

University of Miami Bulletin, 2009 – 2010 Graduate Course Listing

*** 500 level courses appear in both the undergraduate and graduate course listing and may be considered undergraduate or graduate at the discretion of the department. Prerequisites, co-requisites and other course requirements are subject to change.**

University of Miami Bulletin, 2009-2010
Graduate Course Listing
MARINE AND ATMOSPHERIC SCIENCE
APPLIED MARINE PHYSICS

AMP509 Coastal Physics and Engineering

3 credits

Spring Semester

Course addresses linear wave theory, wave statistics, wave generation, tides, wind-driven currents, nearshore circulation, sediment transport by waves and currents, bedforms, bedload, and suspended load. Other topics include longshore and cross-shore transport, equilibrium beach profiles, coastal processes models, Pelnard-Consideré model for shoreline change, and Escoffier model for inlet stability.

PREREQUISITE: CAE 330 OR AMP 575.

AMP515 Environmental Hydrology

3 credits

Fall Semester

An introduction to the physical processes of hydrological science. The principles of evapotranspiration, precipitation, infiltration, groundwater flow, seepage, overland flow, and stream flow are expounded. Areas of interrelation with environmental, marine, and geophysical sciences are emphasized. Measurement techniques for hydrological variables and the statistical analysis of hydrological data time series for runs and extremes are also described.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP531 Ocean Measurements

3 credits

Spring Semester

Course topics include instrumentation, automatic data acquisition and analysis, time series analysis, signals and noise, filtering, and applied statistics.

PREREQUISITE: MTH 311.

AMP535 Introduction to Underwater Acoustics

3 credits

Spring Semester

Course topics include sound waves and pulses, harmonic analysis, sound propagation in the ocean, sonar systems, scattering and absorption, acoustic measurement of marine life and sea-floor properties, sound transmission in waveguides, ambient noise, transducers, and hydrophones.

PREREQUISITE: MTH 311.

AMP542 Physics of Remote Sensing

3 credits

Offered By Announcement Only

This course discusses basic physical principles of remote sensing. The main topics are (1) Introduction, (2) Sampling issues, (3) Fundamental laws of electromagnetic waves, (4) Passive sensing, (5) Active sensing, and (6) Brief survey of satellite sensors.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP551 Special Topics

1- 3 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Applied Marine Physics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP552 Special Topics

1- 3 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Applied Marine Physics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

University of Miami Bulletin, 2009-2010
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MARINE AND ATMOSPHERIC SCIENCE
APPLIED MARINE PHYSICS

AMP553 Special Topics

1- 3 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Applied Marine Physics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP554 Special Topics

1- 3 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Applied Marine Physics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP555 Special Topics

1- 3 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Applied Marine Physics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP575 Applied Ocean Hydrodynamics

3 credits

Fall Semester

The equations governing the dynamics of homogeneous fluids are derived. The concepts of deformation rates, vorticity, stream function, and ideal fluid flow are introduced and demonstrated in applications describing flows in the marine environment. Semi-empirical methods for analyzing viscous flows, boundary layers, and turbulence are presented. Eddy viscosity and more advanced turbulence closure schemes are discussed in the context of coastal circulation, bottom boundary layers and sediment transport.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP576 Wave Propagation in the Ocean Environment

3 credits

Fall Semester

Wave equation models, acoustic and other elastic waves, surface gravity waves, boundary conditions, ray tracing, dispersion, diffraction, reflection attenuation, and radiation transport laws are discussed.

PREREQUISITE: MTH 311.

AMP577 Marine Soil Mechanics

3 credits

Spring Semester

Course topics include principles of soil and rock mechanics and dynamics, theories of poro-elasticity, sea-seabed and interactions, and measurement methods of physical properties of sediments. An introduction to wave propagation through porous media is included.

PREREQUISITE: AMP 576 AND 575 OR PERMISSION OF INSTRUCTOR.

AMP590 Sustainable Fisheries - Assessment and Conservation

3 credits

Spring Semester

This is the second of a three course series. This course will focus on advanced stock assessment techniques using acoustics and optics. It will cover, for example:
- History of sampling fish stocks - "from catching to measuring fish" - Measuring with underwater sound and light - Sounds and echoes in marine ecosystem - Survey of fish stocks and their habitat.

PREREQUISITE: MSC 471, OR EQUIVALENT.

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MARINE AND ATMOSPHERIC SCIENCE
APPLIED MARINE PHYSICS

AMP601 Analytical Methods in Marine Physics

3 credits

Fall Semester

Review of linear algebra with emphasis on real symmetric systems. Least squares, optimal estimation, and the Gauss-Markov theorem. Equilibria in discrete and continuous systems, and the foundations of continuum mechanics. Review of vector and tensor analysis. Calculus of variations and the variational principles of mechanics. Fourier analysis and orthogonal expansions. Integral transforms. The discrete Fourier and z transforms. Functions of a complex variable. Ordinary differential equations. Dynamical systems, the phase plane, stability, and an introduction to chaos. The diffusion equation. Linear and nonlinear wave equations. Applications to marine physics involving wave motion and fluid flow are emphasized throughout the course.

PREREQUISITE: CONSENT OF INSTRUCTOR.

AMP610 Environmental Optics and Electromagnetic Wave Propagation

3 credits

Spring Semester

The course will allow students to understand the physical background of geophysical optical and microwave measurements, to learn how to carry out and interpret optical measurements, and how to work with microwave passive/active remote sensing platforms. The student will leave with a thorough understanding of existing physical background of optical instrumentation for underwater measurements as well as active/passive optical and microwave remote sensing.

PREREQUISITE: PERMISSION OF THE INSTRUCTOR.

AMP631 Air-Sea Interaction

3 credits

Offered By Announcement Only

Course topics include the flux of momentum, heat, moisture, and salt, vertical distribution of energy sources and sinks near the interface, surface waves, mixed layers, and large scale interactions. (Same as MPO 631.)

PREREQUISITE: AMP 575 OR 576 AND PERMISSION OF INSTRUCTOR.

AMP636 Marine Vehicle Dynamics

3 credits

Offered By Announcement Only

Course topics include dynamics of floating bodies, free surface potential flow, boundary value problems, dynamics of marine vehicles, resistance and motions in waves, slender body hydrodynamics, strip theory of ship motions, seakeeping, and maneuvering.

PREREQUISITE: AMP 534, 575.

AMP640 Numerical Modeling in Applied Marine Physics

3 credits

Spring Semester

Techniques and applications of numerical modeling in one of the following topical areas: sound propagation and scattering in the ocean; surface gravity wave propagation and scattering in regions of shallow and intermediate depths; and hydrodynamics in the coastal ocean environment. Emphasis (sound propagation versus gravity wave propagation or hydrodynamics) alternates from one year to the other.

PREREQUISITE: AMP 535, 575 OR 576 AND PERMISSION OF INSTRUCTOR.

AMP650 Coastal Ocean Circulation

3 credits

Spring Semester

Circulation and stratification in the coastal ocean, including the dynamics of wind-driven, tidally-driven, and buoyancy-driven mean and transient flows over variable topography with density stratification. Design of numerical models and observing systems for coastal ocean circulation is also included.

PREREQUISITE: MPO 503, 511 OR AMP 575, AND 601 OR EQUIVALENT, CONSENT OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
APPLIED MARINE PHYSICS

AMP672 Advanced Underwater Acoustics

3 credits

Spring Semester

Analysis and numerical modeling of sound propagation in the ocean: geometrical acoustics, normal mode theory, and the parabolic equation method. Recent advances in underwater acoustics: effects of oceanic variability, signal fluctuations, random medium propagation, ocean bottom interactions, and shallowwater propagation are also examined.

PREREQUISITE: AMP 535.

AMP673 Applied Underwater Acoustics

3 credits

Fall Semester

Course topics include sonar systems and operating characteristics, scattering and reverberation, target strength, signal processing, transducers and arrays, detection and noise, and acoustic telemetry.

PREREQUISITE: AMP 535.

AMP675 Estuary Dynamics

3 credits

Offered By Announcement Only

Course topics include water motions in estuaries, lagoons and inlets. shallow water tides including tide generation, harmonic analysis, and analytical solutions to the shallow waterwave equations. Classification of estuaries by topography, circulation, and stratification are also discussed as well as mixing concepts, diffusion, dispersion, and buoyancy effects. tide, wind, density induced circulation, and residence time.

PREREQUISITE: AMP 575.

AMP676 Advanced Wave Hydrodynamics

3 credits

Spring Semester

Wave hindcasting/forecasting, one dimensional and directional wave spectra, probability distributions, transformations in shallow water, nonlinear analysis, and wave breaking.

PREREQUISITE: AMP 576.

AMP677 Advanced Geoacoustics

3 credits

Fall Semester

Theory of elastic wave propagation in fluid filled porous media. Energy loss mechanisms in sediments, methods to measure geoacoustic properties and their spatial variability, and theory of scattering of elastic waves in random poroelastic media are discussed.

PREREQUISITE: AMP 577 OR INSTRUCTOR'S APPROVAL.

AMP680 Transport and Mixing Process in the Marine Environment

3 credits

Offered By Announcement Only

Heat and constituent transport and mixing processes in the marine environment. Derivation of the fundamental equations governing heat and constituent transport and mixing processes, steady and unsteady state heat transfer by conduction, laminar and turbulent convection, and radiation, steady and unsteady state constituent transfer by diffusion and laminar and turbulent convection, mixing and flushing in tidally driven coastal waters are also discussed.

PREREQUISITE: AMP 575.

AMP686 Advanced Ocean Measurements

2 credits

Offered By Announcement Only

Theory and techniques of ocean measurements, ocean data systems, and processing and ocean data transmission are discussed. Lecture, 2 hours.

PREREQUISITE: AMP 531 AND PERMISSION OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
APPLIED MARINE PHYSICS

AMP689 Applied Marine Physics Seminar

1 credits

Offered By Announcement Only

Oral presentation and discussion of research and special topics by students, faculty, and visiting scientists. Attendance is required each semester for students in Applied Marine Physics.

