

MARINE SCIENCE (MSCI)

MSCI 101 - The Ocean Environment (4 Credits)

Origin and evolution of the oceans, plate tectonics, ocean circulation, waves and tides, seawater and sediment composition, and influences on biology. Three lecture and three laboratory hours per week. Scheduled field trips required.

Carolina Core: SCI

MSCI 102 - The Living Ocean (4 Credits)

Origin, evolution, and diversity of marine life, biological production, trophic dynamics, nutrient cycles, marine resources, and environmental concerns. Three lecture and three laboratory hours per week. Scheduled field trips required.

Carolina Core: SCI

MSCI 210 - Oceans and Society (3 Credits)

A nontechnical introduction to human interactions with the marine environment: marine organisms, marine systems, and the physical and chemical characteristics of oceans and estuaries. Not available for marine science major credit.

Carolina Core: SCI

MSCI 210L - Oceans and Society Laboratory (1 Credit)

Experiments and exercises which illustrate how specific components of marine environments are structured, function, and can be measured. Two laboratory hours per week. Not available for marine science major credit. Attendance on designated field trips may be required.

Prerequisite or Corequisite: MSCI 210.

Carolina Core: SCI

MSCI 215 - Coastal Environments of the Southeastern U.S. (3 Credits)

Coastal zones of South Carolina and neighboring states, including geologic history, geomorphology, stratigraphy, hydrogeology, shoreline processes, environmental issues, and effects of man. Not available for geological science or marine science major credit. Three lecture hours each week plus optional field trips.

Cross-listed course: GEOL 215

Carolina Core: SCI

MSCI 215L - Coastal Environments of the Southeastern U.S. (Laboratory) (1 Credit)

Exercises examining coastal ecology, geomorphology, hydrogeology, shoreline processes, environmental issues, and human impact. Not available for marine science major credit. Two laboratory hours per week. Scheduled field trips required.

Prerequisite or Corequisite: D or better in GEOL 215 or MSCI 215.

Cross-listed course: GEOL 215L

Carolina Core: SCI

MSCI 305 - Ocean Data Analysis (3 Credits)

Instrumentation, oceanographic time series, spatial and directional data sets, and basic parametric modeling.

Prerequisites: MSCI 101 and MATH 141.

Graduation with Leadership Distinction: GLD: Research

MSCI 311 - Biology of Marine Organisms (4 Credits)

Biological concepts emphasizing adaptation to marine environments. Laboratory experiments emphasize principles and techniques of marine biological study. Three lecture and three laboratory hours per week. Scheduled field trips are required.

Prerequisites: MSCI 102 or BIOL 101.

MSCI 313 - The Chemistry of the Sea (4 Credits)

Biogeochemical cycling, carbonate chemistry, climate change, hydrothermal vents, stable isotopes, trace metals, radioactive tracers, mass balance, and properties of sea water. Three lecture and three laboratory hours per week.

Prerequisites: C or better in MSCI 101, CHEM 111, CHEM 112, and MATH 141.

MSCI 314 - Physical Oceanography (4 Credits)

Properties of seawater, mass and momentum balances, circulation, mixing, waves and other processes in the marine environment.

Prerequisites: C or better in MSCI 101 and MATH 141; C or better in PHYS 201 or PHYS 211.

MSCI 335 - Processes of Global Environmental Change (4 Credits)

The science of global change, its relation to the hydrosphere, atmosphere, lithosphere, and biosphere. Global system science, biogeochemical cycles, paleoclimatology, glaciation, and eustasy.

Cross-listed course: GEOL 335

MSCI 365 - Data Science in Earth, Ocean and Environmental Science (3 Credits)

Computational analysis of earth, marine, and environmental datasets applying time series analysis, regression, filtering, and statistical analysis.

Prerequisites: C or better in STAT 515; C or better in CSCE 206 or higher; C or better in MATH 142 or higher.

Cross-listed course: ENVR 365, GEOL 365

MSCI 375 - The Deep Sea (3 Credits)

The Deep Sea is an interdisciplinary, scientific survey of the geology, biology, chemistry, and physical setting of the deep-sea (more than 1000 m depth).

MSCI 390 - Policy and Marine Science (3 Credits)

Analysis of past and current issues in global and national marine policy. Relationship between science and policymakers.

MSCI 399 - Independent Study (1-6 Credits)

Contract approved by instructor, advisor, and department chair is required for undergraduate students.

Graduation with Leadership Distinction: GLD: Research

MSCI 450 - Principles of Biological Oceanography (3 Credits)

Principles and methods of measuring production in the sea. Emphasis on the ocean's role in the global carbon budget. Three lecture hours per week. Scheduled field trips are required.

Prerequisites: MSCI 311, BIOL 301.

