

MARINE BIOLOGY AND ECOLOGY (MBE)

MBE 230. Introduction to Marine Biology. 3 Credit Hours.

The sea as an environment. Marine life, its special problems and adaptations. Emphasis on Caribbean organisms.

Prerequisite: BIL 150 or BIL 160.

Components: LEC.

Grading: GRD.

Typically Offered: Fall & Spring.

MBE 232. Introduction to Marine Biology Laboratory. 1 Credit Hour.

Ecology, physiology, and behavior of marine organisms in south Florida marine habitats.

Pre/Corequisite: MSC 230. or BIL 230. and Prerequisite: BIL 151 or BIL 161.

Components: LAB.

Grading: GRD.

Typically Offered: Fall.

MBE 306. Marine Ecology. 3 Credit Hours.

This course will examine the principles by which marine organisms interact with their external environment and other biota, and in turn, influence their external environment and other biota. This will include organismal ecology, population ecology, community ecology, ecosystem ecology, and paleoecology. While focused on marine ecology, it will make comparisons with terrestrial ecology.

Prerequisite: MSC 230 and Requisite: Cannot take MSC 306 if already taken BIL 330.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 307. Physiology of Marine Organisms. 3 Credit Hours.

This course will introduce basic principles of physiology by comparing how various marine animals and plants endure in marine environments. The approach will emphasize the integration of function between and within different physiological systems which results in the maintenance of constant internal state i.e., homeostasis. The physiological systems examined include: energy metabolism, ion regulation, calcification, neural and endocrine processes, reproduction, movement, respiration and circulation, osmoregulation.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Fall & Spring.

MBE 308. Genetics and Evolution. 3 Credit Hours.

Genetics and Evolution is equivalent to common genetic courses except that it has a greater focus on heritability, quantitative and population genetics and how evolution affects these parameters. Evolution is included to provide insight about the genetics and phenotypic variation within and among populations and their change over time.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 310. Living Resources of the Ocean. 3 Credit Hours.

Marine fish and shellfish of major commercial and recreational value: biology, techniques of harvesting, and resource management.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 319. Research Fundamentals. 1 Credit Hour.

Research Fundamentals will provide an introduction to academic research methods including basic laboratory techniques, data analysis, and scientific communication. Students will read the primary literature and both analyze data and communicate results using multiple formats. The course emphasizes active learning (discussions, working with peers, writing, etc.) and is directed toward early stage undergraduate students interested in pursuing research.

Prerequisite: MSC 204 Or MTH 224.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 323. Invertebrate Zoology. 4 Credit Hours.

Biology of invertebrates, with emphasis on tropical and subtropical marine forms. Field work and combined lecture-laboratory sessions.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 324. Biology of Fishes. 3 Credit Hours.

Selected topics on the ecology and physiology of fishes. Lectures on reproduction, respiration, osmoregulation, sense systems, hormonal control.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 326. Marine Genomics. 4 Credit Hours.

This course integrates lectures, discussions and research on genomics to understand the demography and evolutionary processes affecting populations. This research intensive course uses genomic data to better understand the health of species and ecological communities. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: BIL 150 and BIL 160 And MSC 230 Or BIL 230 And Corequisite: MSC 463 and MSC 466 and MSC 467.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 329. Marine Vertebrate Zoology. 3 Credit Hours.

The course will be a comprehensive examination of the form and function of the vertebrate lineage of marine animals from early chordates to the evolution of cartilaginous and bony fish and the emergence of tetrapods, those that evolved from marine ancestors and have since returned to the seas. A comparative point of view will be used to assess the anatomy and physiology of each taxonomic group as well as behavioral and ecological adaptations related to their life history. Specifically, the course will cover the emergence of the vertebrate body plan and the evolution of fish from agnathans through modern teleosts, as well as the tetrapod lineage of marine reptiles, marine birds, and marine mammals. We will examine critical points in vertebrate evolution where genome-wide duplication events occurred as well as instances of convergent evolution in various lineages.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 333. Ocean Human Health. 3 Credit Hours.

The focus of this course is on the present, future, and potential effects of oceanic processes and marine organisms on human health and wellbeing and on human impacts on the marine environment.

Prerequisite: MSC 230 or BIL 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 350. Survey of Marine Mammals. 3 Credit Hours.

The biology, physiology, natural history, behavior, and conservation of marine mammals.

Prerequisite: MSC 230 or BIL 230.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 365. Tropical Coastal Ecosystems: Lab and Field Methods. 1 Credit Hour.

