

SCHOOL OF THE EARTH, OCEAN AND ENVIRONMENT

Courses

ENVR 101 - Introduction to the Environment (3 Credits)

Analysis of environmental issues and the role of science in their identification and resolution.

Carolina Core: SCI

ENVR 101L - Introduction to the Environment Lab (1 Credit)

Demonstrations, field trips, data analyses, and discussion relating to environmental issues, such as sustainability, resource management, and pollution control.

Prerequisite or Corequisite: C or better in ENVR 101.

Carolina Core: SCI

ENVR 121 - Green Explorations (3 Credits)

Interdisciplinary seminar combining the intellectual exploration of ecological perspectives with the physical exploration of the local environment. First-year students only.

Cross-listed course: POLI 121

ENVR 122 - Green Engagements (3 Credits)

Interdisciplinary seminar on designing, researching, and implementing collaborative projects to promote ecological sustainability. First-year students only.

Cross-listed course: POLI 122

Graduation with Leadership Distinction: GLD: Community Service, GLD: Research

ENVR 200 - Natural History of South Carolina (4 Credits)

General review of plants, animals, and geological features of South Carolina, with an emphasis on connections to the natural world.

Carolina Core: SCI

ENVR 201 - Environmental Science and Policy I (4 Credits)

Introduction to interdisciplinary and multidisciplinary perspectives on environmental issues. Required for majors in the Environment and Sustainability Program. Integrative case studies address ways of understanding nature. Sophomore Standing.

ENVR 202 - Environmental Science and Policy II (4 Credits)

Continuing interdisciplinary and multidisciplinary exploration of relations between environment and society for majors in the Environment and Sustainability Program. Case studies raise issues, challenges, and strategies to achieving sustainability.

ENVR 231 - Introduction to Sustainability Management and Leadership (3-4 Credits)

Introduction to development, establishment, and implementation of sustainability management systems and organizational leadership for achieving environmental, social, and economic goals.

ENVR 295 - Green Technology in Germany (3 Credits)

Examination of roots and culture of environmentalism and related technological innovation in Germany. Comparison of green practices around the world to practices within Europe and U.S.

Cross-listed course: GERM 295

Graduation with Leadership Distinction: GLD: Community Service

ENVR 310 - Surface and Subsurface Hydrology (4 Credits)

Environmental considerations of the hydrologic cycle. Occurrence and movement of surface water and groundwater as they relate to water budgets, water supply, and ecosystems. Geochemistry of natural waters, water quality, and pollution.

Prerequisites: C or higher in MATH 122 or MATH 141; C or higher in GEOL 101, GEOL 103, GEOL 201, GEOG 104, GEOG 201, ENVR 101, ENVR 201, ECIV 101 or MSCI 101.

Cross-listed course: GEOL 310

ENVR 321 - Environmental Pollution and Health (3 Credits)

A survey of pollution (chemical, biological, physical) effects on environmental quality and public health with emphases on how each pollutant class behaves and affects individual and community health over acute to chronic exposure periods.

Cross-listed course: ENHS 321

ENVR 322 - Environmental Ethics (3 Credits)

Examination of principles and arguments surrounding moral issues involving the environment.

Cross-listed course: PHIL 322

Carolina Core: VSR

Graduation with Leadership Distinction: GLD: Community Service, GLD: Diversity and Social Advocacy, GLD: Professional and Civic Engagement Leadership Experiences, GLD: Research

ENVR 323 - Global Environmental Health (3 Credits)

Concerns in global environmental health, with a focus on toxic pollution and disease burden in developing countries. Investigation of international treaties, corresponding environmental pollution processes, and human health effects.

Cross-listed course: ENHS 323

ENVR 331 - Integrating Sustainability (3 Credits)

Multidisciplinary approach to interrelated environmental, economic and social problems facing humans at local, regional and global scales.

ENVR 342 - Environmental Anthropology: Cross-cultural Perspectives on Environmental Change (3 Credits)

Cross-cultural perspectives on environmental issues.

Cross-listed course: ANTH 342

ENVR 348 - Environmental Racism and Justice (3 Credits)

History of the environmental justice movement and the unequal distribution of environmental harms on low income, minority, and historically marginalized groups.

Cross-listed course: AFAM 348

ENVR 352 - Energy, Society and Sustainability (3 Credits)

The role of energy in shaping society and geographic settings, as well as how energy production and consumption are shaped by the societal values and norms in which it is extracted, produced, and consumed.

ENVR 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: GEOL 365, MSCI 365

ENVR 399 - Independent Study (1-6 Credits)

Contract approved by instructor, advisor, and dean of the School of the Environment is required for undergraduate students.

Graduation with Leadership Distinction: GLD: Research

ENVR 460 - Congaree National Park: Field Investigations in Environmental Science (4 Credits)

Field research practices and analysis techniques in environmental science. Combines inquiry-based field investigations at Congaree National Park and laboratory sample analysis with integration of data and public policy concepts. Daily field trips required.