AMP690 Mechanics and Thermodynamics of the Air-Sea Interface

3 credits

Spring Semester

This course deals with the theory and practice of air-sea interaction. Two hours of lectures and one hour in the wind-wave laboratory provide an appropriate mix of theory and experiment. The topics covered include: thermodynamics of the interface; conservation equations; wave generation, propagation, and dissipation; boundary layer turbulence; heat, mass, and momentum transfer; energy dissipation, intermittency; turbulence closure; and wave prediction models.

PREREQUISITE: AMP 575 OR PERMISSION OF INSTRUCTOR.

AMP691 Sustainable Fisheries - Advanced Acoustic Surveying

3 credits

Spring Semester

This is the third and final course in the three course series. It addresses graduate students with a strong research interest in measuring fish and their habitat on the stock and population level. This course will focus on advanced stock assessment techniques using acoustics and optics. It will cover, for example: - A critical review of classical and current research papers - Signal processing and laboratory experiments - Field surveys and stock assessment reports.

PREREQUISITE: AMP/MBF 590.

AMP694 Advanced Studies

1- 3 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP695 Advanced Studies

1- 3 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP696 Advanced Studies

1- 3 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP697 Advanced Studies

1- 3 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP698 Advanced Studies

1- 3 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

AMP700 Practical Training and Internship

1- 6 credits

Offered By Announcement Only

Supervised internships or off-campus employment for students pursuing the M.A., M.S., or Ph.D. degree. Consists of work related to research in progress.

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MARINE AND ATMOSPHERIC SCIENCE
APPLIED MARINE PHYSICS

AMP705 Special Project

1- 6 credits *Fall & Spring Semester & First & Second Summer Session*

Supervised project for students pursuing the Master of Arts degree. Consists of a paper which is researched and written on a topic approved by the student's advisory committee, and presented as a seminar to the student's division. Six credits are required for graduation.

PREREQUISITE: COMPLETION OF 24 GRADUATE COURSE CREDITS.

AMP706 Special Project-Post Candidacy

1- 6 credits *Fall Semester*

Used to establish student has been admitted to candidacy for the MA Degree. The student working on his/her research paper enrolls for credit not to exceed 06 combined with 705. No credit is awarded until final paper has been accepted.

AMP710 Master's Thesis

1- 6 credits *Fall & Spring Semester & First & Second Summer Session*

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

AMP715 Master's Thesis-Post Candidacy

1- 6 credits *Fall & Spring Semester & First & Second Summer Session*

Used to establish student has been admitted to candidacy for the MS degree. The student working on his/her Master's Thesis enrolls for credit not to exceed 6 combined with 710. Credit is not awarded until the Thesis has been accepted.

AMP720 Research in Residence

0 credit *Fall & Spring Semester & First & Second Summer Session*

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 AMP 710 (usually six credits). Credit not granted. May be regarded as full time residence.

AMP730 Doctoral Dissertation

1-12 credits *Fall & Spring Semester & First & Second Summer Session*

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 AMP 730 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.

AMP740 Doctoral Dissertation-Post Candidacy

1-12 credits *Fall Semester*

Used to establish student has been admitted to candidacy for the Ph.D. Degree. The student working on his/her Doctoral Dissertation enrolls for credit for a minimum of 12 combined with 730. Credit is not awarded until Dissertation has been accepted.

AMP750 Research in Residence

0 credit *Fall & Spring Semester & First & Second Summer Session*

Used to establish research in residence for the Ph.D., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE AFFAIRS & POLICY

MAF501 Political Ecology of Marine Management

3 credits

Spring Semester

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.

PREREQUISITE: MAF 505.

MAF502 Economics of Natural Resources

3 credits

Fall Semester

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.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF503 Marine Resource Economics

3 credits

Offered By Announcement Only

This course surveys the economics of international and global marine resource problems, with particular emphasis on biodiversity loss and climate change. The mainstream economics focus on efficiency--getting the most welfare out a given endowment of resources--in complemented with a range of social science and natural science interdisciplinary linkages. Three themes stand out. First, economic efficiency may not be the only or even dominant concern in the provision of environmental assets. Issues of fairness and access to those assets, both within a time frame period and over time, may be of greater importance to both individuals and societies. Second, if habitats and their non-human occupants have some form of "intrinsic" value unrelated to human preferences, then we face the problem of how to account for those values. Third, economics lacks a "sustainability" theorem that would ensure whatever economy we might devise would be ecologically sustainable. To be sure of sustainability, economic models must have sustainability conditions build into them.

PREREQUISITE: MAF 502, ECO 345, OR PERMISSION OF INSTRUCTOR.

MAF504 Fieldwork in Coastal Management

3 credits

Spring Semester

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.

PREREQUISITE: MAF 518 IS HIGHLY RECOMMENDED

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MARINE AFFAIRS & POLICY

MAF505 Fieldwork in Coastal Cultures

3 credits

Spring Semester

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.

PREREQUISITE: MSC 310 OR PERMISSION OF INSTRUCTOR.

MAF506 Advance Fieldwork in Coastal Cultures

3 credits

Spring Semester

Advanced field course in which the students participate in the social and economic analysis of a coastal culture (e.g. Louisiana bayou fishermen, Abacos boat builders, Tarpon Spring spongers). Students utilize field research techniques learned in MAF 505 and develop skills in framing a research problem. Students examine a coastal issue from an anthropological perspective, structuring a field research paper.

PREREQUISITE: MAF 505.

MAF510 Environmental Planning and the Environmental Impact Statement

3 credits

Spring Semester

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.

MAF512 Aquaculture Management

3 credits

Fall Semester

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.

MAF513 Aquaculture Management II

3 credits

Spring Semester

Course is a complement to Aquaculture Management (MAF 512) and examines advanced aquaculture management techniques and strategies with emphasis on commercial operations. Course requires a background in either aquaculture or business. Prerequisite: MAF 512 or permission of instructor.

PREREQUISITE: MAF 512 OR PERMISSION OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE AFFAIRS & POLICY

MAF514 Field Techniques in Prehistoric Underwater Archaeological Excavation

3 credits

First Summer Session

An introduction to specialized techniques of underwater excavation applicable to the excavation of Little Salt Spring (LSS), a prehistoric site owned and operated by Rosenstiel School of Marine and Atmospheric Science. All students participate in a one-week intensive lecture course in the prehistory of Florida and general techniques of underwater excavation. The field course begins thereafter. All students must be present for all of the field course in order to complete the basic requirements. Activities include daily underwater excavation in depths of 10-30 feet of water, as well as surface support activities relating to diving and the recording and basic conservation of recovered ecofacts and artifacts dating before 9,000 radiocarbon years before present.

PREREQUISITE: STUDENTS WHO INTEND TO DIVE (NOT REQUIRED) MUST HAVE ALREADY BEEN QUALIFIED AS RSMAS SCIENTIFIC DIVERS (BASIC), UNDER GUIDELINES ESTABLISHED BY THE AMERICAN ACADEMY OF UNDERWATER SCIENCES (AAUS) IN ORDER TO PARTICIPATE IN COURSE-RELATED SCUBA-DIVING ACTIVITIES.

MAF515 Techniques of Marine Archaeological Survey and Recording

3 credits

Offered By Announcement Only

The location and study of underwater archaeological sites is undergoing fundamental changes because of application of advanced technologies developed for other fields, notably remote sensing, and the general availability of computer power for individual users. This course introduces the student to the latest techniques of survey and recording, focusing on hardware and software that can greatly increase the efficiency of any underwater excavation.

PREREQUISITE: PREVIOUS COURSES IN ARCHAEOLOGY OR MARINE ARCHAEOLOGY OR PERMISSION OF INSTRUCTOR.

MAF516 Ocean Policy and Development and Analysis

3 credits

Fall Semester

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.

MAF517 Aquaculture and the Law

3 credits

Offered By Announcement Only

This course examines the substantive legal issues concerning Aquaculture and the Coastal Zone. Legal aspects of Aquaculture related to ownership and boundaries in the coastal zone, legal and regulatory constraints, international consideration private and public rights, risks and incentives. Fish and shellfish as personal property and conservation laws affecting the fish farmer.

MAF518 Coastal Zone Management

3 credits

Fall Semester

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.

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MAF519 Aquaculture Management III (Fieldwork)

3 credits

First Summer Session

Students will conduct fieldwork on environmental, technological, social, economical, and administrative aspects encountered in commercial aquaculture operations. This fieldcourse will complement Aquaculture Management I and II. Students will be able to apply most of the topics taught in MAF 512 and MAF 513. They will participate in all stages of the production process, including maturation, spawning, larval husbandry, nursery and growout 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.

PREREQUISITE: MAF 512, 513 OR PERMISSION FROM THE INSTRUCTOR.

MAF520 Environmental Law

3 credits

Fall Semester

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.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF525 Fisheries Socioeconomics and Management

3 credits

Fall Semester

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.

MAF526 Marine Cultural Resource Management

3 credits

Spring Semester

Submerged archaeological sites as exhaustible resources of a country's cultural heritage. 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 the US states.

PREREQUISITE: APY 340.

MAF530 Port Operations and Policy

3 credits

Offered By Announcement Only

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.

PREREQUISITE: JUNIOR STANDING.

MAF560 Introduction to Marine Geographic Information Systems

3 credits

Fall Semester

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, synoptic 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.

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MAF561 Introduction to Marine Geographic Information Systems - Laboratory

1 credits

Fall Semester & First Summer Session

Introduction to Marine Geographic Information Systems - Laboratory introduces students the 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.

MAF562 Spatial Analysis: Intermediate Course in Marine GIS

3 credits

Spring Semester

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.

PREREQUISITE: MAF 560, 561 OR PERMISSION OF THE INSTRUCTOR.

MAF570 Conservation and Management of Large Marine Vertebrates

3 credits

Fall Semester

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.