This course will provide students with the theory and application of field sampling methods used to document status and trends in the health of coral reef, seagrass, and mangrove ecosystems. Students will learn about sampling theory, sampling methods, sampling equipment, and species identifications using a combination of classroom and field activities. This 1-credit course is designed as a companion to MSC 366 where theory detailed in this class is put to practice to design and execute a targeted, small-scale sampling program for the coastal ecosystems found in South Florida. Lectures will be complemented with field activities to be carried out at sites around Key Biscayne and at the UM Broad Key station.

Pre/Corequisite: MSC 366.

Components: LAB.

Grading: GRD.

Typically Offered: Spring.

MBE 366. Tropical Coastal Ecosystems. 3 Credit Hours.

This course will provide a comprehensive background on the ecology, conservation, and restoration of the three main tropical coastal ecosystems: Mangroves, Seagrasses, and Coral Reefs. The first part of the course will consist of a review of ecological theory, followed by lectures on the dynamics of the three ecosystems, including diversity, community structure, stress ecology, management tools, and novel restoration paradigms. Classes will be complemented by student presentations, in-class activities, and media-outreach projects. Readings for this class will include a required textbook and papers from the primary literature. Grades will be based on exams, quizzes, in-class projects, and student presentations.

Prerequisite: MSC 230 or BIL 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 370. Current Research in Marine Biology: Seminars and Discussion. 2 Credit Hours.

These discussions and seminars comprising a 2 cr course provide well-prepared undergraduate students interested in marine research with an introduction to graduate student-presented science in the specialization of marine biology.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 381. Marine Field Ornithology. 1-4 Credit Hours.

Waterbirds such as seabirds, shorebirds, and wading birds are key components of the marine ecosystem, including pelagic, coastal, and estuarine communities. As ecological indicators waterbird abundance provides a proxy for the health of these environments. Waterbirds have also served as important model systems for studies of behavior, evolutionary biology, and ecological theory. This course will provide an introduction to waterbird biology and conservation, including a variety of different field trips to waterbird communities.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 403. Marine Environmental Toxicology. 3 Credit Hours.

This course will provide an introduction to the principles of environmental toxicology with an emphasis on marine ecosystems, considering a variety of different classes of toxicants, how they can impact marine organisms, the scientific methods used to assess impacts, and the regulatory frameworks used to monitor and manage their release to the environment.

Prerequisite: BIL 255 and (CHM 112 or CHM 121).

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 404. Marine Organismal and Environmental Health. 1 Credit Hour.

This 1-credit course will complement salt water semester courses. (Must have taken MSC403 or MSC333 and either MSC466 or MSC326 and MSC463). Students will be required to collect and analyze samples, interpret their findings and present them in a formal laboratory report due two weeks after the trip. Students will also be required to give a presentation they have prepared before the trip and attend two seminars on Marine Organismal and Environmental Health topics.

Pre/Corequisite: MSC 327 or MSC 333 or MSC 403 or MSC 466 or MSC 326 and MSC 463.

Components: LAB.

Grading: GRD.

Typically Offered: Fall.

MBE 406. Tropical Marine Ecology: Sampling, Monitoring, and Restoration Methods. 4 Credit Hours.

This course integrates lectures, discussions and authentic research on the ecology, conservation, and restoration of the three main tropical coastal ecosystems found in South Florida: Mangroves, Seagrasses, and Coral Reefs. This research intensive course focuses on the application of field sampling methods and integrate ecological theory to define the health and success of coastal ecosystems. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: MSC 230 Or BIL 230 And MSC 232 And Corequisite: MSC 407 and MSC 408 and MSC 409.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 407. Molecular Ecology and Physiology of Reef Coral Symbioses. 4 Credit Hours.

Reef corals requires an intracellular symbiont to succeed. This course integrates lectures and molecular genetic research to quantify this symbiotic relationship. Students will be involved in research to define and quantify coral-symbionts interactions and how these interactions influences coral physiology and success. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: MSC 230 Or BIL 230 And Corequisite: MSC 406 and MSC 408 and MSC 409.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 408. Climate Change: Limits of Marine invertebrate Adaptability. 4 Credit Hours.

This course integrates lectures, discussions and authentic research on the effect of global climate change on the success of marine invertebrates. Students will be involved in research to understand how the predicted changes in the ocean environment (temperature, oxygen, and pH) affects the ability for marine organisms to acclimatize and adapt to these environments. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: MSC 230 Or BIL 230 And MSC 232 And BIL 255 And Corequisite: MSC 406 and MSC 407 and MSC 409.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 409. Coral Immunology and Microbiology. 4 Credit Hours.

