MARINE ECOSYSTEMS AND SOCIETY

http://www.rsmas.miami.edu/academics/graduate-programs/degrees/marine-ecosystems-society/

Dept. Code: MES

Marine Ecosystems and Society (MES) students engage in basic and applied research activities that contribute to the management of natural resources and the development of marine policy. Students tailor their course selections to match their research goals and individual career objectives. Graduates are poised to develop solutions to the many challenges of ocean and coastal conservation, including climate change, overfishing, resource allocation, cultural resource management, and ecosystem and species preservation.

MES faculty expertise spans diverse quantitative and qualitative disciplines that integrate biophysical, economic, and social dimensions of marine resources. This allows students to explore the intersection between science and policy, including local and global legal frameworks, risk assessment theory and practice, and the development of policies related to the management of marine ecosystems. Building on this framework, the MES academic program offers a broad, flexible curriculum and access to research opportunities designed to adequately prepare students for careers in marine fisheries science, aquaculture, species conservation, ecosystem science, marine geospatial planning, socioeconomics, cultural resource management, exploration science, environmental law, and marine policy.

Degree Programs

- Master of Professional Science (M.P.S.)
  - Requires 30 credit hours, including 24 course credit hours and 6 internship credit hours.

- Master of Science (M.S.) (p. 1)
  - Requires 30 credit hours, including 24 course credit hours and 6 research credit hours.

- Doctor of Philosophy (Ph.D.)
  - Requires 60 credit hours, including a minimum of 24 course credit hours and a minimum of 12 research credit hours.

Applicants to the MES M.S. and Ph.D. programs must possess a Bachelor's degree in a relevant academic field. All applicants are required to take the Graduate Record Examination (GRE). Those whose first language is not English must pass the Test of English as a Foreign Language (TOEFL) with a score of at least 550 (Paper-based) or 80 (IBT).

Master of Professional Science (M.P.S.) Programs

The M.P.S. degree prepares students for science careers in industry, government, and non-profit organizations, where employment demands are growing. M.P.S. degrees were developed and implemented nationally in response to employer demands for well-rounded, highly trained employees with a breadth of knowledge and practical skills to address emerging environmental issues and improve the management of natural and cultural resources. The curriculum is structured to allow students to complete their degree in as little as 12 months, with the training and real-world experience necessary to prepare them for careers in today’s professional science job market.

There are eight MES tracks for the M.P.S. degree:


  A dual B.A./M.P.S. program enables qualified students from the undergraduate Marine Affairs program to earn a B.A. and M.P.S. degree in Marine Ecosystems and Society in 5 years.


  The UM School of Law and the Rosenstiel School offer a joint degree program in Law and Marine Resource Management. Upon completion of this program, a student earns a J.D. degree from the School of Law and M.P.S. degree in Marine Ecosystems and Society from RSMAS.

- M.P.S. in Aquaculture (AQU) (http://bulletin.miami.edu/graduate-academic-programs/marine-atmospheric-science/marine-ecosystems-and-society/aquaculture-mps)

- M.P.S. in Coastal Sustainability (CSU) (http://bulletin.miami.edu/graduate-academic-programs/marine-atmospheric-science/marine-ecosystems-and-society/coastal-sustainability-mps)

- M.P.S. in Coastal Zone Management (CZM) (http://bulletin.miami.edu/graduate-academic-programs/marine-atmospheric-science/marine-ecosystems-and-society/coastal-zone-management-mps)


- M.P.S. in Underwater Archaeology (UA) (http://bulletin.miami.edu/graduate-academic-programs/marine-atmospheric-science/marine-ecosystems-and-society/underwater-archaeology-mps)

Master of Science (M.S.) Programs

- M.S. in Marine Ecosystems and Society (MES) (http://bulletin.miami.edu/graduate-academic-programs/marine-atmospheric-science/marine-ecosystems-and-society/marine-ecosystems-society-ms)
Doctor of Philosophy (Ph.D.) Programs

- Ph.D. in Marine Ecosystems and Society (MES) (http://bulletin.miami.edu/graduate-academic-programs/marine-atmospheric-science/marine-ecosystems-and-society/marine-ecosystems-society-phd)