Prerequisites: C or better in ENVR 201 and ENVR 202.

ENVR 480 - Capstone Seminar in Environmental Science and Environmental Studies (3 Credits)

Collaborative study of a contemporary environmental issue. Field trips may be required.

ENVR 490 - Special Topics in Sustainability and the Environment (1-4 Credits)

Current developments in sustainability and global environmental issues selected to meet faculty and student interests. May be repeated as content varies.

ENVR 495 - Internship in the Environment (0-6 Credits)

Supervised internship experience in a professional environment within the field of the environment and/or related environmental sciences or studies. Undergraduate internship contract required with approval of instructor, advisor, and department head before registration.

Prerequisites: C or better in ENVR 201 and ENVR 202.

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

Experiential Learning: Experiential Learning Opportunity

ENVR 499 - Research in Environmental Science (1-3 Credits)

Independent student research in collaboration with faculty mentors. Contract approved by instructor, advisor, and department chair is required.

Graduation with Leadership Distinction: GLD: Research

ENVR 500 - Environmental Practicum (3 Credits)

Multidisciplinary research projects related to University or community environmental problems (e.g., energy, water conservation, solid waste, recycling).

ENVR 501 - Special Topics in the Environment (3 Credits)

An in-depth analysis course of a specific interdisciplinary environmental topic. Course content varies and will be announced in the schedule of classes by title.

Prerequisites: C or better in ENVR 101 or ENVR 201.

ENVR 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 strategizes to incentivize large-scale adoption of these approaches.

Cross-listed course: GEOL 504, MSCI 504

ENVR 517 - Socionatural Coastlines in Global Perspective (3 Credits)

A discussion-based seminar course that examines nature-society relations in coastal regions globally. The course will use social theory to understand how uneven development processes shaped – and continue shaping – current coastlines. We will explore key topics including coastal capitalism, delta ecologies, and climate justice via several global case studies.

Cross-listed course: GEOG 517

ENVR 531 - Sustainability Management and Leadership Strategies (3-4 Credits)

Integrated management system principles and advanced leadership strategies to create sustainable development initiatives.

ENVR 533 - Sustainability Projects Course (3 Credits)

Research, development and implementation of sustainability projects throughout the campus and community.

ENVR 534 - Water and Sanitation in Global Perspective (3 Credits)

Interdisciplinary examination of the global policy challenge of ensuring equitable access to water and sanitation services for all.

ENVR 538 - Global Food Politics (3 Credits)

Political, social, and cultural landscapes of food and farming around the world; issues of agricultural production, trade, consumption, and food security.

Cross-listed course: GEOG 538

ENVR 540 - Decolonizing the Environment: Race, Nature, Power (3 Credits)

Critical examination of the ways ideas about nature and racial difference are conceptually and materially entwined with the production of social and environmental inequalities.

ENVR 548 - Environmental Economics (3 Credits)

An analysis of the economics aspects of environmental decay, pollution control, and natural resource use. Analysis of the ability of the market system to allocate resources efficiently when economic activity is accompanied by environmental damage. Discussion of alternative public policy approaches to pollution control and natural resource conservation.

Prerequisites: C or better in ECON 221 and ECON 222 or C or better in ECON 224.

Cross-listed course: ECON 548

ENVR 571 - Conservation Biology (3 Credits)

Principles of conservation biology. Importance of biodiversity, causes of decline and extinction, and restoration and conservation policy in terrestrial and aquatic ecosystems.

Prerequisites: C or better in BIOL 301.

Cross-listed course: BIOL 571

ENVR 572 - Freshwater Ecology (3 Credits)

Quantitative study of the population, community and evolutionary ecology of freshwater habitats (lakes, ponds, rivers, streams, wetlands). Includes mandatory fieldtrips.

Prerequisites: C or better in BIOL 301.

Cross-listed course: BIOL 572

GEOL 101 - Introduction to the Earth (4 Credits)

Origin and nature of the earth with emphasis on internal processes and phenomena such as earthquakes, volcanoes, and mountain building; surface processes, including landform evolution. Three lectures and three laboratory hours each week.

Carolina Core: SCI

GEOL 102 - Fossils and the Evolution of Life on Earth (4 Credits)

Basic overview of fossils, including dinosaurs, and their importance for understanding earth history and the evolution of life. Three lectures and three laboratory hours each week.

GEOL 103 - Environment of the Earth (4 Credits)

Analysis of basic energy cycles of the earth. Interaction of human activity with earth processes to affect the environment. Three lectures and three laboratory hours each week. Field trips required.