Cross-listed course: BIOL 450

MSCI 460 - Field and Laboratory Investigations in Marine Science (1-4 Credits)

Intensive inquiry-based investigations combining oceanographic field sampling with laboratory measurements of collected samples using modern analytical instrumentation, and with analysis and integration of data into a final research report. Most of the course is conducted in residence at a marine field site.

Prerequisites: C or better in MSCI 101 and MSCI 102 or C or better in BIOL 101 and 102.

Graduation with Leadership Distinction: GLD: Professional and Civic Engagement Internships, GLD: Research

MSCI 495 - Internship in Marine Science (0-6 Credits)

Internship experience that offers practical field or laboratory experience in oceanography and/or related marine sciences. Course content varies and will be announced by title in schedule of courses. Usually conducted off campus and student must be able to access internship on their own.
Prerequisites: C or better in MSCI 311, MSCI 313 and MSCI 314.

MSCI 496 - Undergraduate Research (3 Credits)

Student research on problems of fundamental significance in collaboration with faculty mentors. Emphasis on critical thinking, problem solving, proposal development, scientific writing, and professional presentation. Nine hours of laboratory, field, or library work per week.

Graduation with Leadership Distinction: GLD: Research

MSCI 497 - Undergraduate Research (3 Credits)

Student research on problems of fundamental significance in collaboration with faculty mentors. Emphasis on critical thinking, problem solving, proposal development, scientific writing, and professional presentation. Nine hours of laboratory, field, or library work per week.

Graduation with Leadership Distinction: GLD: Research

MSCI 498 - Undergraduate Research (3 Credits)

Student research on problems of fundamental significance in collaboration with faculty mentors. Emphasis on critical thinking, problem solving, proposal development, scientific writing, and professional presentation. Nine hours of laboratory, field, or library work per week.

Graduation with Leadership Distinction: GLD: Research

MSCI 499 - Undergraduate Research (3 Credits)

Student research on problems of fundamental significance in collaboration with faculty mentors. Emphasis on critical thinking, problem solving, proposal development, scientific writing, and professional presentation. Nine hours of laboratory, field, or library work per week.

Graduation with Leadership Distinction: GLD: Research

MSCI 501 - Principles of Geomorphology (3 Credits)

The process of earth denudation with emphasis on chemistry of weathering, stream and erosion hydraulics, quantitative analysis of land form evolution.

Prerequisites: C or better in GEOL 101.

Cross-listed course: GEOL 501

MSCI 502 - Principles of Coastal Geomorphology (4 Credits)

Geological and physical controls on the morphology, development, and stability of coastlines. Analysis of waves and erosional processes, and coastal zone morphodynamics. Several required field trips.

Prerequisite or Corequisite: D or better in MATH 122 or MATH 141.

Cross-listed course: GEOL 502

MSCI 503 - Environmental Microbiology (3 Credits)

An overview of the microbial world including a survey of the distribution, functioning, and diversity of microorganisms in natural systems. Discusses the crucial roles that microorganisms play in ecosystem function, biogeochemical cycles, and environmental quality.

Prerequisites: MSCI 102 or BIOL 102, CHEM 112.

Cross-listed course: BIOL 502

MSCI 504 - Climate Geoengineering (3 Credits)

This course will discuss the urgent need for deploying solar radiation and carbon dioxide removal approaches at scale, including potential benefits and risks of these options. It will also discuss regulatory and governance considerations at both the national and international level and strategies to incentivize large-scale adoption of these approaches.

Cross-listed course: ENVR 504, GEOL 504

MSCI 505 - Senior Seminar (1 Credit)**MSCI 509 - MATLAB-Based Data Analysis in Ocean Sciences (3 Credits)**

MATLAB-based course in processing, analysis, and visualization of large oceanographic data sets. Includes scalar and vector time series measured at fixed locations as well as shipboard surveys of oceanographic characteristics varying both in 3-D and in time. Methods and techniques are relevant to other geoscience disciplines.

Prerequisites: MATH 141.

MSCI 510 - Invertebrate Zoology (4 Credits)

Phylogenetic and comparative aspects of anatomy, physiology, reproduction, and embryology of the invertebrates. Three lecture and one three-hour laboratory period per week.

Prerequisites: C or better in BIOL 301 or MSCI 311.

Cross-listed course: BIOL 510

Graduation with Leadership Distinction: GLD: Research

MSCI 511 - Advanced Paleontology (3 Credits)

Systematic, ecologic, biogeographic, and evolutionary aspects of paleontology; lectures, practical exercises, field trips.

Prerequisites: C or better in GEOL 305.

Cross-listed course: GEOL 511

MSCI 515 - Marine Micropaleontology (4 Credits)

Marine microfossils; distribution, ecology, paleoecology, and biostratigraphy; use of microfossils in marine sediments to study oceanographic history. Three lectures and two laboratory hours per week.