MES 601. Political Ecology of Marine Management. 3 Credit Hours.
Course provides a grounding in political ecology as an important theoretical approach to resource policy and management. The social analysis of resource use, social change, and development are discussed. Models of development and concepts of nature relate to resource use and policy formation are also included. Within this framework, ethnicity, class, and the politics of conservation are explored.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 602. Economics of Natural Resources. 3 Credit Hours.
Course brings together the approaches of natural resource and environmental economics to provide a comprehensive overview of the economics of national, international, and global environmental problems. A unifying theme throughout the course is the concept of sustainable development, defined as maximizing the net benefit to economic development while maintaining the services and quality of natural resources over time. Economic reasoning is used to examine the causes and consequences of environmental and resource problems and measures for dealing with them.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 604. Fieldwork in Coastal Management: Tourism, Conservation, and Development. 3 Credit Hours.
This course will select a coastal research site and explore its physical geography, culture, legal framework and institutions, and tourist development/conservation conflicts. In addition, we will examine different methodologies for diagnosing the site’s socioeconomic, governance, and environmental characteristics. Participants will meet weekly throughout the semester in Miami to discuss background readings and develop a group research field project that course participants will carry out during a Spring Break trip to the research site. Upon return to the University of Miami, the class will prepare manuscripts and presentations based on the field data that course participants have collected during the trip.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 605. Fieldwork in Coastal Cultures. 3 Credit Hours.
Field course in which the student participates in a social and economic analysis of a coastal culture (i.e., stone crab fishermen in Everglades City, spiny lobster fishermen in Key West, boat builders and commercial divers in the Abacos, Bahamas). Preliminary lectures and reading introduce the theory and method which the student then practices during a week-long field trip.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 606. Advanced Fieldwork in Coastal Cultures. 3 Credit Hours.
This ethnographic fieldwork course lets you experience coastal cultures first-hand in Miami and the Keys. Learning the political ecology approach in the field, you keep an in-depth field journal, complimenting entries with photography as visual anthropology. We will be interacting with some of Miami’s wealth of ethnic communities, both Latino and Haitian.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 608. Biometrics in Marine Science. 3 Credit Hours.
Applied statistical analysis in marine biology and biological oceanography. Descriptive statistics, probability distributions, and hypothesis testing are discussed. Concepts of analysis of variance, simple linear regression, and computer statistical distribution-free methods are also included as well as principles and procedures with computer statistical packages for data analysis. Lecture and laboratory.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 610. Environmental Planning and the Environmental Impact Statement. 3 Credit Hours.
Course takes a broad view of environmental planning and analysis while focusing specifically on the preparation of environmental impact statements. Statutory requirements and procedures at the federal level are examined. Judicial opinions are studied that reflect environmental disputes and controversies. The course also considers some of the substantive requirements of environmental impact analyses such as the assessment of physical and biological environment and socioeconomic impacts.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 612. Aquaculture I. 3 Credit Hours.
Course examines the various strategies of resource exploitation and utilization in developing aquaculture projects. Resources include environmental, technological, social, economical, and administrative aspects encountered in commercial aquaculture development. The course covers all stages of planning and development, with emphasis on determining the technical and economic feasibility of aquaculture projects.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 613. Aquaculture II Lab. 3 Credit Hours.
Course is a complement to Aquaculture I (MES 512/612) and examines advanced aquaculture management techniques and strategies with emphasis on commercial operations. Course requires a background in either aquaculture or business.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.
MES 614. Underwater Archaeology Field Techniques. 3 Credit Hours.
This course is designed to provide students the practical and scientific tools necessary to conduct archaeological investigations in underwater contexts. Critical skills such as baseline mapping, trilateration, artifact illustration, photography, and others are discussed, practiced, and ultimately applied during summer fieldwork. Site visits to nearby shipwrecks are also a possible component of the course. Please note that there is a significant amount of diving to complete this this course.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

