MEES - MARINE-ESTUARINE-ENVIRONMENTAL SCIENCES

MEES432 Physiological Ecology of Animals (3 Credits)
An examination of the influence of environmental constrains on animal function and energetic efficiency in the context of abiotic conditions in the habitats occupied by individuals.
Prerequisite: BSCI361; or students who have taken courses with comparable content may contact the department; or permission of instructor.
Credit Only Granted for: MEES498E, MEES698E, MEES432, or MEES632.
Formerly: MEES498E.

MEES498 Topics in Marine-Estuarine-Environmental Sciences (1-4 Credits)
Lecture and/or laboratory series organized to study a selected area of marine-estuarine-environmental sciences not otherwise considered in formal courses.

MEES601 Applied Environmental Science (2 Credits)
Designed to promote an appreciation of interdisciplinarity in natural and social sciences and to provide exposure to how science can influence and inform ongoing policy and management debates. The course addresses the role of science and scientists in providing information to policy makers and managers on complex environmental challenges.
Credit Only Granted for: MEES601 or MEES609A.
Formerly: MEES609A.

MEES602 R Programming Basics (1 Credit)
R Programming- Part 1 Module (Basics)
Credit Only Granted for: MEES708X or MEES602.
Formerly: MEES708X.

MEES603 Responsible Conduct of Research (1 Credit)
Explores the "rules of the road" for being a scientist. Using a case study approach, the seminar will cover concepts of how science is regulated, what constitutes misconduct, how research is planned, conducted, and reported authorship and data ownership, and the ethical treatment of human and animal subjects. The course will focus mainly on mentor-trainee interactions and diversity in the sciences.
Credit Only Granted for: MEES608B or MEES603.
Formerly: MEES608B.

MEES604 Biometry (3 Credits)
Application of inferential statics to environmental data, design a sound experiments and studies, and a working knowledge of R.
Credit Only Granted for: BIOM601, MEES604, MEES698B.
Formerly: MEES698B.

MEES605 Energy and Environment (3 Credits)
Role of energy in environmental and human-dominated systems and their linkage. Discussion of the historical and modern production and consumption of energy. Energy systems simulation modeling, energy analysis and energy auditing. Review of national energy policies and proposed alternatives.
Prerequisite: MATH120; or must have completed MATH220; or students who have taken courses with comparable content may contact the department. Cross-listed with ENST605.
Credit Only Granted for: ENST405, ENST605, MEES605, or MEES698Z.
Formerly: MEES698Z.

MEES606 Cell and Molecular Biology for Environmental Scientists (4 Credits)
An invisible world courses through every living thing. This is the world of molecules, tiny machines millions of time smaller than the machines we are most familiar with, like automobiles. Individually, each of the molecules is a delicate instrument, measuring, making, weighing, and building the thing we call life. The molecules of living things are unique among the molecules of the Earth. These tiny molecular messengers, engines, and machines are built to perform highly specific tasks unlike the molecules formed by physical processes.
Prerequisite: An undergraduate course in cell biology or biochemistry.
Credit Only Granted for: MEES698C or MEES606.
Formerly: MEES698C.

MEES607 Quantitative Methods in Environmental Sciences (3 Credits)
Mathematical approaches and solutions (both analytical and numerical) that cut across environmental disciplines, and will introduce analytical techniques.
Prerequisite: MATH120 and MATH121; or must have completed MATH220 and MATH221; or students who have taken courses with comparable content may contact the department.
Credit Only Granted for: MEES607 or MEES698G.
Formerly: MEES698G.

MEES608 Seminar in Marine-Estuarine-Environmental Sciences (1-2 Credits)

MEES609 Professional Development in Marine Estuarine Environmental Science (1-3 Credits)
Training designed for existing and future careers.
Repeatable to: 20 credits if content differs.

MEES610 Land Margin Interactions (4 Credits)
Broad overview of the components and biogeochemistry of the coastal zone(atmosphere, land, streams, wetlands, estuaries) and the time and space scales on which interactions occur between components. Includes 4 h of classes per week with readings from the literature, field trips, a term paper, and a forum. Course is taught on the Interactive Video Network.
Credit Only Granted for: MEES610 or MEES698I.
Formerly: MEES698I.

MEES611 Estuarine Systems Ecology (3 Credits)
A broad systems perspective on the important components and processes of estuarine ecosystems, with quantitative and/or mathematical treatment toward development of representative models for estuarine dynamics.

