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SUMMARY

1. This handbook outlines the specific procedures and requirements for Doctor of Philosophy (Ph.D.), Master of Science (M.S.), and Master of Professional Science (M.P.S) degree-seeking students in the Department of Marine Ecosystems and Society (MES) Graduate Academic Program at the Rosenstiel School of Marine and Atmospheric Science (RSMAS). It serves as a supplement to the RSMAS and University of Miami (UM) Graduate Handbooks, which also establish the specific academic rules by which the MES graduate program is governed.

2. Ph.D. and M.S. students are assigned an MES Committee Chair upon acceptance to RSMAS. The Chair of each student’s Dissertation/Thesis Committee will guide the student through their entire degree process, including all academic and research activities. The Chair is responsible for monitoring their students’ progress towards the degree.

3. The Dissertation/Thesis/Internship Committee, consisting of two, full-time graduate MES faculty and one outside (department or school) member, should be established early in the graduate career and meet at least once annually.

4. Graduate students are expected to defend their Ph.D. dissertation in no more than 5 years after entering the MES graduate program with a B.S. degree. This will be 3-4 years if they hold a Master’s degree. M.S. students are expected to defend their thesis 2 years after entering the MES graduate program. It is expected that students will complete the M.P.S. degree in 16 months or less.

5. In their first year at RSMAS, students take courses specific to their subject of focus, pass a comprehensive exam, establish a Committee, and have their first Committee meeting. The M.P.S. students should meet with their Committee prior to engaging in the internship and should maintain contact with the Committee members for the duration of the internship. Ph.D. and M.S. students should plan to meet with their Committee at least once per year, while consulting regularly with Committee members.

6. Students are encouraged to begin forming ideas for their dissertation/thesis/internship project as early as possible. Ph.D. and M.S. students should collaborate with the Committee Chair on a concise description of Committee meetings, with a summary of each Committee meeting provided to the GSO for the students’ files. The Chair also provides an annual summary of each student’s progress towards completion of the degree to the MES Academic Committee (AC) chair.

7. During the second year, Ph.D. and M.S. students complete coursework and compose and defend their proposal (early in the second year for M.S. degree) before the Committee. The Ph.D. student must successfully pass a written qualifying examination and be admitted to candidacy. Admission to candidacy has to happen at least one semester prior to the defense of the Ph.D. To earn their degree, M.S. and M.P.S. students must complete their written thesis/internship report and present it orally to the public and have it approved by the Committee.

8. In the third year and every year thereafter, Ph.D. students hold a Committee meeting and conduct research and compose dissertation chapters prior to defending.

9. The completed written dissertation must be made available to the dissertation Committee at least four weeks prior to an oral defense. Announcement of defense, usually two weeks prior to the defense, requires that the Committee approves of the dissertation in concept, must occur 2 weeks prior to the defense. At the defense,
the Ph.D. candidate must provide an oral public presentation of the dissertation, and then defend this dissertation in private before their Committee.

PREFACE

This section presents guidelines common to all the graduate degrees in MES: Ph.D., M.S. and M.P.S.

Graduate student education involves a close relationship between the Chair of a student’s Committee and the student. The Chair is responsible for advising and supporting each student’s research/project. The graduate student is responsible for his/her academic performance and becoming an independent scientist/professional. This MES Student Handbook is designed to aid students and faculty by stating the Program’s interpretations of RSMAS policy and by stating specific Program requirements. It is ultimately the responsibility of each student and their Chair to meet all of the guidelines and requirements of the Program described in this document and the other requirements outlined in the MPS, RSMAS, and UM Graduate Handbooks. These handbooks evolve through time; so, students should always refer to the version relevant to the academic year they entered the program.

The dissertation/thesis/internship Committee is important to the student and to our academic institution, because members of the Committee are the guardians of a program of excellence. A Committee should be formed in the student’s first year and immediately followed by the first Committee meeting. Committee members play an important role in the maturation and education of a graduate student, and as such, students should discuss potential candidates with their Chair. Students should select Committee members for their expertise and ability to provide guidance, advice, and support. Committee membership needs to satisfy some rules that are specific for each degree and defined below. Ph.D. and M.S. Committees must meet at least once per year to review each student's progress. A short summary of the meeting is sent to the RSMAS Graduate Studies Office (GSO) by the Committee Chair for addition to the students’ files. Active participation by the faculty as members of a Committee is very important for a successful graduate program. The members of a dissertation/thesis Committee are responsible for the comprehensive and qualifying exams (Ph.D.), overseeing student research, and approving the proposal. The Committee is also responsible for ensuring that each student achieves optimal academic, research, and professional growth, as well as reviewing and approving the student dissertation/thesis/internship report.