Carolina Core: SCI

GEOL 110 - Cultural Geology (3 Credits)

The growth of geological concepts, scientific and non-scientific. The impact of geological factors on human affairs. The role of time and evolution (biological and physical). Restricted to non-science majors.

Carolina Core: SCI

GEOL 170 - The Water Planet (3 Credits)

Introduction to the origin of water and water properties, water in the universe, water in the solar system, water on Earth and its geological history.

Carolina Core: SCI

GEOL 201 - Observing the Earth (4 Credits)

An introduction to study of the earth through observation of ancient and modern earth systems in a field setting. Field trips required.

GEOL 205 - Earth Resources (3 Credits)

Mineral, energy, and water resources with emphasis on geological processes governing their distribution. Intended for non-science majors. Three lecture hours each week with occasional field trips.

Carolina Core: SCI

GEOL 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: MSCI 215

Carolina Core: SCI

GEOL 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: MSCI 215L

Carolina Core: SCI

GEOL 230 - Geology of the National Parks (3 Credits)

Examination of the geologic setting and scientific significance of selected National Parks. Three lecture hours.

Carolina Core: SCI

GEOL 302 - Rocks and Minerals (4 Credits)

Chemical and physical processes of mineral formation in earth systems including an overview of igneous, sedimentary, and metamorphic rock-forming processes. Includes laboratory. Field trips required.

Prerequisites: C or better in GEOL 101, GEOL 103, or GEOL 201; CHEM 111 recommended.

GEOL 305 - Earth Systems through Time (4 Credits)

Survey of earth history, the evolution of continents and oceans, the history of life, and geological dating methods. Includes laboratory and recitation. Required field trips. Taught alternate years.

GEOL 310 - Surface and Subsurface Hydrology (4 Credits)

Environmental considerations of the hydrologic cycle. Occurrence and movement of surface water and groundwater as they relate to water budgets, water supply, and ecosystems. Geochemistry of natural waters, water quality, and pollution.

Prerequisites: C or higher in MATH 122 or MATH 141; C or higher in GEOL 101, GEOL 103, GEOL 201, GEOG 104, GEOG 201, ENVR 101, ENVR 201, ECIV 101 or MSCI 101.

Cross-listed course: ENVR 310

GEOL 315 - Surface and Near Surface Processes (4 Credits)

Overview of groundwater, surface water hydrology, sediment transport, river systems, and coastal processes. Includes laboratory and recitation. Required field trips.

Prerequisites: D or better in PHYS 201 or PHYS 211.

Graduation with Leadership Distinction: GLD: Research

GEOL 318 - Field Studies in Geology (1 Credit)

Directed field studies of extraordinary geological locations in North America. Requires a seven- to nine-day field trip during spring break.

Prerequisites: C or better in GEOL 101, GEOL 103, or GEOL 201 and consent of instructor.

Graduation with Leadership Distinction: GLD: Research

GEOL 325 - Stratigraphy and Sedimentary Basins (4 Credits)

Overview of sedimentary basins, sediment transport, sedimentation, depositional environments, stratigraphy, seismic stratigraphy, eustacy, and sedimentary petrology. Includes laboratory and recitation. Required field trips.

Prerequisites: GEOL 302.

GEOL 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 eustacy.

Cross-listed course: MSCI 335

GEOL 345 - Igneous and Metamorphic Processes (4 Credits)

Origin and significance of igneous and metamorphic rocks, and relation to tectonic processes. Mineralogy, geochemistry, volcanism, plate tectonics, isostasy, heat flow. Includes laboratory and recitation. Required field trips.

Prerequisites: C or better in GEOL 302; D or better in MATH 122 or MATH 141.

GEOL 355 - Structural Geology and Tectonics (4 Credits)

Geologic structures and deformation of Earth materials. Stress and strain, deformation mechanisms, P-T-t paths, geologic maps, and structural regimes in plate tectonics. Includes laboratory and recitation. Required field trips.

Prerequisites: C or better in GEOL 302; D or better in PHYS 201 or PHYS 211.

GEOL 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, MSCI 365

GEOL 371 - A View of the River (3 Credits)

Introduction to terrestrial and tidal river morphology and processes, with case studies of South Carolina. Field trips required.

Prerequisites: C or better in GEOL 101, GEOL 103, or GEOL 201.

GEOL 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

GEOL 495 - Internship in the Geological Science (0-6 Credits)

Supervised internship experience in a professional environment within the field of geology and/or related geological sciences. Undergraduate internship contract required with approval of instructor, advisor, and department head before registration.

Prerequisites: C or better in GEOL 101, GEOL 103 or GEOL 201; C or better in one other GEOL course at or above the 300 level.

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

Experiential Learning: Experiential Learning Opportunity

GEOL 498 - Undergraduate Research (3 Credits)

Student research on problems of regional and fundamental significance, supervised by a faculty member of the student's choice. Emphasis is on the development of critical thinking and lucid scientific report writing.