MEES612 Applied Bayesian Statistics (1 Credit)
This seminar will explore the advanced practices of Bayesian network and graphical model to high dimensional inter-disciplinary environmental data. Through hands-on experience and real studies from Bayesian perspectives, students will learn the basics of evaluating Bayesian network and graphical analyses, and interpreting and communicating the results. Case studies involving ecological and environmental science will be used to illustrate Bayesian analyses. The statistical programming language R and software packages such as OpenBUGS, JAGS, and STAN will be used in illustrating Bayesian models.
Recommended: MEES 698B or equivalent course, students are encouraged to discuss with the instructor.
Credit Only Granted for: MEES 608R or MEES612.
Formerly: MEES608R.

MEES613 Environmental Statistics I (3 Credits)
Extends the quantitative training for students in the environmental sciences. It will explore the basic practices of statistics to inter-disciplinary environmental data. The goal is to train students with the statistical knowledge and tools needed to conduct statistical analysis in their own research. The statistical programming language R is used in class, to complete homework sets, and to analyze online data.
Credit Only Granted for: MEES698B or MEES613.
Formerly: MEES698B.

MEES614 Spatial Ecology in R (3 Credits)
Many ecological questions in terrestrial and marine systems originate from the observation that organisms and the ecological processes that influence them vary in space. This course emphasizes the study of spatial ecological patterns (including animal movement), the processes that generate and maintain these patterns and processes, and the construction of models in R to analyze, simulate, and understand the interplay between spatial pattern, ecological processes, and scale. The objective of the course is to introduce students to ecological theories and concepts relevant to the study of spatial ecological patterns in terrestrial and marine systems, while providing the R skills necessary to articulate and answer scientific questions by confronting models with data.
Prerequisite: General Ecology and basic proficiency in R programming.
Recommended: Courses in GIS and statistics.
Restriction: Permission of instructor.

MEES615 Scientific Writing and Communication (2 Credits)
This professional development course will provide graduate students with a solid foundation in the fundamental concepts of scientific writing and communication to both scientists and citizens. Main topics will include the peer-review process and paper structure, how to develop strong editing and review skills, and how to craft effective research and outreach talks. Additional topics will include scientific ethics and application of communication skills to proposals, networking, job applications, and interviews. Students must agree to write new text for each writing assignment.
Restriction: Must have completed first year of graduate study; or permission of the instructor; and must have permission of the Marine Estuarine Environmental Sciences (MEES) Program.
Credit Only Granted for: MEES608D or MEES615.
Formerly: MEES608D.
Additional Information: Offered synchronously to all MEES partner institutions via video. Please contact the instructor(s) for access and logistical information as needed.

MEES617 Hydrological Effects of Land Use Change (3 Credits)
Detailed examination of the catchment-scale hydrological effects attributable to major land use and land cover alterations, including both anthropic and non-anthropic disturbances.
Prerequisite: Statistics course and hydrology course or permission of instructor.

MEES618 Seminars in Marine Estuarine Environmental Sciences (1-2 Credits)
Topics of interest in Marine Estuarine Environmental Sciences.
Repeatable to: 20 credits if content differs.

MEES620 Environment and Society (3 Credits)
Students will obtain foundational knowledge of core theories and methods that integrate cultural and socio-economic research into environmental science. Key topics include: coupled natural and human systems, cultural models of the environment, social networks, ecological economics, political ecology, environmental justice, and science communication.
Cross-listed with: ANTH620.
Credit Only Granted for: ANTH620 or MEES620.
Additional Information: Offered over the interactive video network.

MEES621 Biological Oceanography (4 Credits)
Population and community ecology of estuarine and marine systems; coastal and estuarine processes are emphasized in the context of oceans in general. Field and lab trips required.

MEES622 Sustainability Science: quantitative and systems approach (3 Credits)
Modern sustainability science goes beyond single-resource management and integrates biophysical and socio-economic considerations of sustainability. This course is designed to help provide students with a historical background, critical thinking approaches, and analytical tools to address sustainability from a scientific perspective.

MEES623 Comparative Animal Physiology (2 Credits)
Introduces students to the many biochemical and physiological mechanisms that allow different species to inhabit a variety of ecosystems.
Recommended: Undergraduate Biochemistry or Physiology.
Jointly offered with: MEES423.

MEES626 Environmental Geochemistry I (3 Credits)
Brief overview of biogeochemical cycles; fundamental aquatic chemistry that can be applied to a variety of environmental systems.
Recommended: Completion of one semester of physical chemistry is recommended.
Restriction: Permission of instructor.
Credit Only Granted for: MEES626 or MEES698L.
Formerly: MEES698L.