This course integrates lectures, discussions and authentic research on coral immunology and microbiology for students to learn how the coral immune response and the coral associated microbes affect coral success. This research-intensive course integrates coral microbiome analysis with immunology assays to generate data on coral wellbeing. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: MSC 230 Or BIL 230 And MSC 232 And Corequisite: MSC 406 and MSC 407 and MSC 408.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 410. Marine Conservation Science. 3 Credit Hours.

Nature of marine biodiversity, what threatens it, and what can be done to recover the biological integrity of estuaries, coastal seas, and oceans. Topics include: distinctive aspects of marine populations and ecosystems; threats to marine biological diversity, singly and in combination; place-based management of marine ecosystems; and the human dimensions of marine conservation.

Junior Standing.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 415. Coral Reef Science and Management. 3 Credit Hours.

The interdisciplinary nature of coral reef science and management: biological, environmental, ecological and socioeconomic aspects of coral reef science, coral reef management problems and approaches at local to global scales, and the implications of climate change for coral reef science and management.

Prerequisite: MSC 230.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 426. Research in Microbial Genomics. 4 Credit Hours.

This course integrates lecture and laboratory studies to focus on the structure, function, evolution, mapping and editing of microbial genomes belonging to the three domains of life; Archaea, Bacteria and Eukarya.

Prerequisites: BIL 150 and BIL 151 and BIL160 and BIL161 and BIL 250.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 432. Comparative Ecology of Terrestrial and Marine Systems. 3 Credit Hours.

A comparison of various biotic and abiotic controls on terrestrial and marine ecosystems is undertaken. The course stresses proximate mechanisms and underlying evolutionary processes. Analysis methods and models of various ecosystems are compared and critiqued. Issues involved in sustainability and conservation of resources are discussed in relation to agriculture, fisheries and forestry. The importance of biodiversity and climate change in the future of ecosystems is stressed.

Prerequisite: MTH 162. And BIL 330. Or ECS 232.

Components: LEC.

Grading: GRD.

MBE 462. Marine Biomedicine. 3 Credit Hours.

The course will cover diverse bioactive molecules that are derived from marine sources ranging from sponges to sharks. The isolation and characterization of these compounds as well as their potential application in clinical medicine and human health will be reviewed. The class will also cover marine-derived factors used in biotechnology and marine animal models used in biomedical research with an emphasis on marine immunology.

Prerequisite: BIL 255 and (CHM 112 or CHM 121).

Components: LEC.

Grading: GRD.

MBE 463. Conservation Genomics. 4 Credit Hours.

This course integrates lectures, discussions and research on genetics and genomics to understand population biology, conservation, and susceptibility of endangered species to extinction and the effect of invasive species on natural communities. This research intensive course sequences genomes and uses the data to better understand the health of species and ecological communities. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: BIL 150 and BIL 160 And MSC 230 Or BIL 230 And Corequisite: MSC 326 and MSC 466 and MSC 467.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 464. Marine Comparative Immunology Lab. 1 Credit Hour.

The laboratory course will cover immunology techniques used in the assessment of immune function and immune reactivity in diverse marine taxa from sponges to fish to mammals.

Prerequisite or Co-requisite: MSC 465.

Components: LAB.

Grading: GRD.

Typically Offered: Fall.

MBE 465. Marine Comparative Immunology. 3 Credit Hours.

The course will cover immune function in diverse marine taxa from sponges to fish and the evolution of innate and adaptive immune mechanisms from a comparative point of view, with an emphasis on shark and fish immunology. Adaptations related to living in a microbe-rich marine environment will be highlighted. Potential applications of research findings will be addressed with respect to conservation and aquaculture. The role of invertebrate and vertebrate models in the study of the evolution of the immune system and applications for human health and medicine will be discussed.

Prerequisite: BIL 255.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 466. Experimental Physiology. 4 Credit Hours.

This course integrates lectures, discussions and research. Topics will include homeostasis, interactions with the external environment, and life with limited oxygen and water. Lectures will be highly discussion-based; students will be expected to read primary research articles as suggested by the professor before lecture to foster participation in those discussions and form hypotheses about accompanying laboratory. Each lab will be written up as a formal laboratory report (i.e., Introduction, Materials and Methods, Results and Discussion). This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: BIL 255 And Corequisite: MSC 326 and MSC 463 and MSC 467.

Components: HRK.

Grading: GRD.

Typically Offered: Fall.

MBE 467. Marine Animal Neurophysiology and Behavior. 4 Credit Hours.