Although each student’s Committee is responsible for encouraging and documenting their progress, the MES faculty play a supportive role by conducting an annual review of all MES students.

COMPREHENSIVE EXAM FORMAT

All MES graduate students must pass a comprehensive exam no later than their third semester in residence. The exam’s format for M.S. and Ph.D. Students will be defined by the student’s Committee Chair in consultation with the Committee. The format for MPS students is defined below.

Passing the exam requires 100% pass (P/F) on the comprehensive questions. A single retake is possible at the discretion of each student’s Committee and the program faculty. A failed Comprehensive Exam with no endorsement to retake the exam will result in immediate dismissal from the MES graduate program. A failed retake of the Comprehensive Exam will also result in immediate dismissal from the MES graduate program.

RESEARCH ETHICS
All RSMAS students must take the Research ethics course (RSM 700 - 0 credits). All students assigned as Teaching Assistants (TA) or Instructional Student Support (ISS) must take Educational Training 1 (RSM 771 – 1 credit). Ph.D. students must also enroll in Educational Training 2 (RSM 772 – 3 credits) and Educational Training 3 (RSM 773 – credits) during their first and second TA assignments, respectively. These courses count towards the minimum course credits required for each degree.

INTERNSHIP PRESENTATION & DEFENSE OF THESIS/DISSERTATION
MES requires a public oral presentation of the M.P.S. internship report, M.S. thesis, and Ph.D. dissertation. M.P.S. students should coordinate a date and time for their presentation with their Committee and the MPS Office, and this must follow the submission of the first draft of the internship report. For M.S. and Ph.D. students, the complete written thesis/dissertation must be provided to the Committee four weeks prior to the oral defense. The Announcement of Defense form, signed by all Committee members, must be submitted to the GSO two weeks before the intended defense. The final dissertation/thesis must be signed by all Committee members and turned in to the GSO no later than the end of the subsequent full semester following the date of defense, in accordance with the deadlines established by the UM Graduate School.

LEAVE OF ABSENCE
When a student is not registered at the University for a period of one or more semesters, this constitutes a leave of absence, which must be documented with a “Petition for Leave of Absence” form (UM Graduate School). All leaves must be approved in advance by the MES AC via memorandum from the student’s Chair, indicating the Chair’s approval. Following the termination of leave, students must be readmitted to the program, and the readmission form must be approved by the MES AC. Students are cautioned that the Recency of Credit rule set by the Graduate School continues during leaves of absence.

STUDENT PROGRESS & ACADEMIC STANDING
The MES AC tracks the progress of MES students. Thus, students should notify the MES AC regarding any/all forms submitted to GSO. All graduate students must maintain a GPA >3.0 at all times. This is a requirement of the Graduate School (GS) and is evaluated each semester by GSO. A student whose GPA falls below 3.0 is automatically placed on RSMAS academic probation. If the GPA is not increased to 3.0 in the subsequent semester, the student may be dismissed from the program.

ERRORS, APPEALS, & CHANGES IN POLICY
Occasionally, a student who intended to enter the Ph.D. program is registered as an M.S. student at the time of acceptance. To correct this error, a memorandum signed by the student's Chair is sent to GSO with a copy directed to the MES AC. The same process is followed for the opposite circumstances.

The student may appeal any decision made by the MES AC to the RSMAS Graduate AC, and, if necessary, subsequently to the Associate Dean for Graduate Education.

All students should be aware that there is no right to a degree, and that the M.P.S., M.S. and Ph.D. degrees are conferred only with approval of their graduate, thesis, or dissertation Committees, respectively, and completion of all degree requirements as defined by the Department, the School, and the University. The MES faculty recognizes that the guidelines for obtaining degrees will evolve in any thriving program. Any faculty member or student who has recommendations about these guidelines should contact the MES Graduate Program Director.
DOCTORATE (PH.D.) DEGREE

SUMMARY OF PH.D. DEGREE IN MES

**Year 1:** Enroll in courses; Comprehensive exam passed at the end of summer semester; Student dissertation Committee formed and first Committee meeting held

**Year 2:** Enroll in and complete courses; Proposal written and approved; Qualifying exams passed; Second Committee meeting held

**Years 2-4:** Annual meetings with the dissertation Committee; Conduct research and begin writing dissertation chapters

**Year 5:** Complete writing of dissertation and defense

THE PH.D. DEGREE

Ph.D. students are expected to finish the Ph.D. program in five years, except if they enter the program with a M.S., in which case they are expected to complete it in four years. Students are required to meet annually with their Committee and provide a succinct, 1-page annual progress report to their Chair. The Chair is expected to add a statement summarizing the Chair’s views about the student’s progress to the annual report. The annual report will be considered by the MES faculty in their annual student review.