MAF576 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to marine affairs.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF577 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to marine affairs. Prerequisite: Permission of instructor.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF578 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to marine affairs.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF579 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to marine affairs.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF580 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to marine affairs.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE AFFAIRS & POLICY

MAF610 International Ocean Law

3 credits

Spring Semester

Course analyses 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.

MAF620 Coastal Law and Policy

3 credits

Fall Semester

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.

MAF630 Case Studies in Marine Policy

3 credits

Offered By Announcement Only

This team-taught course is an interdisciplinary research and writing seminar for graduate students. The objective is to give students "hands on" problem solving and decision making experience under conditions of competing interests and scientific uncertainty. Each student team will develop an investigative report for inclusion into a document that will serve future courses as well as the policy and research communities at large.

MAF670 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF671 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF672 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF673 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF674 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAF705 M.A. Internship

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

The M.A. student must complete an approved six credit internship with an organization engaged in activities associated with marine affairs. Credits are not awarded until the internship has been successfully completed, a written report approved and a formal letter of evaluation received from the cooperating institution.

PREREQUISITE: COMPLETION OF ALL OTHER REQUIREMENTS FOR M.A. DEGREE IN MARINE AFFAIRS.

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MARINE AFFAIRS & POLICY

MAF706 MA Internship-Post Candidacy

1- 6 credits

Fall Semester

Used to establish student has been admitted to candidacy for the MA Degree. The student working on his/her Internship enrolls for credit not to exceed 06 combined with 705. No credit is awarded until final Internship report has been accepted.

MAF710 Master's Thesis

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

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

MAF715 Masters thesis-Post Candidacy

1- 6 credits

Fall Semester

Used to establish student has been admitted to candidacy for the MS Degree. The student working on his/her Master's Thesis enrolls for credit not to exceed 06 combined with 710. Credit is not awarded until the Thesis has been accepted.

MAF720 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

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.

MAF725 Continuous Registration--Master's Study

0 credit

Fall & Spring Semester & First & Second Summer Session

To establish residence for non-thesis master's students who are preparing for major examinations. Credit not granted. Regarded as full time residence.

MARINE BIOLOGY & FISHERIES

MBF508 Biometrics in Marine Science

3 credits

Fall Semester

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.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF511 Aquaculture

3 credits

Offered By Announcement Only

Focus on techniques to culture marine organisms. The growth and physiology of early life stages, the culture of food organisms for larval stages, food requirements of larval and juvenile stages, water quality measurement, disease control, tank design, grow out, composition of artificial feeds and artificial spawning are discussed in detail. Applications of these techniques in commercial aquaculture, culture of animals for research, and for stock enhancement programs are examined. Practical examples are presented for laboratory and hands on rearing of fish larvae. Commercial aquaculture facilities are visited in field trips during the laboratory. Lecture, 2 hours; laboratory, 2 hours.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE BIOLOGY & FISHERIES

MBF512 Aquaculture Laboratory

2 credits

Offered By Announcement Only

Determining and monitoring water quality, culturing food organisms, larval rearing of shrimp and fish, feeding techniques, identifying parasites and diseases, and avoiding causes of mortality are discussed. Visits to local fish and shrimp hatcheries and farms is included. Corequisite: MBF 511.

PREREQUISITE: COREQUISITE: MBF 511.

MBF513 Biology and Ecology of Mangroves

3 credits

Spring Semester

Recent research advances in the study of mangroves as a dynamic interface between terrestrial and marine systems. Topics include taxonomy, biogeography, morphology and physiognomy, water relations and mineral nutrition, and physiology and reproduction with emphasis on how mangroves modify tropical coastal environments and how they are affected by external stressors including global climate change. Lecture, 2 hours; field trips, 1 hour; field and laboratory work, minimum 2 hours.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF514 Tropical Marine Biology: A Field Course

3 credits

Spring Semester

General survey of marine flora and fauna of tropical marine ecosystems. Inhabitants and communities of the sandy shore, rocky shore, seagrass meadows, mangrove shoreline, coral and artificial reefs are collected, identified, maintained. Life histories of representatives are presented. Concepts of island biology and geology such as shore zonation local reef formation and the geological history of the lagoon are also discussed. The 10 day course involves 90 contact hours and approximately 40 hours of formal lectures. Grades are based on a laboratory practicum and written final exam. The course is given in its entirety at the University's field station at Bimini, Bahamas.

PREREQUISITE: BY PERMISSION OF INSTRUCTOR.

MBF515 Tropical Marine Ecology

3 credits

Offered By Announcement Only

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

PREREQUISITE: INVERTEBRATE ZOOLOGY AND ECOLOGY OR PERMISSION OF INSTRUCTOR.

MBF518 Ecology and Physiology of Coral Reef Systems

3 credits

Offered By Announcement Only

Coral reefs as integrated systems are examined from geological, ecological, and biological perspectives. The roles of global and local environmental fluctuations, physical disturbance, and biotic interactions in controlling reef formation and community structure is emphasized. The physiology of scleractinian corals and their algal symbionts is described and the prevalence of algal-invertebrate symbiosis on coral reefs related to nutrient cycling, productivity, and food webs on coral reefs.

PREREQUISITE: PERMISSION OF INSTRUCTORS.

MBF519 Tropical Marine Ecology Lab

1 credits

Offered By Announcement Only

Combined field-laboratory exercises in mangrove, sea grass, and coral reef ecosystems.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE BIOLOGY & FISHERIES

MBF520 Tropical Marine Ecology: A Short Course

2 credits

Spring Semester

This tropical Marine Biology course established primarily for Florida high school marine biology teachers is taught from an interactive point of view where students are afforded the opportunity to both learn in the conventional way of classroom lectures, and more importantly to learn by involvement and participation. Students are exposed to the major marine communities found in Bimini and South Florida such as: 1) coral reef; 2) artificial reef; 3) mangrove; 4) seagrass flats; and intertidal zones. Students learn about the uniqueness of each of these ecosystems and the plants and animals which inhabit them. Lectures are divided up by habitat and are given in the morning. In the afternoon students go into the field and traverse on foot or snorkel in each ecosystem. Specimens are collected and identified at night and students are required to learn and identify 50 organisms found in six ecosystems. Field guides are used as reference material. A written exam and laboratory practical is given on the last day of class.

PREREQUISITE: COLLEGE BIOLOGY.

MBF525 Biology of Elasmobranch Fishes: A Field Course

2 credits

Offered By Announcement Only

Course discusses the first aspects of elasmobranch biology including systematics of the major taxa, paleontology, and the evolutionary history of sharks as well as anatomical aspects. Course also addresses the physiology and biochemistry of sharks, circulatory, respirative, developmental, skeletal, and sensory systems involving behavior, ecology, and life history strategies. Factors such as feeding, reproduction, and social and swimming behavior are also discussed. The relation between man and shark: overexploitation as it affects shark conservation, survival, and biodiversity is included. Course is given in its entirety at Bimini, Bahamas.

PREREQUISITE: By permission of instructor.

MBF531 Plankton

3 credits

Spring Semester

Course topics include the drifting organisms, their central role in the economy of the sea, the influence of the environment, and their adaptations to it. The dynamic and productivity of the plant and animal plankton, the ecology and physiology of animal plankton, especially in connection with special distribution and nutrition, and an introduction to the taxonomy, and quantitative enumeration of the animal plankton is included. Lecture, 3 hours.

PREREQUISITE: PERMISSION OF THE INSTRUCTOR.

MBF540 Introduction to Ecological Modeling

3 credits

Offered By Announcement Only

An introduction to conceptual and mathematical model building methods for ecological processes at population, community, ecosystem, and landscape/seascape- level scales. Other topics include mathematical foundations, numerical modeling, holistic and structured population models, demography, density-independent and -dependent models, linear and nonlinear systems, community composition, competition, succession, and ecosystem structure and function are discussed. Gap-phase, process-based, compartmental, and coupled biological-physical ecosystem models at landscape scales are also examined.

PREREQUISITE: CALCULUS AND PERMISSION OF INSTRUCTOR.

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MARINE BIOLOGY & FISHERIES

MBF550 Analytical Techniques in Marine Biology

2 credits

Offered By Announcement Only

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

MBF570 Special Topics

1- 4 credits

Offered By Announcement Only

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

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF571 Special Topics

1- 4 credits

Offered By Announcement Only

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

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF572 Special Topics

1- 4 credits

Offered By Announcement Only

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

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF573 Special Topics

1- 4 credits

Offered By Announcement Only

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

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF574 Special Topics

1- 4 credits

Offered By Announcement Only

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

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MBF575 Current Applications of Ecological Theory

3 credits

Offered By Announcement Only

Course examines current applications of ecological theory. Topics include issues of stress ecology, methodologies for evaluating stress responses, methodologies for ecological risk assessment, general systems theory, and human/environmental interactions. Lecture, 3 hours.

PREREQUISITE: PERMISSION OF THE INSTRUCTOR.

MBF576 Diseases of Marine Organisms

3 credits

Offered By Announcement Only

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

Lecture, 3 hours.

PREREQUISITE: GRADUATE STANDING; OR BIL 150, 160, 255 AND PERMISSION OF THE INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE BIOLOGY & FISHERIES

MBF578 Evolutionary Genetics

3 credits

Fall Semester

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

MBF586 Environmental Biology of Fishes

3 credits

Offered By Announcement Only

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

MBF590 Sustainable Fisheries - Assessment and Conservation

3 credits

Spring Semester

This is the second of a three course series. This course will focus on advanced stock assessment techniques using acoustics and optics. It will cover, for example:
- History of sampling fish stocks - "from catching to measuring fish" - Measuring with underwater sound and light - Sounds and echoes in marine ecosystem - Survey of fish stocks and their habitat.

PREREQUISITE: MSC 471, OR EQUIVALENT.