This course integrates lectures, discussions and research on neural and endocrine systems in marine animal models, and how these systems work together to control elements of physiology, sensation and perception of the environment and behavior. This course is part of Saltwater Semester so that students can be actively involved in intensive research. As part of the Saltwater Semester, students are required to enroll in four of the 4-credit Saltwater Semester courses (16 credits) where each course meets for 3 weeks at the Marine campus.

Prerequisite: BIL 230 Or MSC 230 And BIL 255 And Corequisite: MSC 326 and MSC 463 and MSC 466.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 504. Biology of Marine Mammals. 3 Credit Hours.

The purpose of this class is to introduce students to the biology, evolution, taxonomy, physiology, natural history, behavior, conservation, and management of marine mammals.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 505. Marine Mammal Disease and Medicine. 3 Credit Hours.

This course will cover the basics (theory and application) of marine mammal disease and medicine. Applications will focus on the medical management of managed care and wild populations.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 506. Procedures in Marine Mammal Health and Disease. 1 Credit Hour.

The aim of this course is to provide the student with more in-depth exposure and study of various practical health related techniques/skills that are integral to marine mammal health and disease assessment. While the procedures are most applicable to marine mammals in managed care, several of the procedures can be adapted and/or are used in study of wild marine mammals. Health and disease assessment procedures will be divided into the following five categories/areas: physical examination and behavioral assessment; multimodal and advanced diagnostics (eg., electrocardiogram, ultrasound, etc.); sample collection (types, procedures); clinical pathologic (eg., hematology, biochemistry, serology) interpretation; gross and histopathologic necropsy techniques and interpretation.

Requisite: Senior Standing.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 507. Marine Mammal Applied Behavior Analysis and Managed Care. 3 Credit Hours.

This course involves a thorough examination of specific aspects of marine mammal managed care and conservation programs, with an emphasis on behavior management, analysis, and modification as a basis for adaptive response to changing environments both in-situ and ex-situ. Coursework will also focus on health management and assessment, emergency handling and transportation, government regulations, and wildlife conservation.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 514. Tropical Marine Biology. 3 Credit Hours.

In this intensive one-week field course, students are introduced to the ecology, biology, and interconnections of all of South Florida's major marine habitats through a combination of lectures and field excursions from UM's remote private island research station in the Florida Keys.

Senior Standing.

Components: LEC.

Grading: GRD.

Typically Offered: Spring & Summer.

MBE 515. Tropical Marine Ecology. 3 Credit Hours.

Marine ecology with emphasis on tropical ecosystems and local habitats. Physical environmental and biotic adaptations, population, and community ecology are discussed. Field exercises in mangrove, sea grass, and coral reef ecosystems are also included.

Requisite: Senior Standing.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 518. Reef Coral Biology, Ecology, and Conservation. 3 Credit Hours.

Scleractinian (stony) corals are the principal builders of contemporary coral reefs and their unique biology underpins the ecological success of reef ecosystems in the world's shallow tropical seas. This class covers the physiology and ecology of these critical organisms, the environmental factors governing their health, and their biotic interactions with other species. Examples of topics covered include algal symbiosis, calcification, reproduction, taxonomy, microbial ecology, competition with macroalgae, and herbivory, with insights at all levels from molecules to ecosystems. A special focus is on the decline of coral reefs due to anthropogenic stressors including climate change and coral bleaching, diseases, nutrient pollution, overfishing, and ocean acidification.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 521. Field Techniques and Instrumentation in Tropical Marine Ecology. 3 Credit Hours.

This course covers the instrumentation and field techniques commonly used to characterize the structure and function of the three dominant ecosystems in the tropics and subtropics, i.e. coral reefs, seagrass beds and mangroves.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 522. Marine Microbial Dynamics. 3 Credit Hours.

An overview of the function of microbes in the ocean from a chemical perspective, building a quantitative understanding of cellular needs and metabolic functions, and the role these microbial processes play in controlling chemical fluxes and biogeochemical cycles in the ocean.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 529. Population Genetics and Genomics. 3 Credit Hours.

This course provides an introduction to population genetics, which examine the evolutionary processes that affect genomes of natural populations: mutation, genetic drift, natural selection, and gene flow.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 532. Marine Mammal Research Techniques. 3 Credit Hours.

The goal of this course is to provide an overview of the field of marine mammal research (historic, current, and future), hands-on training in applied research skills relevant to the field of marine mammalogy, as well as an understanding of the biological and ecological significance of captive and wild research and contributions to management and conservation.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 535. Practical Computing for Biologists. 3 Credit Hours.