Cross-listed course: GEOL 515

MSCI 521 - Introduction to Geochemistry (3 Credits)

Investigation of low temperature chemical reactions controlling the geochemistry of the earth's surface. Emphasis on CO₂, carbonates, oxidation-reduction, thermodynamics, isotopes, biogeochemistry.

Cross-listed course: GEOL 521

MSCI 524 - Environmental Radioisotope Geochemistry (3 Credits)

Introduction to radioactivity and the use of radionuclides to study environmental processes, including age-dating and biogeochemical cycling in aquatic systems.

Prerequisites: C or better in CHEM 111, CHEM 112 and MATH 141.

Cross-listed course: GEOL 524

MSCI 525 - Marine Plants (4 Credits)

Diversity, distribution, physiology, ecology, evolution, and economic importance of marine algal, seagrass, and mangrove communities. Three lecture and three laboratory hours per week. Scheduled field trips are required.

Prerequisites: BIOL 301 or MSCI 311.

Cross-listed course: BIOL 525

MSCI 535 - Fishery Management (3 Credits)

Management and conservation of aquatic and marine resources, with emphasis on fisheries. Data procurement and analysis; commercial and recreational fisheries; sociological, political, legal, and environmental factors that affect fishery management; and fish biodiversity.

Prerequisites: BIOL 301.

Cross-listed course: BIOL 535

MSCI 536 - Ichthyology (4 Credits)

Phylogeny, morphology, behavior, and ecology of fishes. Three lecture and 3 laboratory hours plus three field trips to be arranged.

Prerequisites: BIOL 301 or MSCI 311.

Cross-listed course: BIOL 536

Graduation with Leadership Distinction: GLD: Research

MSCI 537 - Aquaculture (3 Credits)

Introduction to the practical and scientific aspects of the commercial culture of freshwater and marine organisms. Three lecture hours per week. One all-day field trip required.

Prerequisites: BIOL 301 or MSCI 311.

Cross-listed course: BIOL 537

MSCI 538 - Behavior of Marine Organisms (4 Credits)

The identification of behavioral adaptations of estuarine and marine organisms: their ecology, physiology, development, and evolutionary history; field observations.

Prerequisites: BIOL 101 and BIOL 102 or MSCI 311.

Cross-listed course: BIOL 538

Graduation with Leadership Distinction: GLD: Research

MSCI 545 - Geological Oceanography (3 Credits)

A comprehensive study of the origin and development of the major structural features of the ocean basins and the continental margins. Discussion of the techniques used in obtaining geologic data and the interpretation of sedimentary processes, vulcanism, and the stratigraphy of the ocean basins.

Cross-listed course: GEOL 545

MSCI 550 - Sedimentary Simulations and Sequence Stratigraphy (4 Credits)

Problems of sequence stratigraphy resolved with graphic computer simulations. Sedimentary fill of basins by carbonates and/or clastics tracked as a function of rate of sediment accumulation, tectonic behavior, and sea level. Includes laboratory.

Prerequisites: C or better in GEOL 325.

Cross-listed course: GEOL 550

MSCI 552 - Population Genetics (3 Credits)

An introduction to the principles of population genetics, with emphasis on the origin, maintenance, and significance of genetic variation in natural populations.

Prerequisites: C or better in BIOL 301 or MSCI 311.

Cross-listed course: BIOL 552

Graduation with Leadership Distinction: GLD: Research

MSCI 553 - Marine Sediments (3 Credits)

Marine sedimentary environments; physical/biological factors which control the formation and distribution of modern marine sediments.

Prerequisites: C or better in GEOL 516.

Cross-listed course: GEOL 553

MSCI 555 - Conservation and Health in Marine Systems (3 Credits)

Introduces the field of conservation and explores the intersection between conservation and environmental health with a particular focus on coastal and marine case studies.

MSCI 557 - Coastal Processes (3 Credits)

Physical and geological processes controlling the formation and evolution of beach, barrier, and nearshore environments, including discussion of coastal management issues.

Cross-listed course: GEOL 557

MSCI 566 - Ecosystem Analysis (3 Credits)

The formulation and simulation of compartment models of marine and terrestrial ecosystems with complex nutrient cycling, food chains, and energy flow. Analog and digital simulation techniques. Ecosystem stability and sensitivity. Organization, structure, and diversity of an ecosystem.

MSCI 568 - Introduction to Micrometeorology (3 Credits)

Small-scale processes in the atmospheric boundary layers, including energy budget, radiation, soil heat transfer, humidity, viscous flows, turbulence, momentum and heat exchanges, evaporation, and marine atmospheric boundary layer.