THE DISSERTATION COMMITTEE

The dissertation Committee will consist of no fewer than five members: the Chair, who must be an MES member (Appendix 1) of the University Graduate Faculty, three members also from the Graduate Faculty of UM (including at least one more from MES), and one member from outside RSMAS (this can be a faculty member at UM outside MES or a scientist/faculty from outside of the University).

Students should supply the MES AC with copies of the approved appointment to Student’s Committee form, notification of any changes in the membership of the Committee, and the annual progress reports. The originals should be submitted to the GSO.

COURSE INFORMATION & REQUIREMENTS

Sixty credits beyond the baccalaureate degree are the minimum requirement for the Ph.D., and not less than half of the total credits must be in work open only to graduate students (>700). At least 24 must be completed in residence at the University of Miami. A minimum of 12 dissertation research credits are required. The faculty Chair and student should carefully consider how many credits to transfer when the student enrolls in the MES program with an M.S. degree from another school (see the RSMAS Handbook for more information). Transferred credits should be relevant to the MES Ph.D. program.

REQUIRED COURSES

The course schedule will be developed by the student in consultation with the Chair of the Dissertation Committee. Commonly, students will be associated with specific academic tracks (e.g. Fisheries and Aquaculture, Conservation Biology, Coastal Zone Management, or Exploration Science). There are no generally required MES courses; however, some academic tracks within MES may have specific course requirements. Additionally, students must attend all MES student seminars. Students will give one student seminar at the beginning of their third semester at RSMAS (not counting summers) and every year after with the exception of the semester in which they defend their dissertation. In every subsequent fall and spring semester, students should be enrolled full-time via a combination of necessary coursework and research activities. Full-time status is achieved by either a total of 9 course credits or 1 research credit (MES 830).
WAIVER OF MES COURSES

A student who has successfully completed one or more courses equivalent to an MES course at an accredited institution and would like to transfer these credits as part of a previously obtained M.S. may petition the MES AC to certify equivalency. This is accomplished by correspondence with the MES/RSM course instructor, after which the instructor drafts and sends a recommendation memorandum to the MES AC. Once the certification is provided, the student may claim the course as one that helps satisfy the 50% MES/RSM course requirement.

DISSERTATION PROPOSAL

The dissertation proposal is the foundation for qualifying exam, s and both must be completed by the end of the second year.

The first step in designing a research project is to formulate clearly stated hypotheses. Students are advised to "be specific and informative and avoid redundancies.” The following components are suggested.

SUMMARY (1 page or less) describing the specific aims and the importance of the research.

PROJECT DESCRIPTION (12-15 pages for components 1-5) consisting of:

1. Specific Aims. Provide a list of aims that state concisely and realistically what the research described in the proposal is intended to accomplish and/or what hypothesis is to be tested. Do not exceed one page.
2. Background and Significance. Briefly sketch the background to the hypothesis, critically evaluate existing knowledge, and specifically identify how the research will advance the field. State concisely the importance of the research by relating the specific aims to longer-term objectives.
3. Progress Report/Preliminary Studies. This section provides an account of the investigator's preliminary studies pertinent to the research.
4. Experimental Design and Methods. Should discuss in detail the experimental design and how these experiments address the specific aims. Should provide detailed procedures for those approaches or techniques that are novel or not well established.
5. Provide a tentative sequence and timetable for the investigation. Discuss the potential difficulties and limitations of the proposed procedures, and briefly list alternative approaches to achieve the aims.

Recommendation in the event of numerous revisions:
Numerous edits to the proposal by the Committee should be avoided. The Chair of the Committee is primarily responsible for providing a sound document to the student’s dissertation Committee. The Committee is responsible for approving the proposal and experimental approach. If there are many questions concerning study design, a Committee meeting should be held to discuss these problems.