Practical Computing for Biologists is a problem-centric course that provides resources for biologists to analyze the increasingly complex data sets generated by new technologies. Flexible, scalable tools will be covered to accomplish a diversity of tasks using open source software. Topics will include: regular expressions, command line operations, Python programming, and bioinformatics pipelines. Exercises relevant to the students' needs will be used to illustrate and develop new skills. After doing several assigned homework problems, students will have an opportunity to develop a bioinformatic analysis on their own data set.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 539. Oceanic Productivity. 3 Credit Hours.

History, methods, and current topics relevant to studies of marine primary production. Magnitude and fate of primary production in the sea is essential to understand secondary production, the success of fisheries recruitment, and global climate.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 542. Oceans and Human Health. 3 Credit Hours.

The objective of this interdisciplinary course is to provide students with introductory knowledge of the broad and relatively young field of Oceans and Human Health. The focus is the present, future, and potential effects of oceanic processes and aquatic organisms on human health, and vice versa. These diverse factors reflect the physical, chemical, biotic and social processes which require an integration of information and knowledge from the medical, marine and social sciences. The course covers harmful algal blooms, marine microbes, and global climate change as well as an overview of coastal impacts and remedies (e.g. dredging from the sea and marine models) through a series of coordinated lectures and case studies on human health, physical environment, and oceanographic processes. Prerequisite: Permission of instructor.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 545. Microbial Ecology and Evolution. 4 Credit Hours.

This course integrates lecture and laboratory studies to focus on the ecology and evolution of microbial organisms belonging to the three domains of life; Archaea, Bacteria and Eukarya. The laboratory component will have a focus on the analysis of the structure, function, evolution, mapping and editing of microbial genomes.

Prerequisite: BIL 150 and BIL 151 and BIL 160 and BIL 161 and BIL 250 and Requisite: Senior Status.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 550. Analytical Techniques in Marine Biology. 2 Credit Hours.

Theory and applications of selected analytical techniques necessary to conduct quantitative research in marine biology (e.g., electrophoresis, metabolite assays, enzyme assays, radioisotope methodology). One hour lecture followed by three hour laboratory per week.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 570. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 571. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 572. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 574. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 576. Diseases of Marine Organisms. 3 Credit Hours.

Infectious, genetic, and environmentally induced diseases of marine fishes and invertebrates as well as diagnostic methods, cellular, and molecular pathology. Lecture, 3 hours.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 578. Evolutionary Genetics. 3 Credit Hours.

A Graduate course that presents an overview from "New Evolutionary Synthesis" (1900) to Evolutionary Genomics. The critical points to emphasize is the importance of standing genetic variation, the role of neutral evolutionary process versus evolution by natural selection and how an evolution perspective provides meaningful insights into the biology.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 586. Fish Physiology. 3 Credit Hours.

Ecology, dispersal, and modes of life of fishes. Adaptations by larvae and adults to various habitats are covered as well as the effects of man on fish faunas and the importance of fishes to various ecological systems. Lecture, 3 hours.

Senior Standing.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 604. Biology of Marine Mammals. 3 Credit Hours.

The purpose of this class is to introduce students to the biology, evolution, taxonomy, physiology, natural history, behavior, conservation, and management of marine mammals.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 605. Marine Mammal Disease and Medicine. 3 Credit Hours.

This course will cover the basics (theory and application) of marine mammal disease and medicine. Applications will focus on the medical management of managed care and wild populations.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 606. Procedures in Marine Mammal Health and Disease. 1 Credit Hour.

The aim of this course is to provide the student with more in-depth exposure and study of various practical health related techniques/skills that are integral to marine mammal health and disease assessment. While the procedures are most applicable to marine mammals in managed care, several of the procedures can be adapted and/or are used in study of wild marine mammals. Health and disease assessment procedures will be divided into the following five categories/areas: physical examination and behavioral assessment; multimodal and advanced diagnostics (eg., electrocardiogram, ultrasound, etc.); sample collection (types, procedures); clinical pathologic (eg., hematology, biochemistry, serology) interpretation; gross and histopathologic necropsy techniques and interpretation.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 607. Marine Mammal Applied Behavior Analysis and Managed Care. 3 Credit Hours.

This course involves a thorough examination of specific aspects of marine mammal managed care and conservation programs, with an emphasis on behavior management, analysis, and modification as a basis for adaptive response to changing environments both in-situ and ex-situ. Coursework will also focus on health management and assessment, emergency handling and transportation, government regulations, and wildlife conservation.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 614. Tropical Marine Biology. 3 Credit Hours.