MBF602 Biological Oceanography Seminar

1 credits

Fall & Spring Semester

Participation is required of all students in Marine Biology and Fisheries department every semester they are in residence whether or not they are registered for the course. Students past their second semester must give one 20-minute presentation per year, on their research or other acceptable topic. Dates are be assigned by lottery. Course may be taken for credit only once.

MBF604 Biological Oceanography

3 credits

Fall Semester

A comprehensive course in Biological Oceanography, including energy flow, biogeochemical cycles, planktonic and benthic ecosystem structure, evolutionary ecology, adaptations of marine organisms, and paleoceanography. Course is required of all MBF students and should be taken in sequence with Oceanography I (MPO 501), Oceanography II (MAC 502), and Oceanography IV (MGG 504).

PREREQUISITE: NON-MARINE BIOLOGY MAJORS NEED PERMISSION OF INSTRUCTOR.

MBF607 Biochemical Toxicology

2 credits

Offered By Announcement Only

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

PREREQUISITE: BMB 506 OR PERMISSION OF INSTRUCTOR.

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MBF610 The Physical Environment of Marine Organisms

3 credits

Spring Semester

The fluid environment of the sea influences the growth, distribution, and survival of marine organisms. The physical processes that affect organisms occur in space and time, ranging from the molecular properties of water to basin-wide linkages between oceanic regime and climate shifts are discussed. Course emphasis is placed on how physical processes affect the life of plankton to nekton, Students are required to present reviews based on the literature.

MBF613 Marine Population Dynamics

3 credits

Spring Semester

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.

PREREQUISITE: MBF 508, 510 OR PERMISSION OF INSTRUCTOR.

MBF614 Population Modeling and Management

3 credits

Fall Semester

Mathematical and computer-intensive models of exploited populations fish, shellfish, 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.

PREREQUISITE: MBF 613 OR PERMISSION OF INSTRUCTOR.

MBF615 Advanced Biometrics in Marine Science

3 credits

Spring Semester

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.

PREREQUISITE: MBF 508 OR PERMISSION OF INSTRUCTOR.

MBF633 Physiological and Biochemical Adaptations of Marine Organisms

2 credits

Fall Semester

Biochemical processes unique to marine organisms. Topics include ion transport and regulation, biochemical adaptations to high pressures and low temperatures, bioluminescence, biochemical aspects of migration and behavior, marine toxins and prostaglandins, and symbiotic associations.

PREREQUISITE: BMB 506 OR BIL 255.

MBF640 Marine Phytoplankton and Primary Productivity

3 credits

Offered By Announcement Only

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

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE BIOLOGY & FISHERIES

MBF671 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF DIVISION ACADEMIC COMMITTEE.

MBF672 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF DIVISION ACADEMIC COMMITTEE.

MBF673 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF DIVISION ACADEMIC COMMITTEE.

MBF674 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF DIVISION ACADEMIC COMMITTEE.

MBF675 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF DIVISION ACADEMIC COMMITTEE.

MBF687 Biology and Systematics of Fishes

3 credits

Offered By Announcement Only

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

PREREQUISITE: GENERAL BIOLOGY; COMPARATIVE ANATOMY DESIRABLE; PERMISSION OF INSTRUCTOR.

MBF690 Sustainable Fisheries - Advanced Acoustic Surveying

3 credits

Fall Semester

This is the third and final course in the three course series. It addresses graduate students with a strong research interest in measuring fish and their habitat on the stock and population level. This course will include: This course will focus on advanced stock assessment techniques using acoustics and optics. It will cover, for example: - A critical review of classical and current research papers - Signal processing and laboratory experiments - Field surveys and stock assessment reports.

PREREQUISITE: MBF/AMP 571.

MBF700 Practical Training and Internship

1- 6 credits

Offered By Announcement Only

Supervised internship or off-campus employment for students pursuing the M.A., M.S., or Ph.D. degree. Consists of work related to research in progress.

MBF705 Special Project

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

Supervised project for students pursuing the Master of Arts degree in Marine Studies. Consists of a paper, researched, and written on a topic approved by the student's advisory committee, and presented as a seminar to the student's division. Six credits are required for graduation.

PREREQUISITE: COMPLETION OF 24 GRADUATE COURSE CREDITS.

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MBF706 Special Project-Post Candidacy

1- 6 credits

Fall Semester

Used to establish student has been admitted to candidacy for the MA Degree. The student working on his/her research paper enrolls fo credit not to exceed 06 combined with 705. No credit is awarded until final paper has been accepted.

MBF710 Master's Thesis

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

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

MBF715 Masters Thesis-Post Candidacy

1- 6 credits

Fall Semester

Used to establish student has been admitted to candidacy for the MS Degree. The student working on his/her Master's Thesis enrolls for credit not to exceed 06 combined with 710. Credit is not awarded until the Thesis has been accepted.

MBF720 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

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 MBF 710 (usually six credits). Credit not granted. May be regarded as full time residence.

MBF730 Doctoral Dissertation

1-12 credits

Fall & Spring Semester & First & Second Summer Session

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 MBF 730 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.

MBF740 Doctoral Dissertation-Post Candidacy

1-12 credits

Fall Semester

Used to establish student has been admitted to candidacy for the Ph.D. Degree. The student working on his/her Doctoral dissertation is not awarded until Dissertation has been accepted.

MBF750 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

Used to establish research in residence for the Ph.D., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

MARINE GEOLOGY & GEOPHYSICS

MGG501 Oceanography I (Geological)

2 credits

Fall Semester

The first section of the core course curriculum designed as an integrated and multidisciplinary view of ocean processes, covering the major disciplines of marine science and their applications to the study of the marine environment. To be taken in sequence with Oceanography II - Physical (MPO 502), Oceanography III - Chemical (MAC 501), and Oceanography IV - Biological (MBF 502). This course is for non-MGG majors only. PREREQUISITE: UNDERGRADUATES REQUIRE PERMISSION OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE GEOLOGY & GEOPHYSICS

MGG511 Earth Surface Systems

3 credits

Fall Semester

An introduction to the elements of the earth surface environment and their interactions with an emphasis on the application to understanding the geologic record. Course includes discussions of the processes and agents that influence and shape the character of the earth's surface, the attributes of the resultant sedimentary features, and the use of these features to unravel geologic and geomorphic history. Focus is placed on systems dynamics and interactions among sedimentologic, geomorphic, biotic, and hydrologic processes.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG512 Marine Micropaleontology

3 credits

Fall Semester

An introduction to the field of marine micropaleontology with an emphasis on applications in biostratigraphy, biochronology, paleoecology, and paleoceanography. Topics include morphology, taxonomy, ecology, and geologic record of the major microfossil groups, methods of environmental inference, and stable isotope and trace element geochemical studies. Lab work includes a survey of the most important taxonomic groups. Lecture, 3 hours; laboratory, 2 hours.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG513 Introductory Geochemistry

3 credits

Fall Semester

Fundamentals of atomic structure and quantum mechanics applied to Chemistry. Topics include origin and distribution of the elements, chemical bonding and substitution, basic thermodynamics of solids, liquids, and gases. Applications of these concepts to such geochemical processes as magmatic differentiation, rock-water interactions, low temperature aqueous geochemistry, and the geochemical cycling of the elements is also included.

MGG514 Geophysics

3 credits

Fall Semester

Course topics include seismology, gravity, heat flow, thermal history, geomagnetism, plate tectonics, and their importance in understanding the Earth's crust, mantle, and core.

PREREQUISITE: ONE YEAR OF CALCULUS AND ONE YEAR OF PHYSICS.

MGG515 Environmental Hydrology

3 credits

Fall Semester

Course offers an introduction to the physical processes of hydrological science. The mechanisms of evaporation, condensation, precipitation, infiltration, groundwater flow, overland flow, and stream flow are described. Areas of interrelation with environmental science, marine science, and geophysical science is emphasized. Description of appropriate measurement techniques and data interpretation methods are important parts of the course.

PREREQUISITE: PHYSICS.

MGG520 Igneous Petrology

3 credits

Fall Semester

Origin and differentiation of magmas in oceanic and continental settings. Igneous systems traced from the mantle and magma chambers to the eruptive stage. What we can tell from textures and mineralogy of igneous rocks. Use of trace-element and isotopes to understand igneous processes and magma source compositions. Magma types and plate-tectonic cycle. Magmatism when the Earth was young. Extra-terrestrial igneous rocks.

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MARINE GEOLOGY & GEOPHYSICS

MGG525 Applied Environmental Geophysics

3 credits

Offered By Announcement Only

Application of subsurface geophysical tools to environmental problems. Course includes the theory and application of shallow refraction and reflection seismology, conducting field experiments and processing both marine and land seismic data, other marine survey techniques such as side-scan sonar surveying, potential field techniques (gravity, magnetics, EM), ground penetrating radar, and borehole geophysics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG533 Environmental Geology

3 credits

Offered By Announcement Only

Seminar and field study. Application of geologic principles to the solution of critical environmental problems. Effects of modification of wetlands, coastal zones, shelf environments, contrast of subtropical and temperate environmental response, and differentiation of short term and persistent effects.

MGG541 Field Evaluation of Fossil Platforms, Margins, and Basins

2 credits

Offered By Announcement Only

Field investigation of classic rock sequences formed within ancient platform, margin, and basin environments. The use of ancient exposures as a guide to the interpretation of modern marine environments.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG550 Mathematical Methods for Geoscientists

3 credits

Fall Semester

Background mathematics needed to solve problems in the geosciences. Applications in tectonics, geodynamics, structural geology, seismology, and hydrology. Topics include linear inverse problems, least squares, linear algebra, matrix theory, vectors, dimensional analysis, probability and scientific inference, continuum mechanics, transform and numerical methods to solve differential, and partial differential equations.

PREREQUISITE: ONE YEAR OF CALCULUS AND ONE YEAR OF PHYSICS.

