MAR

Marine Sciences

MAR 501: Physical Oceanography
Examines physics of ocean circulation and mixing on various scales with strong emphasis on profound effects of Earth's rotation on motions and distribution of properties. An introduction to physics of estuaries and other coastal water bodies.
Co-requisite: MAR 555 or permission of instructor
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 502: Biological Oceanography
Examines biological processes in the ocean, and introduces major ocean biomes and groups of organisms. A broad treatment of energy and nutrient cycling in coastal and open ocean environments.
Prerequisite: Enrollment in Marine Environmental Sciences program or permission of instructor
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 503: Chemical Oceanography
Introduction to chemical oceanography. Topics include origin and history of seawater, major and minor constituents, dissolved gases, the carbon dioxide system, distribution of properties in the world ocean, isotope geochemistry, and estuarine and hydrothermal vent geochemistry.
Prerequisite: Enrollment in the Marine Environmental Sciences program or permission of instructor
Spring, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 504: Modeling Techniques in Chemical Oceanography
Derivation of solutions to advection-diffusion-reaction equations for marine sediments and waters. One- and multi-dimensional models are developed for dissolved and solid-phase substances in cartesian, cylindrical, and spherical coordinates. Effect of imposing multiple layers on these systems is examined.
Prerequisite: Permission of instructor
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 506: Geological Oceanography
An introduction to the geological oceanography of the world ocean with emphasis on the coastal environment; discussions of the physical processes controlling the structure and evolution of the ocean basins and continental margins, the distribution of marine sediment, and the development of coastal features.
Prerequisite: Enrollment in Marine Environmental Sciences program or permission of instructor
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 507: Marine Conservation
The fundamental concepts of conservation science, a 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 will be presented within the context of the conservation of marine resources. Examples drawn from the marine environment emphasize how the application of conservation principles varies in different environments.
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 510: Modeling Techniques in Chemical Oceanography
Derivation of solutions to advection-diffusion-reaction equations for marine sediments and waters. One- and multi-dimensional models are developed for dissolved and solid-phase substances in cartesian, cylindrical, and spherical coordinates. Effect of imposing multiple layers on these systems is examined.
Prerequisite: Permission of instructor
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 511: Benthic Ecology
This course focuses on the ecological interactions of benthic organisms and their habitat. Topics include life histories, the roles of competition, predation and disturbance, feeding adaptations and food webs, interactions between benthic organisms and water motion, sediment chemistry, and other abiotic factors, and evolutionary history of benthic ecological processes.
Spring, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 512: Marine Pollution
Review of the physical and chemical characteristics and speciation in the marine environment of organic pollutants, metals and radionuclides including bioavailability, assimilation by marine organisms, toxicity, and policy issues. Crosslisted as MAR 512 or HPH 671.
Prerequisites: MAR 502, MAR 503
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 514: Environmental Management
This is an introduction to environmental management, and will focus on the interplay between science and public policy. Concepts include problem identification and definition, collection and analysis of relevant data to produce information, and the roles of public perception and action in ultimately determining outcomes when consensus is not reached. Specific fields to which these concepts will be applied will be solid waste management and coastal management. Current local problems will be used to illustrate the broader conceptual issues. Offered as MAR 514 and HPH 672. Prerequisite: Permission of instructor
Offered in Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 515: Phytoplankton Ecology
The biology and ecology of marine phytoplankton. Covered are life cycles, growth, nutrient uptake, grazing, and the effects of environmental factors on growth and survival of phytoplankton. The characteristics of various classes are examined and are related to environmental conditions.
Prerequisites: General biology
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 517: Waves
Theory and observations of surface waves, internal waves, and planetary waves; wave-wave, wave-current, and wave-turbulence interactions; surface wave prediction; beach processes.
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 519: Geochemistry Seminar
This course explores topics in low-temperature geochemistry as chosen by the instructors and participants. The seminar series is organized around a theme such as early diagenesis, estuarine geochemistry, or aquatic chemistry. Students are required to lead one of the seminars and to participate in discussions.
Prerequisite: MAR 503 or permission of instructor
Fall, 1 credit, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 520: New Production and Geochemical Cycles
Consideration of oceanic new production for a variety of ecosystems. Quantitative examination of the impact of new production on the transport and cycling of major and minor elements and pollutants.
Pre- or corequisites: MAR 502, 503
Spring, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 521: Long Island's Groundwater
This course will cover basic groundwater concepts in unconsolidated sediments, and examine contamination issues in light of Long Island's particular hydrogeology, land use, and waste management history. Mathematical principles will be discussed but not stressed; scientific and technical papers discussing particular concepts or problems, including important local examples, will be closely read.
MAR 524: Organic Contaminant Hydrology