MES 615. Marine Archaeological Survey and Technology. 3 Credit Hours.
This course is designed to provide students with an introduction to current technologies and marine remote sensing tools utilized in archaeological survey. Instruction in the use of technology such as the magnetometer, sidescan sonar, sector scan sonar, scanning lasers, and other tools are covered. The use of data acquisition software and the post processing of data are also key elements of this course. There is a significant component of this course utilizing boats and also a smaller diving component.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 616. Ocean Policy and Development and Analysis. 3 Credit Hours.
Ocean policy development and analysis of issues such as: offshore oil drilling, fisheries resource conflicts, marine mammal protection, ocean dumping and incineration, multiple use conflicts in marine protected areas, pollution from land based sources, and oil spill contingency planning.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 617. Legal Environment And Business Planning In Aquaculture. 3 Credit Hours.
This course examines the substantive legal issues concerning Aquaculture and the Coastal Zone. Legal aspects of Aquaculture related to ownership and boundary issues in the coastal zone, legal and regulatory constraints, international consider ation private and public rights, risks and incentives. Fish and shellfish as personal property and conservation laws affecting the fish farmer.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 618. Coastal Zone Management. 3 Credit Hours.
Development of a framework for formulation and assessment of coastal zone policy. Analysis of issues and conflicts in coastal zone management (CZM), such as: zoning and planning, coastal and beach protection, ecosystem protection, the federal flood insurance program, adaptations to sea level rise, coastal pollution from land-based sources, and tourism impacts.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 619. Aquaculture III. 3 Credit Hours.
Students will conduct fieldwork on environmental, technological, social, economical, and administrative aspects encountered in commercial aquaculture operations. This field course will complement Aquaculture I and II-Lab. Students will be able to apply most of the topics taught in MES 512/612 and MES 513/613. They will participate in all stages of the production process, including maturation, spawning, larval husbandry, nursery and grow out techniques, as well as harvesting, processing and exporting. Students will visit several large commercial hatcheries, farms and processing plants currently producing processing, packing and exporting shrimp and fish (both marine and freshwater) for US and European and Asian markets.
Components: LEC.
Grading: GRD.
Typically Offered: Summer.

MES 620. Environmental Law. 3 Credit Hours.
An introductory course focusing on environmental problems. The study of Regulatory legislation, common law, and administrative law. Topics include toxic substances, air and water pollution, and habitat and species protection.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 621. Water Resources in China and Vietnam: Science and Policy. 3 Credit Hours.
The course examines Water Resources from broad perspectives (water quantity and quality, ground water, international river management, watershed management, coastal issues). Additionally, it compares management strategies and problems in three countries: China, Vietnam, and the USA. The course is also highly interdisciplinary - combining natural science, policy, and the social sciences. We spend half of the time in Vietnam and the other half in China, and in both countries have long-term established cooperation with three universities: Hanoi University of Mining and Geology (HUMG), Hanoi University of Natural Resources and the Environment (HUNRE) and Yunnan University, Asian International Rivers Centre (AIRC). In both countries, we arrange lectures and discussions with local students at these universities for one week. The other week is dedicated to field work and travel.
Components: LEC.
Grading: GRD.
Typically Offered: Summer.

MES 622. Principles and Practices of Marine Social Science Research. 3 Credit Hours.
This course will introduce students to the theory of marine social science methods, focusing on how the methods relate to the design, planning, implementation, analysis, and reporting of marine social science research. The course will be divided into three sections: theory, design, and planning; data analysis; and reporting and presentation.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.
MES 625. Fisheries Socioeconomics and Management. 3 Credit Hours.
This course applies microeconomic theory to fisheries resource problems and policies. Economic models with the value of production as their objective, will contrast economists’ and biologists’ definitions of maximum yield and show why an unregulated fishery will not operate at either level. We will use economic reasoning to examine causes and consequences of fisheries problems and measures for dealing with them.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 626. Submerged Cultural Resource Management. 3 Credit Hours.
This course discusses various aspects and details of managing underwater cultural heritage/submerged cultural resources. Topics will include ethics, policies and procedures, marine protected areas, and federal, state, and international laws governing management of submerged archaeological sites. Specific focus is placed on examining the variety of management concepts and frameworks utilized both in the U.S. and internationally. Finally, the role and value of public archaeology in management is also presented and discussed.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 627. Exploration Science Field Studies. 3 Credit Hours.
Exploration Field Studies provides students with an opportunity to gain field experience by being part of an expedition team that is tasked with observing, documenting and communicating discovery, which are the hallmarks of exploration. Students will be tasked with systematically collecting data and media while learning to travel and work as a group in various environments on the island of Eleuthera over the week of spring break. The trip explores the island from the very northern tip to the southern tip in a very intensive, hands-on way. We are based out of the Cape Eleuthera Institute, whom we contract with for room, board and services. We spend several days camping in the field. In addition to the week, students meet several times before and after during the semester to work on logistics, background research and presentations of materials.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 628. Seafood Market and Marketing. 3 Credit Hours.
To educate the next generation of professionals in the seafood business and present future managers of an aquaculture business with the necessary knowledge in the packaging, pricing, placement, promotion and distribution of their finished product to give them the best return on their investment.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 629. Biology, Ecology, and Management of Mangrove Ecosystems. 3 Credit Hours.
This course is intended to introduce students to mangrove ecosystems, one of the most productive, and biologically diverse, ecosystems in the world, and one of South Florida’s key coastal ecosystems. The principal objective is to explain how our scientific understanding of mangrove ecosystems has been unfolding and how today they are considered paramount not only for their organic carbon contributions to coastal areas, but as protectors of the coast, mitigators of global climate change, reservoirs of biodiversity, and supporters of the livelihoods of millions of inhabitants throughout the world. The course will consist of lectures, class discussions, and presentations of student assignments. The lectures will follow an open seminar format in which all students are expected to actively participate in the discussion of the presented material. Two lectures will take place during field trips to local mangrove areas.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 630. Port Operations and Policy. 3 Credit Hours.
The course will include: Introduction to ports; port geography; port operations; port administration; Federal port policy; free ports/free zones; port investment/tariffs; port marketing; Coastal Zone Management and ports; case studies, CZM; fostering economic development; and Port planning and development.

Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 631. Marine and Coastal Protected Area Theory, Planning, Management, and Issues. 3 Credit Hours.
This course shall present the study and analysis of marine and coastal protected areas in an interdisciplinary manner, commencing with an overview of conservation biology and protected area principles (ex. island biogeography), a survey of coastal and marine protected area (MPA) theory, and the influence of ecological parameters on MPA design. Another critical component of the course will be a historical review on MPAs and MPA management, how the concept developed and proliferated, and its present status. The course will next address the human dimensions and socioeconomic impacts of MPAs, including the economic performance and financing mechanisms of MPAs, stakeholder engagement, participation, and conflicts, and management approaches. Finally, the course will review a series of MPA case studies, which incorporate the aforementioned topics in a ‘real world’ environment and demonstrate how the concept has been applied across the world.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 632. Theory and Method in Underwater and Maritime Archaeology. 3 Credit Hours.
This course covers archaeological theory and methodologies used to interpret underwater and maritime sites in both prehistoric and historic contexts. The interconnection of theoretical constructs with submerged archaeological remains is emphasized, providing a broad toolset that can be used to better understand and explain the archaeological assemblage and associated data sets acquired from the investigation of these sites.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.
MES 633. Decision Analysis: Natural Hazards and Catastrophes. 3 Credit Hours.
This course addresses the behavioral factors (cognitive biases, heuristics, risk perception, social influences, and past experiences) that together help explain why people tend to underprepare for potential natural and man-made disasters. Implications for science communication and public policy are emphasized.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.
MES 645. Marine Population Assessment Surveys And Analysis. 3 Credit Hours.
In spite of global conservation efforts, marine animal populations show increasingly critical low levels of abundance. Marine population assessment techniques are mostly based on fishery-dependent data for those species that are commercially exploited. Population assessment techniques based on these types of data usually lack spatial resolution and they do not provide spatial-temporal patterns of species diversity and community structure. Conversely, direct resource surveys aim to provide representative estimates of the relative abundance and population structure of the species (and community) of interest. These surveys can generate multi-species population databases that are fundamental for the modeling and understanding of important ecosystem-wide mechanisms of resource conservation. Multi-species indices of relative abundance are also important in the “tuning” of modern stock assessment and conservation methods. In this course students will learn about experimental sampling concepts and designs, instrumentation, survey implementation and statistical methods to directly assess size-structured population abundance (i.e., density estimates scaled to survey area), and of exploited and non-target species (e.g. sea turtles, marine mammals, etc.) in the ecosystem. Students will analyze real data from various surveys carried out in the past using statistical techniques to estimate valid population parameters and variances. Comparative analyses of survey designs are discussed based on an ample literature on the subject matter, which will be made available to the students.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.
MES 646. Marine Population Biology Processes And Modeling. 3 Credit Hours.
Marine and freshwater animal populations undergo many changes in response to exploitation of core predator and prey species in their ecosystem while subjected to environmental and anthropogenic perturbations in their habitats. Understanding these changes is a major objective of marine population scientists and paramount to marine conservation science. Marine Population Biology Processes and Modeling considers some of the fundamental properties of wild aquatic populations with the aim of knowing and understanding their interactive dynamics. For this purpose mathematical models are used under assumptions that they will provide an adequate description of the biological processes of interest. In this course students will learn conceptual aspects and estimation methods for the main population processes such as growth, survival, reproduction and feeding. Such concepts are framed by mathematical modeling to facilitate interpretation of dynamic population-level processes. Emphasis is also on data requirements and statistical validation of the data and model fitting such that students will develop an ability to integrate and summarize complex biological knowledge under a set of well defined protocols.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.
MES 660. Introduction to Marine Geographic Information Systems. 3 Credit Hours.