MEES627 Biogeochemistry (3 Credits)
A detailed examination of Earth's biogeochemical cycles, with an emphasis on major elements and carbon cycling through globally important biomes. Topics include biogeochemical cycles of organic carbon and nutrients in terrestrial, lacustrine, wetland, and marine systems.
Credit Only Granted for: MEES627 or MEES698K (Spring 2023).
Formerly: MEES698K.

MEES631 Fish Ecology (3 Credits)
Study of the interrelationships between individuals, their communities and environment. Explores the environmental biology of fish, feeding ecology, energetics and growth, population biology, reproduction and life history, and population and community interactions.
Restriction: Permission of instructor.

MEES632 Physiological Ecology of Animals (3 Credits)
An examination of the influence of environmental constrains on animal function and energetic efficiency in the context of abiotic conditions in the habitats occupied by individuals.
Credit Only Granted for: MEES698E, MEES498E, MEES432, MEES632.
Formerly: MEES698E.

MEES637 Zooplankton Ecology (3 Credits)
A quantitative investigation of zooplankton ecology, emphasizing population dynamics and modeling, feeding, behavior, food-webs, and bio-physical interactions.
Prerequisite: MEES621; or permission of instructor.
Credit Only Granted for: MEES698G, MEES637.
Formerly: MEES698G.

MEES640 Interconnected Earth Systems: Land, Ocean, and Estuary (3 Credits)
Explores the interconnected physical and biogeochemical systems of land, estuary, and ocean with cross cutting themes of human impacts and global change. Broad concepts will be combined with targeted interactive case studies to demonstrate how these systems are linked by humans, climate, and water.

MEES650 Advanced Wetland Ecology (3 Credits)
Plant and animal communities, biogeochemistry, and ecosystem properties of wetlands. Lectures are supplemented by field trips (normally 2 days total during the semester) and in-class labs. Hands-on activities and exercises include identification of wetland plant species, wetland mapping and delineation, and collection and analysis of field data on wetland vegetation, soil, and hydrology. Wading boots (at least hip length) are strongly recommended.
Prerequisite: BIOM301; and ENST360 or other ecology equivalent; or permission of AGNR-Environmental Science and Technology department; or permission of CMNS-Marine & Estuarine-Environmental Science Program).
Cross-listed with: ENST650.
Jointly offered with: ENST450, MEES650.
Credit Only Granted for: ENST450, ENST650, or MEES650.
Additional Information: Wading boots (at least hip length) are strongly recommended.

MEES660 Ecological Systems (3 Credits)
An introduction to the field of ecology is provided for matriculating graduate students and prepares them for more advanced concepts. Students will be exposed to ecology both in theory and practice through lectures, readings, and quantitative exercises, round table debates and discussions with current practitioners.

MEES661 Physics of Estuarine and Marine Environments (3 Credits)
General introduction to the physical oceanography of estuarine and marine systems. Physical characteristics of seawater, heat and mass transport, major ocean currents, basic dynamical oceanography, surface waves, tides, turbulence, sediment transport, estuarine circulation.
Prerequisite: Must have completed one year of physics coursework; and must have completed one year of calculus coursework. Or permission of instructor.

MEES670 Conservation Biology (3 Credits)
Conservation in the Anthropocene means conserving biodiversity and ecosystem function in the midst of climate change, habitat loss, overexploitation, altered nutrient cycling, and invasive species with protected areas and reserve networks, ecosystem restoration, and other biodiversity conservation and management schemes.Cross-listed with CONS670.
Credit Only Granted for: CONS670 or MEES670.

MEES671 Remote Sensing for Environmental Management (4 Credits)
Coverage of tools necessary to carry out remote sensing studies of ecosystem pattern and process, land-use and land-cover change and the impact of climate changes. General overview of recent research at the interface of remote sensing, ecosystem analysis, global change, and environmental management.
Credit Only Granted for: MEES671, MEES698X.
Formerly: MEES698X.

MEES680 Cell and Molecular Biology for the Environmental Scientist-From Genes to Ecosystems (3 Credits)
Introduces environmental scientists to the methods and approaches that are the foundations for today's breakthroughs in molecular and cellular biology. Detailed examination of papers published in the last few years along with online background materials will be used to reinforce the connection of key concepts to experimentation.

MEES681 Advanced Ecological Design (3 Credits)
An advanced survey course on the field of ecological design. Principles of design are illustrated with case studies from biologically-based waste treatment systems, ecosystem management and sustainable development.
Prerequisite: Must have completed one semester of calculus; and (CHEM131 and PHYS121). Or permission of instructor. Cross-listed with E NST681.
Credit Only Granted for: ENST481, ENST681, or MEES681.