There are a host of chemical, biological, and physical processes that affect the transport and fate of organic chemicals in natural waters. This course concerns understanding these processes and the structure-activity relationships available for predicting their rates. The major focus of this class is on contaminant hydrology of soil and aquatic environments, and includes the principles behind remediation and containment technologies. This course is offered as both MAR 524 and GEO 524.

Prerequisite: GEO 526 or MAR 503 or permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 525: Environment and Public Health Engineering/Sanitation

Review of the interactions of humans with the atmosphere and water resources, especially in the Long Island coastal community. An introduction is provided to the field of environmental health and the practices relevant to urban/suburban and coastal setting. Offered as MAR 525 and HPH 675.

Prerequisite: Permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 526: Pollutant Responses in Marine Organisms

This course examines physiological, biochemical, and molecular responses of marine organisms to contaminant stress. Material will be examined through review lectures on the topic and group discussion of the current literature.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 527: Global Change

The course examines the scientific basis behind questions of global change and some of the policy implications of changes to the region and country. Topics include evidence and courses of past climactic changes, greenhouse gases and the greenhouse effect, analogues with other planets, the Gaia hypothesis, climate modeling, and deforestation and the depletion of ozone.

Prerequisite: Permission of instructor

Fall, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 528: Ocean Atmosphere Interactions

This course discusses the fundamental physical mechanisms through which the ocean and atmosphere interact. These principles are applied to the understanding of phenomena, such as the El Nino Southern Oscillation, the effects of sea surface temperature on the distribution of low-level winds and development of tropical deep convection, and the effects of tropical deep convection and mid-latitude storms on the ocean's mixed layer. Both modeling and observational aspects are discussed. Material will be taken from selected textbooks, as well as recent literature.

Prerequisite: Permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 529: Isotope Geochemistry

This course deals both with the use of radiocarbon and stable isotope applications to the earth sciences.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 530: Organic Geochemistry

Introduction to the organic chemistry of the earth, oceans, and atmosphere. Topics include production transformation and fate of organic matter; use of organic biomarkers and stable and radioisotopes; diagenesis in recent sediments; oil and coal production and composition; dissolved and particulate organic matter in seawater.

Prerequisite: Permission of instructor

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 531: Long Island Marine Habitats

Focusing on six representative marine environments around Long Island, this course emphasizes the natural history of local marine communities, as well as quantitative ecology, hypothesis testing, and scientific writing. Students visit the sites, measure environmental parameters, and identify the distribution and abundance of common plants and animals. Using qualitative and quantitative methods in the field and laboratory, the class determines major factors that control the community structure in each habitat.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 532: Marine Protected Areas - Belize

Marine Protected Areas (MPAs) are parts of the ocean that are zoned to exclude activities that are potentially detrimental to the ecosystem. Marine reserves are a special type of MPA, in which the harvesting of marine wildlife is prohibited. MPAs are rapidly gaining traction worldwide as a tool to preserve or restore ecosystems, protect endangered species or sustain nearby commercial and recreational fisheries. This course is designed to provide students with a robust background in the science behind the design, implementation and expected outcomes of establishing MPAs. This field course will explore these issues in the context of the Belizean experience where students will travel to Belize and see a number of different MPAs and learn about the challenges, benefits and limitations of MPAs for marine conservation directly from local scientists, managers and rangers.

Summer, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 533: Instrumental Analysis

Fundamental principles of instrumental chemical analysis and practical applications of molecular spectroscopy and atomic spectroscopy. These two instruments are widely used in environmental problem solving. Lectures cover basic concepts of chemical analysis and the fundamental principles of the analytical techniques to be used. In the laboratory, students gain hands-on experience both by performing a series of required basic chemical determinations (nutrients and trace metals in sediments and in river water) and by undertaking special projects. Students prepare written reports describing the methods, the theory underlying those methods, results, and figures of merit. Students also present their results orally in brief presentations.