Marine Geographic Information Systems are emerging as a distinct subset of GIS, due to fundamental differences between terrestrial and underwater spatial information (2-D vs. 3-D, multiresolution, synaptic data collection, time depth (4-D) modeling). Approximately the first half of this course is a brief review of basic GIS, and the second half concentrates on aspects of marine data acquisition and manipulation in the GIS context.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.
MES 661. Introduction to Marine Geographic Information Systems - Laboratory. 0 Credit Hours.
Introduction to Marine Geographic Information Systems - Laboratory introduces students to basic methods and technology in Marine Geographic Information Systems. The course is taught with hands-on laboratory exercises following the evolution of Marine Geographic Information Systems, from basic cartography to topological and network modeling to internet access and application.
Components: LAB.
Grading: GRD.
Typically Offered: Fall & Summer.
MES 662. Spatial Analysis: Intermediate Course in Marine GIS. 3 Credit Hours.
Course provides a general survey of available quantitative methods for spatial analysis using Geographic Information Systems (GIS). Although GIS has been widely used for mapping and database management, this course is focused on the functionality of GIS as an effective tool for modeling and analyzing complex spatial relationships. Quantitative methods suitable for analyzing different features types are discussed. Applications for such methods are also presented.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.
MES 664. Citizen & Participatory Science. 3 Credit Hours.
The Citizen and Participatory Science course will focus on preparing students for designing and implementing citizen and participatory science projects aimed at addressing questions and problems around specific environmental issues. As social networks grow, open data comes online and mobile technologies proliferate and advance, the opportunity to tap into eager and interested citizens to collect data for research and documentation purposes is quickly rising. This program will look at history of citizen science, which is over 100 years old, and will analyze current and past projects. Students will be exposed to how citizen science projects are designed and implemented and how they can be best leveraged to gain useful data for research. Guests lecturers will be invited for virtual and in-person presentations. A key component of the course will be for students to design a citizen science project using best practices. These projects can provide the baseline for launching real projects with organizations interested in applying citizen science to their work. The course will look at both technology driven projects as well as low-tech projects to expose students to the range of work being done in this rapidly evolving area.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 665. Exploration Technology and Media. 3 Credit Hours.
This course is designed to give an overview and broad working knowledge of some of the major tools and technologies used for doing exploratory fieldwork. Examples include but are not limited to mobile technologies, mapping, photography and video, ROV and UAV (drone) technologies.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 670. Conservation and Management of Marine Mammals. 3 Credit Hours.
This course emphasizes on the notion that proper conservation and management of large marine vertebrates (i.e., marine mammals, sea turtles, sharks and rays) require the understanding and integration of some important aspects of the (comparative) biology and ecology of these groups of animals with the multifaceted nature (e.g., social, economical, ethical and cultural dimensions) of these concerns.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 671. Marine Conservation Biology: An Ecosystem-Based Paradigm. 3 Credit Hours.
Until now, fisheries management has used a species-specific approach to conservation, focusing attention on economically important species that people consume. There has been some research on charismatic mega-fauna, particularly whales, seabirds and sea turtles. To this day, fishery biologists are concerned mainly with assessing stocks of commercially harvested species to maintain biomass production, rather than maintaining and restoring biological integrity: species composition, habitat structure and ecosystem function. It is only in the past few years that a new biodiversity-focused, ecosystem-based, multidisciplinary scientific approach to marine conservation has emerged. This new paradigm is known as Marine Conservation Biology.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 672. The Archaeology of Seafaring. 3 Credit Hours.
Ships and seafarers have had considerable influences on civilization throughout history. The ship typically represents the pinnacle of a society’s understanding of many disciplines: astronomy, geography, metallurgy, physics, warfare, et cetera. No other process similarly spread the delights and devastation of the world so effectively. This course studies man’s evolutionary relationship with the sea from early civilization through the 20th century. Emphasis will be on archaeological and ethnographical investigations concerning shipwrecks and maritime epicenters supporting maritime culture. This will be a lecture course supported by visual, audible, and hands-on presentations.