MEES682 Fishery Science and Management (3 Credits)
Aquatic production and fisheries yields. Introduction to fish population dynamics and assessment methods. Effects of fishing on resource potential yields. Causes of fluctuations in resource abundance. An emphasis on the relationship between science and management.
Restriction: Permission of instructor.

MEES684 Marine Microbial Ecology (3 Credits)
The primary goal of this course is to become familiar with the diversity, ecology, and biogeochemical roles of Bacteria, Archaea, microbial Eukaryotes, viruses, and fungi in the marine environment. The course will also cover the latest discoveries in molecular microbial ecology. Each main topic will begin with a lecture and will be followed by a paper discussion. For the paper discussions, each student will present selected papers specified in the syllabus (or by consensus with the course instructors). Students will also participate in class discussions.

MEES687 Next Generation Sequence and Analysis (2 Credits)
Provides a general background to sequence analysis and then move through a series of student-directed tutorials, mostly on the command line, working with datasets for the final thesis. Students who do not have data will be provided with comparable sequence files to gain fluency. The goal is to provide students with hands-on experience with Next-Generation sequence datasets and tailor the instruction to further enhance research.
Credit Only Granted for: MEES618C or MEES687.
Formerly: MEES618C.
Additional Information: Offered synchronously to all MEES partner institutions via video. Please contact the instructor(s) for access and logistical information as needed.

MEES698 Special Topics in Marine-Estuarine-Environmental Sciences (1-4 Credits)
Credit according to time schedule and course organization. Lecture and/or laboratory series organized to study selected areas of environmental science not otherwise considered by existing courses. May be repeated for credit since topic coverage will change.

MEES699 Special Problems in Marine-Estuarine-Environmental Sciences (1-3 Credits)
Research on specialized topics under the direction of individual faculty members.

MEES708 Advanced Topics in Marine-Estuarine-Environmental Science (1-4 Credits)
Lectures, experimental courses and other specialized graduate training in various relevant disciplines.
Repeatable to: 12 credits if content differs.

MEES712 Advanced Population Dynamics and Assessment (4 Credits)
Quantitative and modeling skills, including understanding of population dynamics and responses of populations to exploitation and management actions. Coverage of population models of production, mortality, stock and recruitment, age and growth, and harvesting, and methods for using these models to provide management advice.
Prerequisite: MEES607 or BIOM601; or permission of instructor.
Credit Only Granted for: MEES698D or MEES712.
Formerly: MEES698D.

MEES713 Environmental Statistics II (3 Credits)
Students will extend statistical training to advanced topics of time series analysis and spatial statistics. After taking this course, students will be familiar with a variety of state-of-the-art approaches for qualitative analysis of time- and space-dependent data. Students will become competent users of these methods by practicing them in class and in their homework assignments using the statistical programming language R.
Credit Only Granted for: MEES708M or MEES713.
Formerly: MEES708M.
Additional Information: Offered synchronously to all MEES partner institutions. Please contact the instructor(s) for access and logistical information as needed.

MEES718 Study Groups on Issues in Marine Estuarine Enviornmental Sciences (1-2 Credits)
Active discussions on current environmental topics and issues. Efforts may result in manuscripts, technical report or innovative communication products.
Prerequisite: MEES601 or MEES609A; or permission of the advising committee and instructor.
Repeatable to: 6 credits if content differs.

MEES743 Aquatic Toxicology (3 Credits)
Comprehensive course in which a definitive description of basic concepts and principles, laboratory testing and field situations, as well as examples of typical data and their interpretation and use by industry and water resource managers, will be discussed. The toxicological action and fate of environmental pollutants will be examined in aquatic ecosystems, whole organisms and at the cellular, biochemical and molecular levels.

MEES753 Sediment Dynamics in Coastal and Estuarine Environments (3 Credits)
Focuses on sediment dynamics along the land-sea continuum, from intertidal to nearshore regions. The first part of the course develops relevant sediment-transport theories and equations used in the second part to examine coastal landscapes and features, including sediment/vegetation interactions. Integration of field observations and modeling approaches will be emphasized throughout the course, as will human impacts and responses to climate change.
Prerequisite: MEES640 or MEES660; or permission of instructor.
Credit Only Granted for: MEES698G or MEES753.
Formerly: MEES698G.
Additional Information: Offered synchronously to all MEES partner institutions. Please contact the instructor(s) for access and logistical information as needed.

MEES799 Masters Thesis Research (1-6 Credits)

MEES898 Pre-Candidacy Research (1-8 Credits)

MEES899 Doctoral Dissertation Research (1-8 Credits)