APPROVAL OF DISSERTATION PROPOSAL

The proposal defense provides the student and the dissertation Committee the opportunity to more fully discuss the objectives and methods of the proposed research, after the Committee has had time to read and review it. The student provides a presentation on the proposed work and the hypothesis, methods, and breadth of the research, including alternate approaches. Finally, since the qualifying examination is based on subjects necessary to execute the proposed research, this meeting is an excellent time to define the reading and information the student should utilize to prepare for the exam.

QUALIFYING EXAMINATION

At the end of the second year, a written qualifying examination is required of all Ph.D. students that focuses on
the subject matter needed to successfully execute the research proposed for the dissertation. The purpose of the qualifying examination is to demonstrate that the MES doctoral student has the necessary understanding and expertise in research and related fields to complete the dissertation research. The topic areas should be agreed upon by the student, Chair, and the dissertation Committee soon after the proposal defense. The student is strongly encouraged to discuss the specific topics with each member of the dissertation Committee well in advance of the examination, to clarify the expectations regarding content. The Committee is encouraged to provide specific readings or areas of knowledge they will test the student on. The format of the qualifying exam is decided by the dissertation Committee. It is the Chair’s responsibility to provide the test and to have the student’s Committee grade it in a timely manner.

In the event of a failure, a student may be reexamined once upon the recommendation of the student's Committee in consultation with the AC. If permitted, the reexamination must be hosted before the end of the following semester. An additional oral qualifying examination may be required by the student's Committee but may not serve as a substitute for the written examination, which is a Graduate School requirement. The decision of passing or failing the qualifying examination rests with the dissertation Committee. The qualifying examination (written and, if required by the Committee, oral) must be successfully completed, as documented by the dissertation Committee, before the student can be admitted to candidacy.

ADVANCEMENT TO CANDIDACY

Advancement to candidacy requires the completion of all coursework and passing the qualifying exam. Students should advance to candidacy at the end of their second year but must advance at least one semester prior to defending and graduation.

MAXIMUM YEARS IN THE PH.D. PROGRAM & RECENCY OF CREDIT

As designated by the Graduate School, Ph.D. students must complete all degree requirements within 8 years, including leaves of absence; credits must be revalidated after 7 years. Credits are reinstated for 4 years after completion of the Qualifying Examination. The Associate Dean may refuse to allow a student completing the 8th year in the program to register for a future semester. In such cases, the Ph.D. work is forfeited. Recency of credit is unaffected by resetting the clock.

ADMISSION TO THE PH.D. PROGRAM

All students have to seek admission to the MES Ph.D. program. When accepting a student into the MES Ph.D., the Chair commits to funding the student through the five years of the Ph.D. (four for students with a M.S. degree). It is recommended that the process of identifying a possible Chair be initiated by the student at least three months in advance of the enrollment date.

Completion of the M.S. degree in MES does not guarantee acceptance to the Ph.D. program. For students enrolled in the MES M.S. program and interested in admission to the MES Ph.D. program, the M.S. thesis Committee must recommend admission at the time of the M.S. defense in the form of a memo to the MES AC. The student must then complete a readmission form. Finally, there must be a faculty member ready to commit to act as the student's dissertation Committee Chair.

FUNDING

Most Ph.D. students in the Program are supported by fellowships, research assistantships and teaching assistantships. These types of support include tuition, stipend, and research funds. Research Assistants and Teaching Assistants are awarded tuition scholarships under the terms of current RSMAS policy. There are a limited number of competitive School or University Fellowships available that provide support of varying
duration and nature. Most fellowships/scholarships are available only to doctoral students. Scholarship funds are listed in the RSMAS handbook. Students often also seek fellowships from outside the University of Miami.

MES MASTER OF SCIENCE (M.S.) DEGREE

SUMMARY OF M.S. DEGREE IN MES

**Year 1:** Student Thesis Committee formed, first Committee meeting held; Comprehensive exam passed by the end of the summer semester; Research defined and initiated

**Year 2:** Proposal written and approved; Research completed and thesis defended and completed

THE M.S. DEGREE

This is intended as a full-time, 2-year (24 months) degree that includes a thesis equivalent to a single published scientific paper.

THE THESIS COMMITTEE

The Chair of the student Committee must be a faculty member of MES (appendix 1) and of the Graduate Faculty of the University. The student Committee has two more members, one must be a member of MES and of the Graduate Faculty of the University. The third member can be an outside member (i.e. outside of MES), from inside or outside UM.

Students should supply the MES AC with copies of the approved appointment to Student’s Committee form, notification of any changes in the membership of the Committee, and the annual progress reports. The originals should be submitted to the GSO.