Components: LEC.
Grading: GRD.
Typically Offered: Fall & Spring.

MES 673. Marine Conservation Outreach. 3 Credit Hours.
This course will explore the concepts, theories and practices of creating and evaluating effective Marine Conservation Outreach. The course will cover the project life cycle from planning to implementation to evaluating effectiveness.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 674. From Gold to Glory: The Evolving History and Ethics of Exploration. 3 Credit Hours.
This course will address changes in motivation and approaches to exploration with a focus on risk perception, physiological limitations, and social-cultural context, including how past colonial legacy is still influencing perceptions of the current generation of scientists, explorers, and the groups they interact with. Assignments will include critical readings of source materials and case studies of particular expeditions.

Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 676. Special Topics. 1-4 Credit Hours.
Lectures, research projects or directed readings in special topics related to marine affairs.

Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 677. Management And Conservation Of Marine Ecosystems. 3 Credit Hours.
In this course students will learn how fisheries management works to achieve these objectives. The primary focus will be on how fisheries interact with marine ecosystems, including how particular fisheries management measures influence fishing mortality rates. Nevertheless, the ecosystem-based approach to fisheries management requires seeing fisheries as integrated systems, so it will also be necessary to discuss social, economic and legal aspects of fisheries management.

Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 678. Special Topics. 1-4 Credit Hours.
Lectures, research projects or directed readings in special topics related to marine affairs.

Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.
MES 679. Special Topics. 1-4 Credit Hours.
Lectures, research projects or directed readings in special topics related to marine affairs.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 680. Special Topics. 1-4 Credit Hours.
Lectures, research projects or directed readings in special topics related to marine affairs.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 681. Special Topics. 1-3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MES 682. Special Topics. 1-3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MES 683. Special Topics. 1-3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MES 690. Acoustic Measurement of Nekton, Plankton and Underwater Habitat. 3 Credit Hours.
MBF 590 is an introductory course on the theory, history and applications of acoustics to measure nekton, plankton and underwater habitat. It was designed for those students who wish to learn how to make quantitative measures of organisms and structure underwater. It is a prerequisite for MBF 690, Advance Measurement of Nekton, Plankton and Underwater Habitat, which focuses on data acquisition in the field and laboratory signal processing. This course is essential for students who need to make precise and accurate underwater measurements for their research.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 691. Maritime Archaeology Field Study. 3 Credit Hours.
This field-based course focuses on the acquisition of data from shipwreck sites and subsequent interpretation and analysis. Topics of study will include shipwrecks from the 16th century to World War II era. Students will learn about historic maritime activity and be exposed to analyzing both the archaeological and historical record in examination of these sites. This course will be taught in collaboration with partners in the National Park Service and/or NOAA and dives will take place in Biscayne National Park, Dry Tortugas National Park, or the Florida Keys National Marine Sanctuary.
Components: FLD.
Grading: GRD.
Typically Offered: Summer.

MES 692. Archaeological Study of Submerged Pre-Contact Sites. 3 Credit Hours.
This is a field-based course with a focus on submerged pre-contact or prehistoric archaeological sites within North America, Latin America, and the Caribbean. Students will learn about the past human activity, settlement patterns, and habitation of various regions and sites, while conducting fieldwork. Focus will be placed on topics such as the peopling of the Americas approximately 13,500 years ago, human adaptation to environmental change, and the location and investigation of now-inundated coastal sites and submerged caverns and caves. Techniques and methods of data acquisition for these site types will be taught and students will be responsible for writing a final report on the findings.
Components: FLD.
Grading: GRD.
Typically Offered: Summer.