Prerequisites: Permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 536: Environmental Law and Regulation

This course covers environmental law and regulations from inception in common law through statutory law and regulations. The initial approach entails the review of important case law giving rise to today's body of environmental regulations. Emphasis is on environmental statutes and regulations dealing with waterfront and coastal development and solid waste as well as New York State's Environmental Quality Review Act (SEQRA) and the National Environmental Policy Act (NEPA). Offered as MAR 536 or HPH 676.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 537: Tropical Marine Ecology

The goal of this class is to teach students about the ecology of the tropical coral reef environments through lectures, field trips, snorkeling trips, SCUBA diving trips and student designed research projects. The first half of the course will be devoted to formal lectures, demonstrations, and instructor-led
field trips to provide students with a basic knowledge of the common organisms and the roles they play in various coral reef ecosystems. During the second half of the course, with help from faculty, students will develop and carry out individual research projects examining organismal ecology of coral reefs.

4 credits, Letter graded (A, A-, B+, etc.)

MAR 538: Modern Methods of Data Analysis in Atmospheric and Ocean Sciences - Part I

An introduction to basic statistical concepts and their applications to analysis of data in atmospheric and marine sciences. The topics include distribution, statistical estimation, hypothesis testing, analysis of variance, linear and nonlinear regression analysis, and basics of experimental design. In-depth class discussions of the theoretical concepts are accompanied by extensive applications to data sets supplied by the instructor and the students.

Prerequisites: MAR or OCN graduate standing or permission of instructor

Fall, 3 credits, Letter graded (A, A-, B+, etc.)
May be repeated 2 times FOR credit.

MAR 540: Marine Microbial Ecology

An historical perspective of the field, aspects of nutrition and growth, microbial metabolism, and trophodynamic relationships with other organisms. Emphasis on roles of microorganisms in marine environments such as salt marshes, estuaries, coastal pelagic ecosystems, and the deep sea, as well as microbial contribution to geochemical cycles. Contemporary and classical methodologies covered.

Prerequisite: MAR 502 or permission of instructor

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 541: Foundations of Atmospheric Sciences I

This course will first give an overview of the atmosphere and the climate system, including weather systems and atmospheric general circulations. It then introduces atmospheric thermodynamics and dynamics at the level appropriate to all students in atmospheric sciences.

3 credits, Letter graded (A, A-, B+, etc.)

MAR 544: Atmospheric Radiation

Discussion of the compositions and radiative components of planetary atmospheres. Blackbody and gaseous radiation with emphasis on the respective roles of electromagnetic theory and quantum statistics. Derivation of the equation of transfer and radiative exchange integrals, with application to energy transfer processes within the atmospheres of Earth and other planets.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 545: Paleoceanography and Paleoclimatology

This course will provide an extensive overview of the methods used in paleoclimatic research and an examination of important climate events during the Late-Mesozoic and Cenozoic eras. We will discuss proxies used to create paleoclimatic reconstructions forcing mechanisms on interannual to million year time scales, climate effects on geological and biological processes, and the modeling of present climate and extrapolation to past and future climates.

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 546: Marine Sedimentology

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

Prerequisite: Permission of instructor

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 547: Dynamical Oceanography I

The first course in a two-course series on basic methods and results in dynamical oceanography. This course emphasizes unstratified fluids. Topics covered include but are not limited to basic conservation equations, effects of rotation, geostrophy, potential vorticity conservation, Ekman layers, and Ekman pumping.

Prerequisite: MAR 501 or permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 548: Dynamical Oceanography II

Continuation of Dynamics I. Course covers some of the basic effects of stratification. Topics include potential vorticity for baroclinic motion and baroclinic instability.

Prerequisite: Dynamical Oceanography I

Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 549: Current Topics in Atmospheric Sciences

This course will discuss current research topics in atmospheric sciences and their connections with advance course materials.

0-2 credits, S/U grading

MAR 551: Special Topics in Management

This course involves in-depth examination and assessment of one or two topical problems and issues in the management of fisheries in the mid-Atlantic region. Fisheries management encompasses a diversity of disciplines and interests: biology, ecology, mathematics, law, policy, economics, analytical modeling, sociology, and anthropology. The class conducts a detailed and thorough review of one or two key fisheries management problems that incorporate component issues spanning this range of disciplines. Students form several teams, each team focusing on one aspect of the overall problem and preparing a report detailing that aspect and making recommendations on how management decisions can be improved.

Prerequisite: Permission of instructor

Fall, 1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 552: Directed Study

Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the students.