COURSE INFORMATION & REQUIREMENTS

Students enrolled in the M.S. program must complete 30 credits: 24 course credits (18 of which must be from UM) and 6 research credits. The first year will normally consist of 18 course credits over 2 semesters and 1 research credit for any semester in which enrollment in <9 credits, to achieve full-time student status. The third semester will normally consist of 6 course credits and 2 research credits; the 4th semester will consists of the balance of research credits required to reach 6. The thesis research will begin, at the latest, during summer 1, continue at a reduced pace during the 3rd semester, and completed during the 4th semester and subsequent summer.

REQUIRED COURSES

The course schedule will be developed by the student in consultation with the Chair of the thesis Committee. There are no required MES core courses; however, students are required to take at least 12 course credits in MES. Additionally students must attend all MES student seminars. Students will give one student seminar at the beginning of their third semester at RSMAS (not counting summers) and every year after with the exception of the semester in which when they defend their thesis. In every subsequent fall and spring semester, students should be enrolled full-time via a combination of necessary coursework and research activities. Full-time status is achieved by either a total of 9 course credits or 1 research credit (MES 810).

THESIS PROPOSAL

The thesis proposal must be written and defended before the end of the first semester of the second year. The format of the proposal should be similar to the one described above for a dissertation proposal, but the MS thesis proposal may be more succinct.


THESIS

Preliminary research should be executed during summer 1, and for some students, this will precede the 1st Committee meeting. Thereafter, research should continue during the second year. The thesis should be written and defended on the last semester of the second year.

TRANSFER FROM M.S. TO PH.D.

Students may request to be considered for transfer from the M.S. program into the Ph.D. program. These requests must be submitted to the MES AC prior to the start of the fourth semester and/or before the completion of 24 graduate course credits. Transfers from the M.S. to the Ph.D. will not be considered after students have completed 24 or more credits. Transfer requests must be accompanied by a recommendation from the student’s MS Committee. All students requesting a transfer will have to fulfill the requirements of the Ph.D. degree, including the commitment of a faculty member to fund the student. Transfers are not guaranteed, and if successful, the Ph.D. clock will be considered to have started upon entry to the M.S. degree. Such students will have the full 5 years to complete the Ph.D.

FUNDING

Two funding models currently exist:

A) Fully funded by the Chair. The Chair covers stipend, tuition, insurance, and research costs (as done for Ph.D. students).

B) A self-funded MS. Research costs of the thesis will be borne by the Chair. Tuition and insurance are paid by the student or granted to the student by fellowships obtained solely by the student or with the support of the Chair.
MASTER OF PROFESSIONAL SCIENCE (M.P.S.) DEGREE

Please refer to the 2016-2017 MPS Handbook at the bottom of this link:
http://mps.rsmas.miami.edu/requirements/
Appendix 1. MES Graduate Faculty 2016-2017

**Jerald S. Ault**, Professor and MES Department Chair — 305.421.4884
Theoretical population dynamics, risk assessment, fishery management systems

**Andrew Bakun**, Professor — 305.421.4986
Climate and fisheries, ocean processes regulating marine population dynamics

**Daniel Benetti**, Professor — 305.421.4889
Aquaculture science, technology, R&D, management, project development, environmental monitoring, site and project feasibility studies, business and production planning

**Kenny Broad**, Professor — 305.421.4851
Environmental anthropology, climate and society interaction, environmental policy

**David Die**, Research Associate Professor — 305.421.4607
Fisheries management, fish stock assessment, bio-economics

**Nelson Ehrhardt**, Professor — 305.421.4741
Fishery research and management, marine population dynamics analysis and modelling, fisheries oceanography

**Maria L. Estevanez**, Senior Lecturer — 305.421.4012
Management of recreational and commercial fishing, industry economic impact studies, marine resource allocation policy, marine geographic information systems

**Neil Hammerschlag**, Assistant Professor — 305.421.4356
Behavioral ecology of sharks, predator-prey interactions, biomagnification of toxins; marine conservation and outreach programs

**Frederick “Fritz” Hanselmann**, Lecturer — 305.421.4347
Underwater and maritime archaeology, underwater cultural heritage management, 16th – 18th century colonial shipwrecks, submerged prehistoric sites, capacity building in Latin America and the Caribbean

**David Letson**, Professor — 305.421.4083
Economics of regulation, fisheries economics, water quality management

**Sarah K. Meltzoff**, Associate Professor — 305.421.4087
Marine resource management and sustainable development policy, social analyses of fisheries and aquaculture