MES 693. Special Topics. 1-3 Credit Hours.
Components: FLD.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 694. Population Modeling and Management. 3 Credit Hours.
Mathematical and computer-intensive models of exploited populations fish, shell fish, marine mammals, and sea turtles. Stock production (surplus production), structured analytical yield (yield-per-recruit and age-size structured assessments), stock and recruitment, simulation modeling, adaptive control theory, risk assessments, and decision theoretic analyses are discussed. Techniques of management, concepts of resource allocation, and fishery management institutions with case studies are also included. Lecture and laboratory.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 699. Special Topics. 1-4 Credit Hours.
Lectures, research projects or directed readings in special topics related to marine affairs.
Components: FLD.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 710. International Ocean Law And Governance. 3 Credit Hours.
This course shall track the history and development of international ocean law, from a series of bi-lateral and multi-lateral treaties, the evolving customary law framework, and coastal and maritime state claims to the codification and proliferation of international legal agreements addressing the panoply of ocean use and management issues. Applying a chronological approach, the course shall identify and discuss key developments in international ocean law, leading to the drafting of the Third United Nations Law of the Sea Convention (UNCLOS III). By evaluating the multifold themes addressed under the convention, the course will analyze the effects of convention in a post UNCLOS III world, especially in the fields of environmental protection, the management of marine fisheries and living resources, the allocation of seabed and subsoil resources, issues affecting the high seas, and polar regions.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 711. Marine Population Dynamics. 3 Credit Hours.
The concepts of stocks, sub-populations, and populations as biological systems in the marine environment. Quantitative studies of growth, mortality, recruitment, and abundance of marine populations are discussed. Data requirements, experimental design, sampling, and mathematical procedures for estimating population parameters are included. Lecture and laboratory.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 714. Population Modeling and Management. 3 Credit Hours.
Mathematical and computer-intensive models of exploited populations fish, shell fish, marine mammals, and sea turtles. Stock production (surplus production), structured analytical yield (yield-per-recruit and age-size structured assessments), stock and recruitment, simulation modeling, adaptive control theory, risk assessments, and decision theoretic analyses are discussed. Techniques of management, concepts of resource allocation, and fishery management institutions with case studies are also included. Lecture and computer-based laboratory.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.
MES 715. Advanced Biometrics in Marine Science. 3 Credit Hours.
An introduction to advanced statistical analysis of multivariate empirical observations with primary emphasis on applications in the assessment and interpretation of the dynamics of marine populations and communities in marine biology, biomedical sciences, fisheries, and biological oceanography. Advanced methods in linear, multiple and nonlinear regression analysis, probability and estimation theory, multiple partial correlation, ANCOVA, GLIM, general additive models, nonlinear optimization, multivariate statistics (classification and ordination), and sampling techniques. Exploratory data analysis and modeling are emphasized using the software SAS, S-PLUS, and MATLAB.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 720. Coastal Law and Policy. 3 Credit Hours.
Course examines the authority of different levels and agencies of government to make decisions affecting the coastal zone. Course also explores the coastal problems of shoreline use and development, uses of water areas and the seabed, and the related questions of environmental protection.
Components: LEC.
Grading: GRD.
Typically Offered: Fall.

MES 774. Advanced Studies in Marine Ecosystems and Society. 1-4 Credit Hours.
Supervised study in areas of special interest to graduate students.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

MES 790. Advance Measurement on Nekton, Plankton, and Underwater habitat.. 3 Credit Hours.
MBF 690 is the second course in a series on the acoustic measurement of nekton, plankton and underwater habitat. It follows in the introductory course MBF 59 0. In this course, we will focus more on the acquisition and processing of pla nkton, nekton and marine habitat data using sonar hydrophones. We will also sp end time reviewing and discussing the classic papers that have been published o n this topic. This class was designed for those students who wish to learn how to make quantitative measures of organisms and underwater habitat structure fo r their research.
Components: LEC.
Grading: GRD.
Typically Offered: Spring.

MES 805. MPS Internship. 1-6 Credit Hours.
The Master of Professional Science 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: THI.
Grading: SUS.
Typically Offered: Fall, Spring, & Summer.

MES 820. Research in Residence. 1 Credit Hour.
Used to establish research in residence for the thesis for the master's degree after the student has enrolled for the permissible cumulative total in MAF 710 (usually six credits). Credit not granted. May be regarded as full time residence.
Components: THI.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MES 825. Continuous Registration--Master's Study. 1 Credit Hour.
To establish residence for non-thesis master's students who are preparing for major examinations. Credit not granted. Regarded as full time residence.
Components: THI.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

MES 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 MES 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.