MGG570 Continental Tectonics

3 credits

Spring Semester

Reviews major research techniques used in the study of the structure and evolution of continental crust and topical discoveries, with an emphasis on the Neogene to Recent time. The course begins with brief introductions to the fields of structural geology, seismology, and geodesy as they relate to continental tectonics. New research in areas such as the rheology of the lithosphere, plate motion models, deformation of continental crust in plate boundary zones, oblique subduction, and earthquake hazard assessment are also discussed.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG579 Plate Tectonics

3 credits

Fall & Spring Semester

The theory of plate tectonics, sea floor spreading, and continental drift. Mathematical description of plate motions, finite and instantaneous rotation poles, consequences of plate tectonics, mountain building, rifting, erosion, and recycling of continental materials are also discussed.

PREREQUISITE: PERMISSION OF INSTRUCTOR

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MARINE GEOLOGY & GEOPHYSICS

MGG580 Geological and Environmental Remote Sensing

3 credits

Spring Semester

This one semester course will cover major remote sensing techniques used in the geological and environmental sciences. The course will begin with an introduction to the basic physics of remote sensing, followed by a review of major remote sensing techniques used in aircraft and satellite platforms, including IR and near IR, optical and microwave systems. We will then discuss specific terrestrial and coastal applications using a case history approach, including geologic, soil and biomass mapping, environmental monitoring, and natural hazard assessment. The course is aimed at graduate students and senior undergraduates with some background in math and physics. Grades are based on problems sets (a minimum of three), a mid-term test, and a report or lab exercise involving image processing, due at the end of the semester.

PREREQUISITE: CALCULUS AND PHYSICS.

MGG581 Image Analysis and Interpretation

3 credits

Offered By Announcement Only

Course provides a hands-on approach to learning how to use aerial photography, satellite imagery, and other remotely sensed data to derive information about the physical environment. This course enables the student to process, interpret, and analyze remotely sensed data for use in environmental research. Image Analysis and Interpretation complements the course, MGG 580.

MGG583 Scanning Electron Microscopy

2 credits

Spring Semester

Theory and practical application of the SEM and the electron probe to research problems. Lectures and laboratory with emphasis on independent operation of the SEM, special preparation techniques, and interpretation of results are included. Course is designed to provide students with a broad and thorough background in scanning electron microscopy.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG584 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Marine Geology and Geophysics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG585 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Marine Geology and Geophysics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG586 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Marine Geology and Geophysics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG587 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Marine Geology and Geophysics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MGG588 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Marine Geology and Geophysics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG601 Seminar in Marine Geology and Geophysics

1 credits

Fall & Spring Semester

Oral presentation and discussion of research and special topics by students, faculty, and visiting scientists. Students receiving credit are required to present a seminar.

MGG620 Satellite Radar Interferometry in the Earth Sciences

3 credits

Fall Semester

Spaceborne interferometric Synthetic Aperture Radar is an important technique for various disciplines in the Earth Sciences, such as geodesy, glaciology and hydrology. This course reviews the principles of radar, synthetic aperture radar of interferometric and differential radar interferometric techniques.

PREREQUISITE: PERMISSION OF INSTRUCTOR

MGG622 Geophysical Inverse Theory

3 credits

Spring Semester

This course covers the principles of geophysical inverse theory as applies to problems in the Earth Sciences. Inverse theory is a set of mathematical techniques used to obtain inferences about the Earth from physical measurements. The focus of this class will be on formulating and solving inverse problems, and understanding the non-uniqueness and resolution associated with inversions. The emphasis will be on geodetic data (obtained from GPS and InSAR measurements).

PREREQUISITE: 514 AND/OR PERMISSION OF INSTRUCTOR

MGG650 Stable Isotopes in Biogeochemical Processes

3 credits

Offered By Announcement Only

Theory of stable isotope fractionation, methods of measurement, and application of results to geological, biological, and oceanographic processes. Hands-on experience in the stable isotope laboratory is provided utilizing a range of techniques. A project chosen either by the student or instructor is required. All students who wish to use the stable isotope facility should take this course. Lecture, 2 hours; laboratory, 3 hours. Prerequisite: Permission of instructor.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG660 GIS Programming

1 credits

Spring Semester

Course provides a hands-on approach to learning GIS programming using Avenue for ArcView GIS (ESRI). Avenue is an object-oriented programming language used to create customized graphical user interfaces, automated tasks, and spatial and spatially enabled applications. Students learn how to employ object-oriented programming techniques and modeling methods to develop spatially explicit applications. Prerequisite: MAF 561 or permission from the instructor.

PREREQUISITE: MAF 561 OR PERMISSION FROM THE INSTRUCTOR.

MGG661 Sedimentary Petrology

3 credits

Fall Semester

Composition, texture, fabric, and structures of sediments and sedimentary rocks. The occurrence and properties of the major classes of detrital and chemical sediments from a petrologic and historical perspective is discussed.

PREREQUISITE: MGG 520.

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Graduate Course Listing
MARINE AND ATMOSPHERIC SCIENCE
MARINE GEOLOGY & GEOPHYSICS

MGG662 Comparative Sedimentology

3 credits

Spring Semester

The use of modern sediments to decipher processes of origin, accumulation, and early diagenesis as the basis for interpreting environments and architecture of ancient deposits in outcrop and in the subsurface. Evaluation of the sedimentary record of climate and sea level changes is included as well as the application of facies models for interpretation of seismic and log data.

PREREQUISITE: MGG 511.

MGG663 Deep Sea Sedimentation

3 credits

Offered By Announcement Only

Course topics include classification and major constituents of deep-sea sediments, origin of red clay, production, dissolution, deposition of pelagic carbonate and silica, turbidite sedimentation, hemipelagic deposits, interpretation of the record (plate tectonics and plate stratigraphy, ancient deep-sea sediments and ancient oceans).

PREREQUISITE: PERMISSION OF THE INSTRUCTOR.

MGG668 Isotopic Processes in Earth Sciences

3 credits

Offered By Announcement Only

The use of isotopic methods in geology, geochemistry, and geophysics, including oceanography and meteorology. General laws governing isotopic effects in chemical and physical processes are discussed. Specific problems in dating, tracing, and paleotemperatures are also included.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG669 Advanced Geophysics

3 credits

Offered By Announcement Only

The application of geophysical methods, including seismic refraction, seismic reflection, heat flow, gravity, magnetic field and paleomagnetism, to the study of the structure of oceanic crust.

PREREQUISITE: MGG 514.

MGG670 Seismic Exploration

3 credits

Spring Semester

Elementary theory of seismic waves. Topics include techniques of seismic data acquisition and processing, methods of geophysical and geological interpretation of seismic data, application to hydrocarbon exploration, principles of seismic stratigraphy, and other geophysical methods related to hydrocarbon exploration.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG671 Diagenesis of Carbonate Sediments

3 credits

Spring Semester

Application of geochemical, mineralogical, and petrological principles to the behavior of carbonate minerals in sediments. Physical and chemical conditions responsible for cementation, dolomitization, and aragonite-calcite phase transitions are emphasized. Types of depositional and diagenetic information which may be preserved in carbonate sediments. Laboratory studies of sediments are included.

PREREQUISITE: MGG 513; PERMISSION OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE GEOLOGY & GEOPHYSICS

MGG672 Basin Analysis and Seismic Interpretation

3 credits

Spring Semester

The processes of basin formation and filling. The principles of seismic facies analysis, seismic sequence stratigraphy, and their applications in basin analysis, groundwater management, and exploration for hydrocarbons are discussed.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG676 Paleoclimatology

3 credits

Fall Semester

Climatic variables and their effects on geological and biological processes. The development of the paleoclimatic record, modeling of present climate, and the extrapolation to past and future climates are discussed.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG677 Submarine Volcanism and Its Products

3 credits

Fall Semester

Course topics include classification of volcanoes, their activity and products, submarine versus subaerial volcanoes, historical submarine eruptions, and hydrothermal activities, origin and differentiation of magmas, petrology of submarine, volcanic rocks, geographic distribution of volcanoes, and their tectonic setting are also discussed..

PREREQUISITE: MGG 520 OR PERMISSION OF INSTRUCTOR.

MGG678 Modeling of Marine Biogeochemical Processes

3 credits

Offered By Announcement Only

Diagenesis models, including bioturbation and dissolution in the CaCO₃ and SiO₂ systems. Energy balance climate models and oscillatory states of a simple air-water-ice system are discussed as well as modeling of sedimentation and transport processes.

MGG681 Advanced Studies

1- 4 credits

Offered By Announcement Only

Special study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG682 Advanced Studies

1- 4 credits

Offered By Announcement Only

Special study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG683 Advanced Studies

1- 4 credits

Offered By Announcement Only

Special study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG684 Advanced Studies

1- 4 credits

Offered By Announcement Only

Special study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MGG685 Advanced Studies

1- 4 credits

Offered By Announcement Only

Special study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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Graduate Course Listing
MARINE AND ATMOSPHERIC SCIENCE
MARINE GEOLOGY & GEOPHYSICS

MGG700 Practical Training and Internship

1- 6 credits

Offered By Announcement Only

Supervised internship or off-campus employment for students pursuing the M.A., M.S., or Ph.D. degree. Consists of work related to research in progress.

MGG705 Special Report

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

Supervised project for students pursuing the Master of Arts degree in Marine Studies. Course consists of a research paper, researched, and written on a topic approved by the student's advisory committee, and presented as a seminar to the student's division. Six credits are required for graduation.

PREREQUISITE: COMPLETION OF 24 GRADUATE COURSE CREDITS.

MGG706 Special Project-Post Candidacy

1- 6 credits

Fall Semester

Used to establish student has been admitted to candidacy for the MA Degree. The student working on his/her research paper enrolls for credit not to exceed 06 combined with 705. No credit is awarded until final paper has been accepted.

MGG710 Master's Thesis

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

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

MGG715 Masters Thesis-Post Candidacy

1- 6 credits

Fall Semester

Used to establish student has been admitted to candidacy for the MS Degree. The student working on his/her Master's Thesis enrolls for credit not to exceed 06 combined with 710. Credit is not awarded until the Thesis has been accepted.