**Jill Richardson**, Senior Lecturer and MES Graduate Program Director — 305.421.4346
Marine mammal behavior, acoustics, welfare, cognition, and health; marine science education/outreach

**Daniel O. Suman**, Professor — 305.421.4685
Environmental law, coastal law, coastal management, environmental planning, marine policy

**Gary Thomas**, Professor — 305.421.4733
Fishery ecology, coastal marine ecosystems, hydroacoustics
Appendix 2. MES course list course\textsuperscript{1} numbers\textsuperscript{2}, semester offered\textsuperscript{3}, frequency\textsuperscript{4} and descriptions.

**MES 501/601 Political Ecology of Resource Management** (3 credits) SPRING, ANNUAL
The course provides a grounding in political Ecology as an important theoretical approach to resource use and development. Within this framework, we will examine ethnicity, class and the politics of conservation.

**MES 502/602 Economics of Natural Resources** (3 credits) FALL, ANNUAL
Survey of natural resource economics as it is related to living resources, non-living resources, and environmental quality. Emphasis is on policy prescriptions derived from theoretical models. Emphasis will be on current national and regional marine resource management plans. Applied theories and analytical models used for marine resource assessment and management. Subjects include renewable resources such as fisheries, aquaculture, and forestry and non-renewable extractive resources such as fuels and minerals. Includes public finance including coast/benefit analysis. Prerequisite: Permission of instructor.

**MES 504/604 Fieldwork in coastal management** (3 credits) SPRING, ANNUAL
The field portion of this course will occur in Bocas del Toro, Panama, on the northwest Caribbean coast of Panama where the University of Miami has been involved in the development of a Coastal Management plan since 2004. The Bocas del Toro Archipelago of over 20 nearshore islands boasts a rich diversity of cultures, as well as high quality coastal environments. The region is currently experiencing rapid tourist growth, as well as residential development projects for foreigners. The cultural and biological diversities of the region, as well as the development pressures they face, provide an excellent opportunity to study the socio-economic and environmental impacts of tourist development; regional attempts to create land use and coastal plans; conflicts among different uses and users; and various cultural perspectives on the current and evolving situation. The course allows students to develop projects tailored to their interests and skills.

**MES 506/606 Advanced Fieldwork in Coastal Cultures** (3 credits) SPRING, ANNUAL
Advance field course in which the student participates in a social and economic analysis of a coastal culture. (e.g. Louisiana bayou fishermen, Abacos boat builders, Tarpon Springs spongers). Students will utilize field research techniques learned in MAF 505 and develop skills in framing research problem. They will examine a coastal issue from an anthropological perspective structuring a field research paper.

**MES 608 Biometrics in Marine Science I** (3 credits) FALL, ANNUAL
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.

**MES 510/610 Environmental Planning and the Environmental Impact Statement** (3 credits) SPRING, ANNUAL
The course will take a broad view of environmental planning and analysis while focusing specifically on the preparation of environmental impact statements. Statutory requirements and procedures as the federal level will be examined. Judicial opinions will be studied that reflect environmental disputes and controversies. The course will also consider some of the substantive requirements of environmental impact analyses such as assessment of physical and biological environment and socioeconomic impacts.

**MES 512/612 Aquaculture Management I** (3 credits) FALL, ANNUAL
This course will examine the various strategies of resource exploitation and utilization in developing aquaculture projects, including environmental, technological, social, economics, and administrative aspects. Management strategies offish, crustacean, mollusk and non-traditional species farming will be studied, both at the hatchery and grow-out levels.

\textsuperscript{1} These course numbers replace previous existing course numbers of the MAF and MBF programs which changed to MES in the spring 2016.
\textsuperscript{2} When courses have two numbers e.g. 501 and 601 they are offered at both the undergraduate and graduate level.
\textsuperscript{3} Semester represents the most common schedule and is subject to change.
\textsuperscript{4} Frequency represents the most common practice and is subject to change. Special Topic courses are temporary courses that may be offered only once or twice.
MES 513/613 Aquaculture Management II (3 credits) SPRING, ANNUAL
This course is a complement to Aquaculture Management I (MAF 512) and will examine advanced aquaculture management techniques and strategies with emphasis on commercial operations. Prerequisite: MAF 512 or permission of the instructor.

MES 516/616 Ocean Policy and Development and Analysis (3 credits) FALL, ANNUAL
Ocean policy development and analysis 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.

