEM+

3 credits

MAR 392: 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 or CHE 131 or ENS/PHY 119

DEC: H

SBC: STAS

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: 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

DEC: H

SBC: ESI, STAS

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 for more information.

Prerequisite: One upper-division MAR course
3 credits

MAR 396: Topics in Marine Sciences

May be repeated as the topic changes.

Prerequisite: One upper-division MAR course
1-4 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 458: Speak Effectively Before an Audience

A zero credit course that may be taken in conjunction with any ATM, ENS, or MAR course that provides opportunity to achieve the learning outcomes of the Stony Brook Curriculum's SPK learning objective.

Pre- or corequisite: WRT 102 or equivalent; permission of the instructor

SBC: SPK

S/U grading

MAR 459: Write Effectively in Environmental Sciences

A zero credit course that may be taken in conjunction with any 300- or 400-level ATM,

ENS, or MAR course, with permission of the instructor. The course provides opportunity to practice the skills and techniques of effective academic writing and satisfies the learning outcomes of the Stony Brook Curriculum's WRD learning objective.

Prerequisite: WRT 102; permission of the instructor

SBC: WRTD

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

SBC: EXP+

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

SBC: EXP+

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

SBC: EXP+

0-6 credits, S/U grading