In this intensive one-week field course, students are introduced to the ecology, biology, and interconnections of all of South Florida's major marine habitats through a combination of lectures and field excursions from UM's remote private island research station in the Florida Keys.

Components: LEC.

Grading: GRD.

Typically Offered: Spring & Summer.

MBE 615. Tropical Marine Ecology. 3 Credit Hours.

Marine ecology with emphasis on tropical ecosystems and local habitats. Physical environmental and biotic adaptations, population, and community ecology are discussed. Field exercises in mangrove, sea grass, and coral reef ecosystems are also included.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 618. Reef Coral Biology, Ecology, and Conservation. 3 Credit Hours.

Scleractinian (stony) corals are the principal builders of contemporary coral reefs and their unique biology underpins the ecological success of reef ecosystems in the world's shallow tropical seas. This class covers the physiology and ecology of these critical organisms, the environmental factors governing their health, and their biotic interactions with other species. Examples of topics covered include algal symbiosis, calcification, reproduction, taxonomy, microbial ecology, competition with macroalgae, and herbivory, with insights at all levels from molecules to ecosystems. A special focus is on the decline of coral reefs due to anthropogenic stressors including climate change and coral bleaching, diseases, nutrient pollution, overfishing, and ocean acidification.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 621. Field Techniques and Instrumentation in Tropical Marine Ecology. 3 Credit Hours.

This course covers the instrumentation and field techniques commonly used to characterize the structure and function of the three dominant ecosystems in the tropics and subtropics, i.e. coral reefs, seagrass beds and mangroves.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 622. Marine Microbial Dynamics. 3 Credit Hours.

An overview of the function of microbes in the ocean from a chemical perspective, building a quantitative understanding of cellular needs and metabolic functions, and the role these microbial processes play in controlling chemical fluxes and biogeochemical cycles in the ocean.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 629. Population Genetics and Genomics. 3 Credit Hours.

This course provides an introduction to population genetics, which examine the evolutionary processes that affect genomes of natural populations: mutation, genetic drift, natural selection, and gene flow.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 630. Marine Microbiology. 4 Credit Hours.

This course introduces the diversity, habitats and ecology of the marine microbial biosphere. Microbes drive many elemental cycles in the oceans. As primary producers and final degraders of organic matter they provide the foundations of marine trophic webs and biogeochemical processes. This course will place microbes into the context of marine ecosystem function and biogeochemistry.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 632. Marine Mammal Research Techniques. 3 Credit Hours.

The goal of this course is to provide an overview of the field of marine mammal research (historic, current, and future), hands-on training in applied research skills relevant to the field of marine mammalogy, as well as an understanding of the biological and ecological significance of captive and wild research and contributions to management and conservation.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 635. Practical Computing for Biologists. 3 Credit Hours.

Biology is becoming far more computationally intensive, yet the undergraduate and graduate biology curricula have not kept pace with this new reality. Practical Computing for Biologists, based on Haddock's and Dunn's book of the same name, is a problem-centric course that provides resources for biologists to analyze the increasingly complex data sets generated by new technologies. We will cover flexible, scalable tools to accomplish a diversity of tasks using open source software. Topics will include: regular expressions, command line operations, Python programming, and bioinformatics pipelines. Exercises relevant to the students' needs will be used to illustrate and develop new skills. After doing several assigned homework problems, students will have an opportunity to develop a bioinformatic analysis on their own data set.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 639. Oceanic Productivity. 3 Credit Hours.

History, methods, and current topics relevant to studies of marine primary production. Magnitude and fate of primary production in the sea is essential to understand secondary production, the success of fisheries recruitment, and global climate.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 640. Marine Phytoplankton and Primary Productivity. 3 Credit Hours.

Ecology of marine phytoplankton and overview of major taxa including cyanobacteria. Distribution and magnitude of primary production in the sea and relationship to marine food webs and biogeochemical cycling is included.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 641. Reef Restoration Techniques. 2 Credit Hours.

This course will provide a comprehensive background on the theory and practice of active coral reef restoration. This 5-day lab and field-intensive course will be structured with lectures and demos in the morning followed by lab or field activities in the afternoon. Readings for this class will include 2 restoration manuals and papers from the primary literature. Grades will be based on 1 exam, 2 quizzes, and 1 field monitoring report. Field activities will be carried out at sites around Key Biscayne. During these field trips, students will conduct hands-on restoration activities (e.g., nursery maintenance, equipment deployment, coral collections, coral planting, coral monitoring). The data collected during these activities will be used by the students to write a monitoring report.

Components: LEC.