MES 517/617 Legal Environment and Business Planning in Aquaculture (3 credits) FALL, ANNUAL
This course examines the substantive legal problems concerning Aquaculture and the Coastal zone. Legal aspects of aquaculture in developing and developed countries. Complexity of legal problems and effects of these problems on aquaculture success. Legal and regulatory constraints.

MES 518/618 Coastal Zone Management (3 credits) SPRING, ANNUAL
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.

MES 519 Aquaculture Management III (3 credits)
Fieldwork. Practical, hands-on experience is provided during a 2-week fieldtrip, where students visit and spend time working in hatcheries, farms and processing plants.

MES 520/620 Environmental Law (3 credits) FALL, ANNUAL
An introductory course focusing on environmental problems. Includes study of regulatory legislation, the common law and administrative law. Topics covered include toxic substances, air and water pollution, and habitat and species protection.

MES 525/625 Fisheries Socioeconomics and Management (3 credits) FALL, ANNUAL
This course will survey commercial fisheries, recreational fisheries and aquaculture from a perspective of socioeconomic as it affects management. During the first half of the semester, we will examine the unique attributes of the fishing industry, including the interaction between the harvest and the consequences of special institutional and legal conditions prevalent in fisheries. During the second half, we will study socioeconomic consequences of fishery policy, application of fishery management will be simulated/developed through readings, classroom discussion, and case studies exercises.

MES 526/626 Management of Underwater Cultural Resources (3 credits) FALL, ANNUAL
Submerged archaeological sites as exhaustible resources analogous in many respects to non-renewable natural resources. Policies and procedures for their protection or mitigation will be surveyed, using as examples the statutes and regulations of foreign states, the federal government, and US states.

MES 530/630 Port Operations and Policy (3 credits) SPRING, ANNUAL
The course will include: Introduction to ports, ports 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.

MES 545/645 Marine Population Assessment Surveys & Analysis (3 credits) SPRING, ANNUAL
Resource surveys aim to directly estimate abundance and population structure of species and marine communities. The course includes experimental sampling concepts and designs, instrumentation, survey implementation and statistical methods and models to directly assess size-structured exploited populations and non-target species (e.g. sea turtles, marine mammals, etc.) in marine ecosystem. Data from various surveys carried out in the past will be used in laboratory exercises. Comparative analyses of survey designs and results from an ample literature on the subject matter are included.

MES 546/646 Marine Population Biology Processes & Modeling (3 credits) SPRING, ANNUAL
Biological characteristics and anthropogenic effects affecting marine population dynamics are explained with the aim of understanding their interactive dynamics. Students will learn conceptual aspects and estimation methods for the main population parameters and processes such as growth, survival, reproduction and feeding. Emphasis is 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.
MES 660 Introduction to Marine Geographic Information Systems (3 credits) FALL and SPRING, ANNUAL
Marine Geographic Information Systems are emerging as distinct subset of GIS, due to fundamental differences between terrestrial and underwater spatial information. Approximately the first half of the course will be a detailed consideration of basic GIS method and theory, and the second half will concentrate on aspects of marine data acquisition and manipulation in the GIS context. The course is independent of particular software programs.

MES 661 Introduction to Marine Geographic Information Systems Lab (0 credits) FALL and SPRING, ANNUAL
This course introduces students to the basic methods and techniques in Marine Geographic Information Systems. It will be 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. The course will concentrate on the use of ARCVIEW GIS including it extensions.

MES 562/662 Intermediate Spatial Analysis. (3 credits) SPRING, ANNUAL
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.

MES 564/664 Citizen & Participatory Science (3 credits) FALL, ANNUAL
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. Guest 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.

MES 565/665 Exploration Technology and Media (3 credits) SPRING, ANNUAL
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.

MES 670 Conservation and Management of Marine Mammals (3 credits) FALL, ANNUAL
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, economic, ethical and cultural dimensions) of these concerns.

MES 571/671 Marine Conservation Biology (3 credits) FALL, ANNUAL
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.

MES 573/673 Marine Conservation Outreach (3 credits) SPRING, ANNUAL
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.

MES 574/674 Gold and Glory: Ethics of Exploration (3 credits) FALL, ANNUAL
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.

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MES 576/676 Exploration Science Field Studies (3 credits) SPRING, SPECIAL TOPICS
This course takes theoretical concepts and methodological skills gained in the classroom and take them into the field in challenging environments, including blue water, terrestrial, and desert areas. Students will focus on science and media project as the outcome of the fieldwork.