Prerequisite: Permission of instructor

Fall, 1-12 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 553: Fishery Management

Survey of the basic principles of and techniques for studying the population dynamics of marine fish and shellfish. Discussion of the theoretical basis for management of exploited fishes and shellfish, contrasting management in theory and in practice using local, national, and international examples. Includes lab exercises in the use of computer-based models for fish stock assessment.

Prerequisite: Calculus I or permission of instructor

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 554: Aquatic Animal Diseases

This course is designed to expose students to fundamental and current issues pertaining to host/pathogen interactions in aquatic environment. By the end of the course, students should have a basic understanding of disease processes in aquatic animals; knowledge of the tools used for disease diagnosis; and an appreciation of disease management tools available today. A particular accent is given to the role of the environment as an important factor in infectious and non-infectious diseases.

3 credits, Letter graded (A, A-, B+, etc.)
MAR 555: Introduction to Mathematics for Marine Scientists
Course is designed to develop quantitative thinking and approaches in marine sciences. Topics covered are differential equations, partial differential equations. Discussions include formulation of practical problems, i.e., application of differential equations.
Prerequisite: Calculus I or permission of instructor
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 557: Case Study and Project Planning Seminar
This seminar will introduce students to case studies in marine conservation carried out regionally, nationally, and internationally through seminars given by professionals in the field. In addition students will be given direction on how to develop a plan for a case study as well as instruction on how to obtain, analyze, and present data. Students will be required to submit a written project plan for either their Capstone Project or Internship prior to the end of the semester.
Spring, 1 credit, S/U grading

MAR 558: Remote Sensing
Theory and application of remote sensing and digital image analysis to marine research. Students use standard software and PCs for digital filtering, enhancement, and classification of imagery.
Prerequisite: MAR 501, 502, 504, 506, or permission of instructor
Spring, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 559: Risk Analysis, Error and Uncertainty
This seminar style course will explore error estimation, uncertainty propagation, risk analysis, model validation, and decision analysis.
Fall, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 560: Ecology of Fishes
Introduction to current research in the ecology of fishes. Topics such as population regulation, migration, reproductive strategies, predator-prey interactions, feeding behavior, competition, life history strategies, and others are discussed.
Prerequisite: Familiarity with concepts of ecology or biological oceanography
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 561: Quantitative Fisheries Ecology
The course covers quantitative models that are currently utilized to assess the status of fish stocks and academic pursuits of understanding single-species and ecosystem dynamics. The course builds on basic ecological models such as the density-independent exponential and density-dependent logistic models and introduces equilibrium and non-equilibrium production models and statistical-catch-atch techniques. Recruitment and growth models commonly used in fisheries ecology are also covered. Least-squares, non-linear and likelihood methods are methods utilized in model parameter estimation. Statistical techniques such as bootstrapping and Monte Carlo methods are used to assess uncertainty in models outputs. This course is useful for students that plan academic or management careers in fisheries and wildlife research.
Offered
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 562: Early Diagenesis of Marine Sediments
The course treats qualitative and quantitative aspects of the early diagenesis of sediments. Topics include diffusion and adsorption of dissolved species; organic matter decomposition and storage; and diagenesis of clay materials, sulfur compounds, and calcium carbonates. The effects of bioturbation on sediment diagenesis are also discussed. This course is offered as both MAR 562 and GEO 562.
Prerequisite: Permission of instructor
Fall, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 563: Early Diagenesis of Marine Sediments II
The basic principles and concepts of diagenetic processes developed in MAR/GEO 562 are used to examine in detail early diagenesis in a range of sedimentary environments. These include terrigenous and biogenic sediments from estuarine, lagoonal, deltaic, open shelf, hemipelagic, oligotrophic deep-sea, and hydrothermal regions.
3 credits, Letter graded (A, A-, B+, etc.)

MAR 564: Atmospheric Structure and Analysis
Real world applications of basic dynamical principles to develop a physical understanding of various weather phenomena. Topics include the hypsometric equation, structure and evolution of extratropical cyclones, fronts, hurricanes and convective systems, surface and upper air analysis techniques, radar and satellite interpretation, and introduction to operational products and forecasting.
Prerequisite: 1 year of calculus.

Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 566: Air Pollution and Its Control
A detailed introduction to the causes, effects and control of air pollution. The pollutants discussed include carbon monoxide, sulfur oxides, nitrogen oxides, ozone, hydrocarbons and particulate matter. The emissions of these bases from natural and industrial sources and the principles used for controlling the latter are described. The chemical and physical transformations of the pollutants in the atmosphere are investigated and the phenomena of urban smog and acid rain are discussed.
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 568: Scientific Communication
This course is designed to provide first-year graduate students with an introduction to the standards and practices of both proposing and presenting results of oceanographic research. Students will develop skills in communicating in both oral and written formats, and have the opportunity to produce a draft thesis proposal.
2 credits, Letter graded (A, A-, B+, etc.)

MAR 570: Modern Methods of Data Analysis in Atmospheric and Ocean Studies - Part II
Sampling and experiment design considerations, time and frequency domain analysis, Fourier methods, related topics in probability and statistics. Course involves some computer work.
Prerequisite: Permission of instructor
Fall, 3 credits, Letter graded (A, A-, B+, etc.)
May be repeated 2 times FOR credit.

MAR 571: Zooplankton Ecology
The course is designed to acquaint the student with the theoretical problems and applied methodology in ecological studies of marine and freshwater zooplankton. Topics will include taxonomy, anatomy, physiology, life history strategies, population dynamics, and food chain interaction.
Prerequisites: MAR 502 and permission of instructor
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 572: Geophysical Simulation
Basic equations and boundary conditions. Linear and nonlinear instabilities. Finite-difference and time integration techniques for problems in geophysical fluid dynamics. Numerical design of global atmospheric and ocean models.
MAR 573: Special Topics-Chemical Oceanography
This course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include carbonate chemistry, isotope chemistry, and microbial chemistry. Prerequisite: Permission of instructor
Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 574: Special Topics: Ocean Dynamics
Introductory dynamical oceanography, framework and applications.
1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 575: Special Topics-Geological Oceanography
The course proposes to take several views of the ecology and biogeochemistry of intertidal wetlands to see whether one or more of these views might be useful in reinvigorating interest in the study of wetland function for its own sake. Ecology and plant life history will be studied in addition to geology and wetlands management.
Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 576: Special Topics-Biological Oceanography
The course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include grazing in benthic environment, coastal upwelling, the nature of marine ecosystems, and marine pollution processes.
Prerequisite: Permission of instructor
Fall, 1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 577: Special Topics-Coastal Zone Management
The course is designed for the discussion of topics of special interest on demand that are not covered in regularly scheduled courses. Examples of possible topics include microcomputer information systems, environmental law, coastal pollution, dredge spoil disposal, science and technology in public institutions, and coastal marine policy.
Prerequisite: Permission of instructor
Fall and Spring, 1-4 credits, Letter graded (A, A-, B+, etc.)
May be repeated for credit.

MAR 578: Seminar
A weekly series of research seminars presented by visiting scientists and members of the staff.
Fall and Spring, S/U grading
May be repeated for credit.

MAR 584: Applied Marine Ecology Seminar
This course provides an opportunity for advanced graduate students to practice presenting data on their thesis research in areas broadly related to how individuals and communities of marine organisms respond to changes in their environments. Each student will prepare an abstract of the work they plan to present and assign an appropriate review or research paper for the class to read. They will then prepare a formal presentation of their work suitable for a departmental seminar. Faculty and students will provide constructive criticism of the presentation as well as participate in a discussion of the work.
Fall, 1 credit, S/U grading
May be repeated for credit.

MAR 585: Coastal Geology Seminar
An assessment of recent developments in coastal geology. Discussion of advances in the application of sedimentology, stratigraphy, and geomorphology to the study of coastal environments. Modern-ancient analogues are emphasized where appropriate.
Prerequisite: Stratigraphy and sedimentary marine geology
Fall, 2 credits, S/U grading
May be repeated for credit.

MAR 586: Introduction to Ecological Modeling
This course will provide students with a familiarity of the major concepts, approaches, and underlying rationale for modeling in the ecological sciences. Topics will include reviews of theoretical and empirical models, the use of models in adaptive management, and how to confront models with data to evaluate alternative hypotheses. Roughly 1/3 of the course will be devoted to the use of models in management, focusing on the problems of fitting models to data and management pitfalls that follow. Course work will consist of readings, in class exercises, and group assignments that involve the construction, analysis, and interpretation of ecological models.
Prerequisite: BEE 550, BEE 552; MAT 131 or equivalent; any statistics course.
Spring, 3 credits, Letter graded (A, A-, B+, etc.)