MGG720 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

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 MGG 710 (usually six credits). Credit not granted. May be regarded as full time residence.

MGG730 Doctoral Dissertation

1-12 credits

Fall & Spring Semester & First & Second Summer Session

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 MGG 730 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.

MGG740 Doctoral Dissertation-Post Candidacy

1-12 credits

Fall Semester

Used to establish student has been admitted to candidacy for the Ph.D. Degree. The student working on his/her Doctoral Dissertation enrolls for credit for a minimum of 12 combined with 730. Credit is not awarded until Dissertation has been accepted.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE GEOLOGY & GEOPHYSICS

MGG750 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

Used to establish research in residence for the Ph.D., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

MARINE & ATMOSPHERIC CHEMISTRY

MAC503 Principles of Marine and Atmospheric Chemistry

3 credits

Fall Semester

Introduction to the chemical aspects of the sea and atmosphere chemical composition, physico-chemical properties and relationships, methodology of study, fundamental aspects of marine and atmospheric chemistry.

PREREQUISITE: CHM 111 OR PERMISSION OF INSTRUCTOR.

MAC504 Analytical Methods in Marine and Atmospheric Chemistry

1 credits

Fall Semester

A survey of analytical methods as applied to oceanographic and atmospheric chemistry.

Course is taught in a multi-instructor format. Topics include trace organic analysis by HPLC, GC, and GC-MS, laser induced fluorescence detection of gas phase atoms, differential absorption detection of atmospheric species, aerosol sampling, ion chromatography, photochemical techniques, oceanographic tracers, microbiological techniques, and computational resources. Course is designed to be taught in conjunction with MAC 503.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC510 Biogeochemical Exploration of the Major Ocean Basins

3 credits

Fall Semester

This course will have students explore the basic hydrography and biochemistry of the major ocean basins through use of several publicly available global ocean data sets. Each ocean basin will be assessed for biogeochemical features that are unique to that system. By the end of the course, students will have the skills necessary to investigate and interpret marine biogeochemical processes throughout the global ocean.

PREREQUISITE: PERMISSION OF INSTRUCTOR

MAC560 Tropospheric Chemistry I

3 credits

Spring Semester

Process-Oriented lower atmospheric chemistry. Topics include photochemical oxidant formation, nighttime chemistry, air-sea exchange, cloud droplet and aerosol reactions, physical properties of aerosols, and transport properties of the troposphere.

PREREQUISITE: MPO 552 OR AN UNDERGRADUATE METEOROLOGY COURSE, OR PERMISSION OF INSTRUCTOR.

MAC581 Special Topics in Marine and Atmospheric Chemistry

1- 4 credits

Offered By Announcement Only

Lectures, research projects or direct readings in special topics of marine and atmospheric chemistry.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC582 Special Topics in Marine and Atmospheric Chemistry

1- 4 credits

Offered By Announcement Only

Lectures, research projects or direct readings in special topics of marine and atmospheric chemistry.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE & ATMOSPHERIC CHEMISTRY

MAC583 Special Topics in Marine and Atmospheric Chemistry

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics of marine and atmospheric chemistry.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC584 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics of Marine and Atmospheric Chemistry.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC585 Special Topics in Marine and Atmospheric Chemistry

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics of marine and atmospheric chemistry.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC605 Chemical Oceanography

3 credits

Spring Semester

Course consists of lecture and discussions with renowned experts in the major disciplinary foci and topical issues dominating the field of Chemical Oceanography. Topics include the chemistry and biogeochemical processes of the carbon cycle, ocean tracers, photochemistry, and specific marine environments (geothermal vents, anoxic waters, sediments, air/sea interface).

PREREQUISITE: MAC 503 OR PERMISSION OF INSTRUCTOR.

MAC615 Tracers of Oceanographic Processes

3 credits

Spring Semester

Course describes the various tracer techniques used by oceanographers to understand water transport and mixing, sedimentation, gas exchange, nutrient recycling, and transport. Tracers used are both natural occurring and anthropogenic. This course is of interest to students from various disciplines.

MAC620 Marine Physical Chemistry

3 credits

Spring Semester

Physical-chemical principles applied to the marine environment, based on thermodynamics and the study of rate processes.

PREREQUISITE: TWO SEMESTERS OF PHYSICAL CHEMISTRY, CALCULUS THROUGH DIFFERENTIAL EQUATIONS.

MAC625 Marine Biochemical Cycles

3 credits

Spring Semester

Course discusses the roles of bacteria in the transformation of compounds in the marine environment, their functions in the carbon, nitrogen, sulfur, and phosphorus cycles, and transformation of metals. Bacterial activities in the deep-sea environment and their involvement in corrosion and fouling is also discussed.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE & ATMOSPHERIC CHEMISTRY

MAC630 Marine Organic Chemistry

3 credits

Offered By Announcement Only

Organic chemistry of the marine environment. Inventory of organic constituents, their sources and sinks, sampling and analytical techniques, functions of and processes involving organic compounds in the ocean are discussed. Review of current research topics is included.

PREREQUISITE: MAC 502 AND TWO SEMESTERS OF UNDERGRADUATE ORGANIC CHEMISTRY OR BIOCHEMISTRY.

MAC640 Global Geochemical Fluxes

3 credits

Offered By Announcement Only

Use of chemical and isotopic tracers to evaluate the pathways and rates at which dissolved and particulate material are cycled through the atmosphere and oceans. Course emphasizes the use of diagnostic computer models as tools for the study of geochemical systems.

PREREQUISITE: MARINE CHEMISTRY.

MAC645 Marine Trace Organic Analysis

3 credits

Offered By Announcement Only

Application of modern liquid and gas chromatographic techniques to marine chemical problems. Stress is placed on determination of natural trace organic compounds in seawater and atmospheric samples. 50% reading and 50% lab project.

PREREQUISITE: MAC 504 OR 630.

MAC650 Reaction Kinetics and Molecular Dynamics

3 credits

Spring Semester

Theories and experimental techniques for studying kinetics in the gas-phase, association, unimolecular and bimolecular reactions, chain reactions, flames, statistical theories, potential energy surfaces, collision dynamics, kinetics in solution and the solid-state, experimental methods, diffusion-controlled processes, transition state theory, thermal decomposition, and nucleation are discussed.

PREREQUISITE: THERMODYNAMICS, ELEMENTARY STATISTICAL MECHANICS.

MAC661 Tropospheric Chemistry II

3 credits

Fall Semester

Chemical and physical properties of tropospheric aerosols. Topics include properties of aerosols, dynamics of single aerosol particles, thermodynamics of aerosols, nucleation theory, aerosol growth, heterogeneous processes, dynamics of aerosol populations, and radiative properties of atmospheric aerosols.

PREREQUISITE: TROPOSPHERIC CHEMISTRY I.

MAC662 Environmental Photochemistry

3 credits

Offered By Announcement Only

Introduction to the principles of photochemistry and their application to understanding sunlight initiated processes in the region of the ocean-atmosphere interface. Organic and inorganic photochemical reactions and subsequent thermal reactions in solution, gas, and solid media are discussed.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC665 Chemistry of Middle and Upper Atmosphere

3 credits

Fall Semester

Course addresses the structure of the stratosphere, mesosphere, and ionosphere, ion chemistry, aurorae, meteoritic chemistry, the ozone layer and anthropogenic influences, techniques for making atmospheric observations, and development of chemical models with simple transport.

PREREQUISITE: ELEMENTARY GAS-PHASE KINETICS, THERMODYNAMICS

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MARINE & ATMOSPHERIC CHEMISTRY

MAC668 Isotopic Processes in Earth Sciences

3 credits

Offered By Announcement Only

The use of isotopic methods in geology, geochemistry, and geophysics including oceanography and meteorology. General laws governing isotopic effects in chemical and physical processes are discussed as well as specific problems in dating, tracing, and paleotemperatures. Same as MGG 668.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC670 Seminar in Marine and Atmospheric Chemistry

1 credits

Fall & Spring Semester

Oral presentation of research and special topics by students, faculty, and visiting scientists.

MAC671 Diagenesis of Carbonate Sediments

3 credits

Offered By Announcement Only

Application of geochemical and mineralogic principles to the behavior of carbonate minerals in sediments. Physical and chemical conditions responsible for cementation, dolomitization, and aragonite-calcite phase transitions are emphasized. Types of depositional and diagenetic information which may be preserved in carbonate sediments are also examined. Laboratory studies of sediments is included. Identical to MGG 671.

PREREQUISITE: MGG 511 AND 513 (OR 514).

MAC680 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC681 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC682 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC684 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC685 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MAC700 Practical Training and Internship

1- 6 credits

Offered By Announcement Only

Supervised internships or off-campus employment for students pursuing the M.A., M.S., or Ph.D. degree. Consists of work related to research in progress.

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MARINE & ATMOSPHERIC CHEMISTRY

MAC705 Special Report

1- 6 credits *Fall & Spring Semester & First & Second Summer Session*

Supervised project for students pursuing the Master of Arts degree in Marine Studies. Consists of a paper, researched, and written on a topic approved by the student's advisory committee, and presented as a seminar to the student's division. Six credits are required for graduation.

PREREQUISITE: COMPLETION OF 24 GRADUATE COURSE CREDITS.

MAC706 Special Project-Post Candidacy

1- 6 credits *Fall Semester*

Used to establish student has been admitted to candidacy for the MA Degree. The student working on his/her research paper enrolls for credit not to exceed 06 combined with 705. No credit is awarded until final paper has been accepted.

MAC710 Master's Thesis

1- 6 credits *Fall & Spring Semester & First & Second Summer Session*

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

MAC715 Masters Thesis-Post Candidacy

1- 6 credits *Fall Semester*

Used to establish student has been admitted to candidacy for the MS Degree. The student working on his/her Master's Thesis enrolls for credit not to exceed 06 combined with 710. Credit is not awarded until the Thesis has been accepted.