Prerequisites: C or better in PHYS 201 and MATH 141.

Cross-listed course: GEOL 568

MSCI 574 - Marine Conservation Biology (3 Credits)

Exploration of how human activities affect marine natural populations, species, communities and ecosystems, including threats to biodiversity; approaches to marine conservation; and ecological and evolutionary responses to anthropogenic disturbance.

Prerequisites: BIOL 301.

Cross-listed course: BIOL 574

MSCI 575 - Marine Ecology (3 Credits)

Structure, dynamics, and interactions between populations and communities in marine ecosystems. Attendance at designated departmental seminars is required. Three lecture hours per week.

Prerequisites: CHEM 111 and BIOL 301 or MSCI 311.

Cross-listed course: BIOL 575

MSCI 575L - Marine Ecology Laboratory (1 Credit)

Laboratory and field exercises in coastal environments. Three hours per week plus field trips.

Prerequisite or Corequisite: MSCI 575 or BIOL 575.

Cross-listed course: BIOL 575L

MSCI 576 - Marine Fisheries Ecology (3 Credits)

Interdisciplinary examination of the distribution, reproduction, survival, and historical variation of the principal commercial marine fisheries.

Prerequisites: BIOL 301.

Cross-listed course: BIOL 576

MSCI 577 - Ecology of Coral Reefs (4 Credits)

Structure, productivity, and biodiversity of coral reefs, emphasizing their sensitivity, stability, and sustainability. Taught as an extended field experience with daily lectures and guided research activities.

Prerequisites: BIOL 301 or MSCI 311.

Cross-listed course: BIOL 577

MSCI 578 - Physiological and Pollution Ecology of Marine Organisms (3 Credits)

Functional adaptation of marine plants and animals to ecological stresses including pollution. Three lecture hours per week.

Prerequisites: MSCI 311 or equivalent.

MSCI 579 - Air-Sea Interaction (3 Credits)

The physical mechanism responsible for interaction between the ocean and the atmosphere and the influence of air-sea interaction on atmospheric and oceanic dynamics and thermodynamics on a wide variety of spatial/temporal scales.

Cross-listed course: GEOL 579

MSCI 580 - Satellite Oceanography (3 Credits)

This course provides knowledge of various techniques used in satellite remote sensing of the oceans. Key skills will be developed in satellite data processing, image analysis, and hands-on research.

Cross-listed course: GEOL 580

MSCI 581 - Estuarine Oceanography (3 Credits)

Estuarine kinematics and dynamics; classification of estuaries; estuarine circulation and mixing. Scheduled field trips are required.

Prerequisites: C or better in MSCI 314.

Cross-listed course: GEOL 581

MSCI 582 - Marine Hydrodynamics (3 Credits)

Basic principles of fluid statics and dynamics. Conservation of mass, momentum, and energy; viscosity, vorticity, and boundary layers with examples from the marine environment. Applications to and analysis of ocean currents and waves.

Prerequisites: C or better in MATH 241 and C or better in either PHYS 201 or PHYS 211.

Cross-listed course: GEOL 582

MSCI 583 - Geology and Geochemistry of Salt Marshes (3 Credits)

Geological and geochemical processes in salt marshes. Methods of geological research in marshes including instrumental techniques, sampling design, and data analysis. Two lectures per week plus four weekends of project oriented fieldwork and/or equivalent lab work. Scheduled field trips are required.

Cross-listed course: GEOL 583

MSCI 585 - Coastal Tropical Oceanography (4 Credits)

Descriptive oceanography of mangrove and coral reef coasts with emphasis on physical processes. Taught as an extended field experience with daily lectures and guided research activities.

Prerequisites: MSCI 312.

MSCI 590 - Beach-Dune Interactions (3 Credits)

Influence of wind on coastal systems, with emphasis on nearshore currents, sediment transport and bedforms, aeolian transport, and dunes. Minimum Junior standing required.

Cross-listed course: GEOG 590

MSCI 599 - Topics in Marine Science (1-3 Credits)

Current developments in marine science selected to meet faculty and student interests. Course content varies and will be announced by title in schedule of courses.

MSCI 624 - Aquatic Chemistry (3 Credits)

Study of the chemical reactions and processes affecting the distribution of chemical species in natural systems. Three lecture hours per week.

Prerequisite or Corequisite: CHEM 321, MATH 142.

Cross-listed course: CHEM 624

MSCI 627 - Marine Phytoplankton (3 Credits)

Examines the physiology and ecology of phytoplankton, including environmental controls on community composition, primary productivity, and detection and characterization of water quality (eutrophication) and harmful algal blooms.

Prerequisites: MSCI 102 or MSCI 450 or BIOL 450.

Cross-listed course: BIOL 627