MAR 588: Molecular Marine Ecology
DNA analysis offers a new window into the ecology of marine organisms, shedding light on aspects of their biology that are traditionally difficult to study, such as their evolutionary history, population structure, population demographic history and reproductive patterns. In this way, DNA analysis can help us better manage fisheries and conserve endangered marine species. This course is designed to expose graduate students to the burgeoning field of molecular ecology and the application of molecular analyses to fisheries management and conservation. Lectures will be supplemented by a group laboratory project, where students will apply techniques such as DNA extraction, polymerase chain reaction, DNA sequencing and computer based analysis of genetic data to address a contemporary marine conservation or fisheries issue.
3 credits, Letter graded (A, A-, B+, etc.)

MAR 589: Capstone Project in Marine Conservation and Policy
Students will conduct an in depth capstone study involving independent analysis of available data and produce an original synthesis paper based on a committee-approved, consequential topic in marine conservation. All students will also present their project at the annual Program Symposium.
Spring, Summer,
Fall, 3-6 credits, S/U grading
May be repeated for credit.

MAR 590: Research
Original investigation undertaken with the supervision of the advisor.
Prerequisite: Permission of instructor
Fall and Spring, 1-12 credits, S/U grading
May be repeated for credit.

MAR 593: Atmospheric Physics
Advanced cloud physics. atmospheric convection, and other moist processes.
3 credits, Letter graded (A, A-, B+, etc.)

MAR 594: Atmospheric Dynamics
This course covers atmospheric waves, quasigeostrophic theory, and atmospheric dynamic instability.
3 credits, Letter graded (A, A-, B+, etc.)

MAR 595: Graduate Seminar in Atmospheric Sciences
Discussion of special research topics centered on monographs, conference proceedings, or journal articles. Topics include climate change, atmospheric chemistry, radiation transfer, and planetary atmospheres. This course is intended primarily for students who have passed the written qualifying examination in atmospheric sciences, although other students may enroll with permission of the faculty seminar leader. Fall and Spring, 0-3 credits, Letter graded (A, A-, B+, etc.)

May be repeated for credit.

MAR 598: Synoptic and Mesoscale Meteorology
Course examines the structure and evolution of synoptic and mesoscale systems using observations, modern dynamical analysis, and numerical weather prediction models. Diagnosis of synoptic systems includes applications of quasi-geostrophic theory to baroclinic waves; jet stream and frontal circulations. A survey of the concepts of mesoscale systems includes convective systems, gravity waves, and terrain-coastal circulations. The student will investigate such phenomena in the laboratory as well as individual projects.

Prerequisite: Permission of instructor
Spring, 4 credits, Letter graded (A, A-, B+, etc.)

MAR 599: Atmospheric Boundary Layer Processes
This course provides the theoretical foundation for a quantitative understanding of transport processes and chemical transformations in the atmospheric boundary layer. Topics covered in this course include the equations of motions for the lower troposphere; the budget of turbulent kinetic energy; turbulent fluxes of momentum, heat and mass; treatment of chemical transformations; and the representation of these processes in numerical models.

3 credits, Letter graded (A, A-, B+, etc.)

MAR 601: Dynamic model with Matlab
An introduction to Matlab as a programming language to model the dynamic systems in biology. The course will cover the basics of Matlab, linear algebra, and the matrix, stochastic, and continuous time models of biology.

Offered
Spring, 2 credits, Letter graded (A, A-, B+, etc.)

MAR 650: Dissertation Research
Original investigation undertaken with the supervision of research committee.

Fall and Spring, 1-9 credits, S/U grading
May be repeated for credit.

MAR 655: Directed Study
Individual studies under the guidance of a faculty member. Subject matter varies according to the needs of the student.

Prerequisite: Permission of instructor
Fall, 1-9 credits, S/U grading
May be repeated for credit.

MAR 670: Practicum in Teaching
Fall and Spring, 1-3 credits, S/U grading
May be repeated for credit.

MAR 699: Dissertation Research on Campus
Research course exclusively for students who have been advanced to candidacy (G5). Major portion of research must take place on SBU campus, at Cold Spring Harbor, or at the Brookhaven National Lab.

Fall, 1-9 credits, S/U grading
May be repeated for credit.

MAR 800: Summer Research
Summer Research. 0 credits, S/U grading. May be repeated for credit.

S/U grading
May be repeated for credit.