MAC720 Research in Residence

0 credit *Fall & Spring Semester & First & Second Summer Session*

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 MAC 710 (usually six credits). Credit not granted. May be regarded as full time residence.

MAC730 Doctoral Dissertation

1-12 credits *Fall & Spring Semester & First & Second Summer Session*

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 MAC 730 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.

MAC740 Doctoral Dissertation-Post Candidacy

1-12 credits *Fall Semester*

Used to establish student has been admitted to candidacy for the Ph.D. Degree. The student working on his/her Doctoral Dissertation enrolls for credit for a minimum of 12 combined with 730. Credit is not awarded until Dissertation has been accepted.

MAC750 Research in Residence

0 credit *Fall & Spring Semester & First & Second Summer Session*

Used to establish research in residence for the Ph.D., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

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MARINE AND ATMOSPHERIC SCIENCE
MARINE & PHYSICAL OCEANOGRAPHY

MPO502 Oceanography II (Physical)

2 credits

Fall Semester

The second section of the course core curriculum designed as an integrated and multidisciplinary view of ocean processes, covering the major disciplines of marine science and their applications to the study of the marine environment. To be taken in sequence with Oceanography I - Geological (MGG 501), Oceanography III - Chemical (MAC 501), and Oceanography IV - Biological (MBF 502). This course is for non-MPO majors only.

PREREQUISITE: UNDERGRADUATES REQUIRE PERMISSION OF INSTRUCTOR.

MPO503 Physical Oceanography

3 credits

Fall Semester

Introduction to properties of seawater, instruments and methods, heat budget, general ocean circulation, formation of water masses, dynamics of circulation, regional oceanography, waves, tides, and sea level. A mathematical and problem solving course for majors in MPO.

PREREQUISITE: PHY 202 OR 206, MTH 310 OR 311, OR PERMISSION OF INSTRUCTOR.

MPO511 Geophysical Fluid Dynamics I

3 credits

Fall Semester

The basic equations of state, continuity, and motion. Topics include wave motions, group velocity, theory of stratified fluids and internal waves turbulence.

PREREQUISITE: MPO 551, OR PERMISSION OF INSTRUCTOR.

MPO518 Remote Sensing of the Atmosphere

3 credits

Offered By Announcement Only

Methods and techniques for remote sensing of the earth's atmosphere. Absorption and scattering of radiation by atmospheric constituents, molecular line or band absorption, and radiative transfer equation are discussed. Application to microwave radar, laser, and optical radar, ground and satellite and optical radar and radiometry, scattering of acoustic waves by turbulence, and to acoustic echo sounding methods are also included.

PREREQUISITE: EEN 533 AND/OR PERMISSION OF INSTRUCTOR.

MPO531 Physical Meteorology

3 credits

Offered By Announcement Only

Electromagnetic and acoustic wave propagation, absorption, and emission. Application to remote sensing, basic physics of dry aerosols, clouds and precipitation, fundamentals of atmospheric electricity, charge separation processes, and electrical field effects are also discussed. Other topics include air pollution physics, dispersal, and removal of particulate and gaseous materials from natural and anthropogenic sources.

PREREQUISITE: BASIC CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS.

MPO542 Physics of Remote Sensing

3 credits

Spring Semester

Course discusses basic physical principles of remote sensing. Topics include an introduction, sampling issues, fundamental laws of electromagnetic waves, passive sensing, active sensing, and a brief survey of satellite sensors.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE & PHYSICAL OCEANOGRAPHY

MPO551 Introduction to Atmospheric Science

3 credits

Fall Semester

Thermodynamics of dry and moist processes; elementary dynamical meteorology; description of weather systems and phenomena on all scales; structure and mechanics of the general circulation. Corequisite: MPO 552.

PREREQUISITE: PHY 206, MTH 310 OR 311, OR PERMISSION OF INSTRUCTOR.

MPO552 Synoptic Meteorological Laboratory

1 credits

Fall Semester

Analysis of the structure of atmospheric systems.

PREREQUISITE: PHY 206, MTH 310 OR 311, OR PERMISSION OF INSTRUCTOR.

MPO561 Tropical Meteorology

3 credits

Spring Semester

Observed structure of large-scale tropical circulations, including the Trades, the Intertropical Convergence Zone, the Walker circulation, and equatorial wave disturbances. An overview of tropical climate, including El Nino/Southern Oscillation, and tropical monsoons is included as well as the formation, structure, and dynamics of tropical cyclone interactions between tropical convection and large-scale circulations, equatorial waves, and flow instabilities.

PREREQUISITE: MPO 511, 551, OR PERMISSION OF INSTRUCTOR.

MPO562 Synoptic Scale Meteorology

3 credits

Offered By Announcement Only

Course topics include the structure and behavior of cyclones, anticyclones, and other temperate latitude synoptic scale disturbances. Objective analysis of synoptic observations, perturbation, stability analysis of large scale synoptic motions, and barotropic and baroclinic waves are also analyzed.

PREREQUISITE: MSC 405 OR MPO 551 AND PERMISSION OF INSTRUCTOR.

MPO563 Mesoscale Meteorology and Severe Storms

3 credits

Offered By Announcement Only

Course topics include the structure and dynamics of clouds, thunderstorms, and mesoscale convective systems, radar and satellite observations of clouds and precipitation, severe storm forecasting, mesoscale disturbances, frontal and orographic clouds, and precipitation.

PREREQUISITE: MSC 405 OR MPO 551 AND PERMISSION OF INSTRUCTOR.

MPO581 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Meteorology and Physical Oceanography.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO582 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Meteorology and Physical Oceanography.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO583 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Meteorology and Physical Oceanography.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE & PHYSICAL OCEANOGRAPHY

MPO584 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Meteorology and Physical Oceanography.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO585 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures, research projects or directed readings in special topics related to Meteorology and Physical Oceanography.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO601 Seminars in Meteorology and Physical Oceanography

1 credits

Fall & Spring Semester

MPO611 Geophysical Fluid Dynamics II

3 credits

Spring Semester

The focus of this course is on the effects of stratification, on time variable phenomena, and on the interaction between large-scale circulation and mesoscale eddies. Course topics include quasi-geostrophic scale analysis, Rossby waves, barotropic and baroclinic instability, wave-mean flow interaction and non-geostrophic waves.

PREREQUISITE: MPO 511.

MPO612 Large Scale Ocean Circulation: Models and Observations

3 credits

Spring Semester

Course topics include theoretical models of the oceanic current systems, wind-driven and thermohaline circulation, effects of bottom topography, and lateral bounding.

PREREQUISITE: MPO 611 OR PERMISSION OF INSTRUCTOR.

MPO615 Numerical Weather Prediction

3 credits

Offered By Announcement Only

Review of fundamental equations and principal wave solutions. Course topics include finite differences, the filtering problem, the equivalent-barotropic model, multi-level primitive equation models, model initialization and verification, and models currently used by the weather service.

PREREQUISITE: MPO 551.

MPO621 Waves and Tides I

3 credits

Fall Semester

Systematic development of equations governing long waves in the ocean. Course topics include tidal dynamics and tide-generating forces, inertio-gravity, planetary, and longs, presurface waves, waves trapped and scattered by topography, and equatorial waves.

PREREQUISITE: MPO 511 OR PERMISSION OF INSTRUCTOR.

MPO623 Statistical Analysis of Geophysical Data

3 credits

Spring Semester

Review of statistical methods. Course topics include statistical description of wave fields, especially inertio-gravity waves, processing methods for general and hydrodynamically conditioned signals, time series analysis, objective analysis, and empirical spectral analysis.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE & PHYSICAL OCEANOGRAPHY

MPO624 Statistical Modeling of Geophysical Fields

3 credits

Spring Semester

An advanced course in statistical modeling, analysis, and assimilation of geophysical data. Emphasis is placed on practical applications, computer software, and new nonstandard techniques.

PREREQUISITE: ONE LINEAR ALGEBRA CLASS AND MPO 623 OR PERMISSION OF INSTRUCTOR.

MPO631 Air-Sea Interaction

3 credits

Spring Semester

PREREQUISITE: MPO 611 OR PERMISSION OF INSTRUCTOR.

MPO632 Climate Dynamics

3 credits

Offered By Announcement Only

Basic understanding of the Earth's Climate System and its variability on time scales ranging from weeks to millennia. Topics include internal atmospheric variability, coupled ocean-atmosphere interactions, and the theory, observations and modeling of climate change.

PREREQUISITE: PREREQUISITE OR COREQUISITE: MPO 551.

MPO633 The Marine Atmospheric Boundary Layer

3 credits

Spring Semester

The marine atmospheric boundary layer plays a key role in the two-way interaction between the atmosphere and the ocean. This course will focus on describing and explaining marine atmospheric boundary layer structure and its evolution. This will include an emphasis on the cloud-topped boundary layer (marine stratocumulus) and the trade-wind boundary layer. Thus, in addition to turbulence, the physical processes considered in this treatment of the marine boundary layer will include shallow moist convection and radiation. The course will start with a basic description of the atmospheric boundary layer that will include a review of the relevant dynamics and thermodynamics. More advance topics will be covered in the second half of the course. Although the course will be a series of formal lectures, students will independently research selected topics, prepare a short review paper, and give an oral summary class.

PREREQUISITE: STUDENTS ENROLLING IN THIS CLASS SHOULD HAVE A BASIC KNOWLEDGE OF ATMOSPHERIC THERMODYNAMICS AND DYNAMICS (MPO 511 OR 551 OR EQUIVALENT).

MPO650 Coastal Ocean Circulation

3 credits

Spring Semester

Circulation and stratification in the coastal ocean, including the dynamics of wind-driven, tidally-driven, and buoyancy-driven mean and transit flows over variable topography with density stratification are discussed. Design of numerical models and observing systems for coastal ocean circulation are also included. (AMP 650).

PREREQUISITE: AMP 535, 575 OR 576 AND PERMISSION OF INSTRUCTOR.