Grading: GRD.

Typically Offered: Summer.

MBE 642. Oceans and Human Health. 3 Credit Hours.

The objective of this interdisciplinary course is to provide students with introductory knowledge of the broad and relatively young field of Oceans and Human Health. The focus is the present, future, and potential effects of oceanic processes and aquatic organisms on human health, and vice versa. These diverse factors reflect the physical, chemical, biotic and social processes which require an integration of information and knowledge from the medical, marine and social sciences. The course covers harmful algal blooms, marine microbes, and global climate change as well as an overview of coastal impacts and remedies (e.g. dredging from the sea and marine models) through a series of coordinated lectures and case studies on human health, physical environment, and oceanographic processes. Prerequisite: Permission of instructor.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 643. Ecology, Conservation, and Ecotourism in the Galapagos. 3 Credit Hours.

This class takes place over three weeks in the Galapagos, Ecuador. It first gives a broad view of the physical/biological/ecological setting of the Galapagos Islands, and then analyzes the intersection between human development and nature in this fragile environment. It also provides an exploration of how tourism offers an alternative income source to unsustainable fisheries that once drove the local economy, and now has created a new set of pressures on the people and the environment.

Components: FLD.

Grading: GRD.

Typically Offered: Fall & Summer.

MBE 645. Microbial Ecology and Evolution. 4 Credit Hours.

This course integrates lecture and laboratory studies to focus on the ecology and evolution of microbial organisms belonging to the three domains of life; Archaea, Bacteria and Eukarya. The laboratory component will have a focus on the analysis of the structure, function, evolution, mapping and editing of microbial genomes.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 650. Analytical Techniques in Marine Biology. 2 Credit Hours.

Theory and applications of selected analytical techniques necessary to conduct quantitative research in marine biology (e.g., electrophoresis, metabolite assays, enzyme assays, radioisotope methodology). One hour lecture followed by three hour laboratory per week.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 670. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 671. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 672. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 674. Special Topics. 1-4 Credit Hours.

Lectures, research projects or directed readings in special topics related to Marine Biology and Fisheries.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 676. Diseases of Marine Organisms. 3 Credit Hours.

Infectious, genetic, and environmentally induced diseases of marine fishes and invertebrates as well as diagnostic methods, cellular, and molecular pathology. Lecture, 3 hours.

Components: LEC.

Grading: GRD.

MBE 678. Evolutionary Genetics. 3 Credit Hours.

A Graduate course that presents an overview from "New Evolutionary Synthesis" (1900) to Evolutionary Genomics. The critical points to emphasize is the importance of standing genetic variation, the role of neutral evolutionary process versus evolution by natural selection and how an evolution perspective provides meaning insights into the biology.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 686. Fish Physiology. 3 Credit Hours.

Ecology, dispersal, and modes of life of fishes. Adaptations by larvae and adults to various habitats are covered as well as the effects of man on fish faunas and the importance of fishes to various ecological systems. Lecture, 3 hours.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 702. Marine Biology and Ecology Graduate Student Seminar. 1 Credit Hour.

Participation is required of all students in the Department of Marine Biology and Ecology every semester they are in residence, whether or not they are registered for the course, beginning in year 1 for PhD students with a MS, year 2 for PhD students without an MS, and approximately in their second semester in residence for MS students. Talks consist of one, 15-minute presentation per year on the research or research plan. The moderator assigns talk dates in May before the academic year. The course may be taken for credit once, but registration is not required.

Components: SEM.

Grading: SUS.

Typically Offered: Fall & Spring.

MBE 704. Biological Oceanography. 3 Credit Hours.

A comprehensive course in biological oceanography, including energy flow, biogeochemical cycles, planktonic and benthic ecosystem structure, the evolutionary ecology and adaptations of marine organisms, and paleoceanography.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 707. Biochemical Toxicology. 3 Credit Hours.

Biochemical mechanisms of absorption, distribution, metabolism, and excretion of natural and synthetic environmental toxicants. Methods for evaluation of acute and chronic toxicity, carcinogenesis, mutagenesis, and teratogenesis including *in vivo*, isolated organ, tissue culture, and subcellular approaches to toxicity testing are included.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 710. Advanced Marine Mammal Biology. 3 Credit Hours.

The purpose of this class is to build upon foundational knowledge relevant to the biology, taxonomy, physiology, natural history, behavior, ecology, and conservation of marine mammals. Advanced concepts will include hydrodynamics, osteology and myology, respiratory system and diving physiology, circulatory/lymphatic systems, the nervous system, urinary/genital/reproductive systems, and neurobiology. Students must have 1 year of general biology/labs and general chemistry, 1 semester of calculus, and at least 9 credits in the natural sciences.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 715. Advanced Topics in the Ecology of Coastal Tropical Marine Ecosystems. 3 Credit Hours.