MES 577/677 Management and Conservation of Marine Ecosystems (3 credits) SPRING, ANNUAL
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.

MES 578/678 Making, Marketing & Distributing Fresh & Frozen Seafood (3 credits) SPRING, SPECIAL TOPICS
All students in the aquaculture track, learn technologies and gain experience about how to develop projects and grow seafood. However, the last and most important stage of the entire process is how to market and sell the product. This course provides the knowledge required to develop a plan to market and sell the production. The most qualified professionals to sell aquaculture seafood products are those who know most about it. This course will provide the basic training in what market seeks and how to discover it, who the buyers are and how to find them, the basics of plant management, processing and packaging, as well as how best to market and distribute their product. Students will learn how to form alliances with those who would supply them with such services, thus streamlining costs, enhancing communications and ensuring a maximum return of the investment made.

MES 579/679 Decision Analysis: Natural Hazards & Catastrophes (3 credits) SPRING, SPECIAL TOPICS
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.

MES 681 R Computing Environment for Biological & Ecosystem Sciences (3 credits) SPRING, SPECIAL TOPICS
Understanding and resolving problems of complex biological and physical processes in marine ecosystems require sophisticated numerical solutions and incorporations of large databases. Mastery of a computer language is compulsory in next generation problem solving. The R Computing Environment is a widely used computing language for resolving biophysical problems. Techniques in the R language are taught to develop means to assimilate and visualize multidimensional data, and provide a computational toolbox to investigate and solve large - scale quantitative problems in biological and marine ecosystem sciences.

MES 583/683 Biology, Ecology, and Management of Mangroves (3 credits) SPRING, SPECIAL TOPICS
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.

MES 590/690 Acoustic Measurement (3 credits) SPRING, ANNUAL
This 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.

MES 710 International Ocean Law and Governance (3 credits) SPRING, ANNUAL
This course analyzes how international and municipal law deals with navigation, pollution, fisheries, exploitation of natural resources, and other uses of the ocean. In addition to jurisdictional issues, sources of international law and scientific research in ocean areas are examined.

MES 713 Marine Population Dynamics (3 credits) FALL, ANNUAL
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.
**MES 714 Population Modeling and Management** (3 credits) FALL, BI-ANNUAL
A synthesis of advanced mathematical and computer-intensive models to monitor, assess and manage responses of marine populations to exploitation and environmental changes. Exposition and development of quantitative modeling concepts and stock assessment techniques to include: (1) principles of resource management; (2) stock production models and surplus yield; (3) structured (age- & length-based) analytical yield models; (4) stock and recruitment models; (5) analytical modeling and parameter estimation; and, (6) dynamic structured assessments. Equilibrium and non-equilibrium approaches will be evaluated with respect to data assimilation and parameter estimation. Simulation modeling tools will be used to highlight and reinforce concepts in decision theory, adaptive control, and risk assessment. Specific population modeling and resource allocation case studies from regional, federal and international fishery management institutions will be illustrated.

**MES 715 Advanced Biometrics in Marine Science** (3 credits) FALL, BI-ANNUAL
An introduction to advanced multivariate statistical analysis of empirical observations with primary emphasis on applications in the assessment and interpretation of the dynamics of populations and communities in marine biology, fisheries, biomedical sciences, and biological oceanography. Advanced methods in generalized linear models, multiple and nonlinear regression model analysis, probability and estimation theory, multiple partial correlation, ANCOVA, generalized additive models, nonlinear optimization, and multivariate statistics (classification and ordination methods). Exploratory data analysis and modeling will be emphasized using the software: R Project for Statistical Computing, SAS and MATLAB.

**MES 720 Coastal Law** (3 credits) FALL, ANNUAL
This course examines the authority of different levels and agencies of government to make decisions affecting the coastal zone. It also explores the coastal problems of shoreline uses and development, uses of water areas and seabed, and the related questions of environmental protection.

**MES 790 Advanced Acoustics** (3 credits) FALL, ANNUAL
This is the second course in a series on the acoustic measurement of nekton, plankton and underwater habitat. It follows in the introductory course MES 690. In this course, we will focus more on the acquisition and processing of plankton, nekton and marine habitat data using sonar hydrophones. We will also spend time reviewing and discussing the classic papers that have been published on this topic. This class was designed for those students who wish to learn how to make quantitative measures of organisms and underwater habitat structure for their research.