MPO651 Dynamic and Modeling of Weather and Climate Systems

1 credits

Fall & Spring Semester

This course will cover a number of advanced topics not currently covered in other courses, such as mesoscale meteorology, mesoscale modelling, cloud physics, and storm dynamics.

PREREQUISITE: MPO 551.

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MPO662 Computer Models in Fluid Dynamics

3 credits

Spring Semester

Course topics include numerical techniques of dealing with dynamic problems in meteorology and oceanography. Dynamic prediction models, initial data conditioning, computational stability, and error estimates are also included.

PREREQUISITE: MPO 611 AND KNOWLEDGE OF COMPUTER PROGRAMMING.

MPO663 Convective and Mesoscale Meteorology

3 credits

Spring Semester

This course begins by establishing the dynamics, thermodynamics, and cloud microphysics fundamentals needed to understand convective clouds and storms. We also review the types of observations, both in situ and remote sensing, available for studying these storms. Observations of both tropical convection and more-vigorous midlatitude severe storms are presented and compared to numerical modeling results, with an emphasis on scientific understanding.

PREREQUISITE: MPO 551 OR EQUIVALENT.

MPO664 Atmospheric and Oceanic Turbulence

3 credits

Spring Semester

Structure and dynamics of planetary boundary layers, turbulent transport processes, Fickian and statistical theories of turbulence, influence of stratification, and rotation on turbulent motion are discussed.

PREREQUISITE: MPO 611 OR PERMISSION OF INSTRUCTOR.

MPO665 General Circulation of the Atmosphere

3 credits

Spring Semester

Course topics include structure and behavior of planetary scale motions, energy, momentum, and moisture budgets of the general circulation, and models of the general circulation and climatic change.

PREREQUISITE: MPO 611 OR PERMISSION OF INSTRUCTOR.

MPO671 Advanced Studies in Meteorology and Physical Oceanography

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO672 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO673 Advanced Studies in Meteorology and Physical Oceanography

1- 4 credits

Offered By Announcement Only

Supervised study in areas of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO674 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

MPO675 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study of special interest to graduate students.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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Graduate Course Listing
MARINE AND ATMOSPHERIC SCIENCE
MARINE & PHYSICAL OCEANOGRAPHY

MPO700 Practical Training and Internship

1- 6 credits

Offered By Announcement Only

Supervised internship or off-campus employment for students pursuing the M.A., M.S., or Ph.D. degree. Consists of work related to research in progress.

MPO705 Special Project

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

Supervised project for students pursuing the Master of Arts degree. Consists of a paper, researched and written on a topic approved by the student's advisory committee, and presented as a seminar to the student's division. Six credits are required for graduation.

PREREQUISITE: COMPLETION OF 24 GRADUATE COURSE CREDITS.

MPO706 Special Project-Post Candidacy

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

Used to establish student has been admitted to candidacy for the MA degree. The student working on his/her research paper enrolls for credit not to exceed 6 combined with 705. No credit is awarded until final paper has been accepted.

MPO710 Master's Thesis

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

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

MPO715 Master's Thesis-Post Candidacy

1- 6 credits

Fall & Spring Semester & First & Second Summer Session

Used to establish student has been admitted to candidacy for the MS degree. The student working on his/her Master's Thesis enrolls for credit not to exceed 6 combined with 710. Credit is not awarded until the Thesis has been accepted.

MPO720 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

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 MPO 710 (usually six credits). Credit not granted. May be regarded as full time residence.

MPO730 Doctoral Dissertation

1-12 credits

Fall & Spring Semester & First & Second Summer Session

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 MPO 730 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.

MPO740 Doctoral Dissertaion-Post Candidacy

1-12 credits

Fall & Spring Semester & First & Second Summer Session

Used to establish student has been admitted to candidacy for the Ph.D degree. The student working on his/her Doctoral Dissertation enrolls for credit for a minimum of 12 combined with 730. Credit is not awarded until Dissertation has been accepted.

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Graduate Course Listing
MARINE AND ATMOSPHERIC SCIENCE
MARINE & PHYSICAL OCEANOGRAPHY

MPO750 Research in Residence

0 credit

Fall & Spring Semester & First & Second Summer Session

Used to establish research in residence for the Ph.D., after the student has been enrolled for the permissible cumulative total in appropriate doctoral research. Credit not granted. May be regarded as full-time residence as determined by the Dean of the Graduate School.

RSMAS-GENERAL

RSM500 Research Diving Techniques

3 credits

Offered By Announcement Only

This course is designed to introduce students to the practices and policies of scientific diving. The object is to prepare students to use SCUBA as a research tool for the marine sciences. The course content will qualify students as RESEARCH DIVERS under the UM/RSMAS Scientific Diving Program and will meet the standards set by the American Academy of Underwater Sciences (AAUS).

RSM510 Environmental Ethics

3 credits

Fall Semester

This course will introduce students to a variety of key issues and concepts in environmental ethics. The course will be a joint scientific and philosophic collaboration, exploring the ethical dimensions of controversial and emerging issues in biotechnology and the environment. After students are exposed to the scientific background of various actual case studies focusing on current environmental and social impact, the ethical and philosophical issues raised by the discussions will be explored using the tools and methods of analytic philosophy. The course will develop the student's ability to construct and evaluate philosophical arguments in the field of environmental ethics, and to reason philosophically on numerous questions in contemporary applied ethics.

PREREQUISITE: ALTHOUGH THERE ARE NO PHILOSOPHY PREREQUISITES FOR THIS COURSE, PERMISSION OF INSTRUCTOR IS REQUIRED.

RSM520 Climate and Society

3 credits

Spring Semester

This course is designed to provide students from different disciplinary backgrounds with an overview of physical processes, general concepts and policy debates surrounding climate issues.

RSM560 Investigating Nature through Science Teacher Active Research (INSTAR)

2 credits

First & Second Summer Session

This is a graduate level marine science course that provides a hands-on approach to education focused on geological and meteorological research in South Florida environment. The course provides training in marine science content, field techniques, state-of-the-art field, computer technology, and science educational reform measures. Participants work collaboratively with marine and atmospheric scientists to bring cutting edge marine science content and research to the classroom focusing on the following coastal themes: geology, hydrology and meteorology. The course will be applicable to all graduate and qualified undergraduate marine science students, per-service teachers in colleges of education, and in-service teachers in school systems throughout the country.

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Graduate Course Listing
MARINE AND ATMOSPHERIC SCIENCE
RSMAS-GENERAL

RSM561 INSTAR for Physical Sciences Follow-up

1 credits

First & Second Summer Session

This is a follow-up course for participants in MGG 560 and is designed to test the application of the methods learned in MGG 560 to the teaching of high school students. Participants are expected to show evidence of teaching material learned in MGG 560.

PREREQUISITE: RSM 560.

RSM562 Investigating Nature through Science Teacher Active Research in Biological Science

2 credits

First & Second Summer Session

This is a graduate level marine science course that provides a hands-on approach to education focused on marine science research and technology in South Florida coastal environments. The course provides training in marine science content, field techniques, state-of-the-art field and computer technology, and science educational reform measures. Participants work collaboratively with marine scientists to bring cutting edge marine science content and research to the classroom focusing on the following coastal themes: coral reefs and marine fisheries. The course will be applicable to all graduate and qualified undergraduate marine science students, per-service teachers in colleges of education, and in-service teachers in school systems throughout the country.

RSM563 INSTAR Biological Sciences Follow-up

1 credits

First & Second Summer Session

This is a follow-up course for participants in RSM 562 and is designed to test the application of the methods learned in RSM 562 to the teaching of high school students. Participants are expected to show evidence of teaching material learned in RSM 562.

PREREQUISITE: RSM 562.

RSM570 Carbon and Climate

3 credits

Offered By Announcement Only

This course is designed to **provide students from different disciplinary backgrounds with an overview of the underlying processes, concepts, and policy debates surrounding the issue of carbon emissions and climate change. Individual faculty from RSMAS and elsewhere will lecture on cutting-edge research areas. Topics covered include: climate modeling; and climate policy.

PREREQUISITE: GRADUATE OR SENIOR STANDING AT RSMAS, OR PERMISSION OF INSTRUCTOR.

RSM571 Special Topics

1- 4 credits

Offered By Announcement Only

Lectures and research projects in special topics related to Marine and Atmospheric Science.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

RSM572 Special Topics

1- 4 credits

Fall & Spring Semester & First & Second Summer Session

Lectures and research projects in special topics related to Marine and Atmospheric Science.

PREREQUISITE: PERMISSION OF INSTRUCTOR.

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MARINE AND ATMOSPHERIC SCIENCE
RSMAS-GENERAL

RSM600 Research Ethics

0 credit

Fall Semester

The NIH Guide for Grants and Contracts stipulates that Institutions receiving support for National Research Service Award Training Grants are required to develop a program in the principles of Scientific Integrity. The University of Miami Rosenstiel School has chosen to respond to this requirement with this course. This course must be taken during the first semester in the Department or Program. This is a six-hour course and will be given in two sessions of three hours each.

RSM610 Marine and Atmospheric Science Colloquia

0 credit

Fall & Spring Semester

An interdisciplinary series of seminars presented by various faculty on current research projects. Course consists of one 1-hour seminar per week. All students are required to register for this course at least once and be expected to attend two consecutive semesters.

RSM620 Object-oriented Programming and Agent-based Modeling

3 credits

Spring Semester

Basics of object-oriented programming using Java, including Java statistical packages, and hands-on development of agent-based simulation models for social, economic, biological and physical sciences. Includes introductions to automaton and individual-based models.

PREREQUISITE: STUDENTS MUST BE COMMITTED TO RAPID LEARNING TO ADVANCED LEVELS IN A SHORT TIME. ONLY 8 STUDENTS PER CLASS DUE TO FACILITY LIMITATIONS.

RSM671 Advanced Studies

1- 4 credits

Offered By Announcement Only

Supervised study or advanced special topics.

PREREQUISITE: PERMISSION OF INSTRUCTOR.