This advanced class in tropical marine ecology is targeted at students in the MS and PhD programs as well as students in the MPS program with a strong background in marine ecology. The class describes the status, trends, and disturbance ecology of tropical coastal ecosystems and organisms, with a focus on coastal ecosystems of South Florida. In addition to reinforcing and expanding knowledge of basic ecological principles through lecture materials, students will be required to complete extensive readings on current topics relating to these ecosystems from the primary scientific literature. Students will participate in several paper discussions based on these readings. Additionally, students will complete two data analysis activities and write brief reports based on these analyses. Some prior knowledge of statistics is expected to complete these assignments.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

MBE 716. Bayesian Statistics for Marine Scientists. 3 Credit Hours.

Bayesian methods are increasingly used in ecology, fisheries science and marine biology, as a statistically rigorous means to incorporate information from diverse sources into a single analysis, deal with missing or incomplete data, and directly estimate the probabilities of hypotheses or outcomes. This course will cover Bayesian methods from the theory to the practical use of the statistics packages OpenBUGS and JAGS for Bayesian analysis. Topics will include development of prior probability density functions, numerical methods for integrating posterior probability density functions, diagnostics of convergence, and methods for model selection and model averaging. Examples will be taken from ecology and marine science and will include Bayesian meta-analysis of life history parameters, fisheries stock assessment models, tag-recapture models, molecular biology, decision analysis and estimation of animal abundance from surveys. Students will be encouraged to read the peer reviewed literature critically, and evaluate whether the Bayesian methods that are commonly applied are being used and interpreted appropriately. After doing several assigned homework problems, students will have an opportunity to develop a Bayesian analysis on their own data set. Knowledge of the R language is useful but not required.

Prerequisite: RSM 612 Or MES 608.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

MBE 770. Mentoring and Supervising Skills. 1-3 Credit Hours.

This course is intended for PhD students who are interested in developing their skills as mentors and research supervisors in preparation for a career in academia or research institutions. It combines reading the literature on best practices in mentoring while implementing the skills they learn, along with the faculty instructor, to co-mentor 1-3 undergraduate researchers in MSC 411/412 or equivalent research classes. This class may be taken for 1-3 credits with 1 credit per undergraduate mentored. The class may be taken more than once, for a total of up to the 3 credits maximum.

Components: IND.

Grading: SUS.

Typically Offered: Fall & Spring.

MBE 771. Advanced Studies. 1-4 Credit Hours.

Supervised study in areas of special interest to graduate students.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 772. Advanced Studies. 1-4 Credit Hours.

Supervised study in areas of special interest to graduate students.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 773. Advanced Studies. 1-4 Credit Hours.

Supervised study in areas of special interest to graduate students.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 775. Advanced Studies. 1-4 Credit Hours.

Supervised study in areas of special interest to graduate students.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 787. Biology and Systematics of Fishes. 3 Credit Hours.

Lectures and laboratories on comparative evolution, morphology, physiology, and ecology of fishes. Laboratory emphasis is placed on family level taxonomy and systematics of marine and estuarine fishes.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

MBE 805. MPS Internship. 1-6 Credit Hours.

The MPS internship is an approved, supervised internship project with an organization engaged in activities associated with the student's degree track. The internship results in a collaborative project, written report, and oral presentation on a topic approved by the student's advisory committee. Up to 6 credits are necessary for graduation.

Components: PRA.

Grading: SUS.

Typically Offered: Fall, Spring, & Summer.

MBE 810. Master's Thesis. 1-6 Credit Hours.

The student working on his/her master's thesis enrolls for credit, in most departments not to exceed six, as determined by his/her advisor. Credit is not awarded until the thesis has been accepted.

Components: THI.

Grading: SUS.

Typically Offered: Fall, Spring, & Summer.

MBE 830. Doctoral Dissertation. 1-12 Credit Hours.

Required of all candidates for the Ph.D. The student will enroll for credit as determined by his/her advisor but not for less than a total of 12. Not more than 12 hours of MBE 830 may be taken in a regular semester, nor more than six in a summer session. Where a student has passed his/her (a) qualifying examinations, and (b) is engaged in an assistantship, he/she may still take the maximum allowable credit stated above.

Components: THI.

Grading: SUS.

Typically Offered: Fall, Spring, & Summer.