Graduation with Leadership Distinction: GLD: Research

GEOL 499 - Undergraduate Research (3 Credits)

Student research on problems of regional and fundamental significance, supervised by a faculty member of the student's choice. Emphasis is on the development of critical thinking and lucid scientific report writing.

Graduation with Leadership Distinction: GLD: Research

GEOL 500 - Field Geology (4-6 Credits)

Geological field techniques including the use of field instruments and the preparation of geologic maps. Written and oral reports required.

Prerequisites: C or better in GEOL 325 and GEOL 355.

Graduation with Leadership Distinction: GLD: Research

GEOL 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: MSCI 501

GEOL 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: MSCI 502

GEOL 503 - Regional Stratigraphy and Biostratigraphy of North America (3 Credits)

Sedimentologic, biostratigraphic, and tectonic history of North America, approached from paleogeographic considerations with emphasis on the Atlantic Coastal Plain and Continental Margin. Three hours lecture and three hours recitation per week. Required field trips.

GEOL 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 strategizes to incentivize large-scale adoption of these approaches.

Cross-listed course: ENVR 504, MSCI 504

GEOL 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: MSCI 511

GEOL 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: MSCI 515

GEOL 516 - Sedimentology (4 Credits)

Modern concepts of sediment composition, sedimentary facies, depositional environments, and stratigraphy. Includes laboratory.

Prerequisites: C or better in GEOL 325.

GEOL 518 - Surface to Subsurface Stratigraphy (3 Credits)

Surface to subsurface stratigraphic interpretation and techniques; litho- and biostratigraphy; geophysical log interpretation and subsurface presentation.

GEOL 520 - Isotope Geology and Geochronology (3 Credits)

Dating techniques for Pleistocene deposits, sediments, archaeological materials, igneous and metamorphic rocks.

GEOL 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: MSCI 521

GEOL 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: MSCI 524

GEOL 526 - Igneous Petrology (4 Credits)

Petrography and petrogenesis of igneous rocks; evolution of contrasting petrotectonic terranes. Three lectures and three laboratory hours per week.

Prerequisites: C or better in GEOL 302.

GEOL 527 - Metamorphic Petrology (4 Credits)

Petrography and petrogenesis of metamorphic rocks in orogenic belts. Three lectures and three laboratory hours per week.

Prerequisites: C or better in GEOL 302.

GEOL 531 - Plate Tectonics (3 Credits)

Geological and geophysical evidence for plate tectonics, detailed development of the plate tectonics model, and present areas of research, including measurements of plate motion using satellite geodesy.

Prerequisites: C or better in two GEOL courses numbered 300 or above, or consent of instructor.

GEOL 537 - Field Methods in Geophysics (3 Credits)

Application of two or more geophysical field methods to a current geological problem. Independent study contract required.

GEOL 540 - Earth Science for Teachers I (3 Credits)

Origin, internal structure and internal processes of the earth, including plate tectonics, earthquakes, volcanoes, and mountain building. Required field trips, two lectures, and three lab hours per week. Cannot be used in MS or PhD programs in geology.

Cross-listed course: EDSE 548

GEOL 541 - Earth Science for Teachers II (3 Credits)

Surface processes acting on the earth; introduction to weather and climate, weathering, erosion, and sedimentary processes; land form evolution; ocean currents and tides, near-shore geologic processes. Required field trips, two lecture, and three lab hours per week. Cannot be used in MS or PhD programs in geology.

Prerequisites: D or better in EDSE 548 or C or better in GEOL 540.

Cross-listed course: EDSE 549

GEOL 542 - Methods in Geoscience Education Research (3 Credits)

Introduction to methods used in discipline-based education research and their application to research questions in the geosciences.

Prerequisites: C or better in least one course in GEOL, ENVR, MSCI or GEOG.

GEOL 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: MSCI 545

GEOL 546 - Marine Geophysics (3 Credits)

Introduction to the nature and structure of the ocean floor as revealed by geophysical techniques. Two hours lecture and three hours laboratory.

GEOL 548 - Environmental Geophysics (4 Credits)

Practical geophysical techniques for exploring the shallow subsurface. Seismic, resistivity, well log, gravity, magnetic method. Includes lectures and field exercises to collect and analyze data.

Prerequisites: D or better in MATH 141; D or better in PHYS 201 or PHYS 211.

GEOL 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: MSCI 550

GEOL 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: MSCI 553

GEOL 554 - Applied Seismology (3 Credits)

Theory of seismic wave propagation. Seismic reflection data acquisition, processing, and interpretation.

Prerequisites: D or better in MATH 141; D or better in PHYS 201 or PHYS 211.

GEOL 555 - Elementary Seismology (3 Credits)

Basic elements of seismology. Mathematical development of seismic wave equations; measurement, description, and interpretation of seismic data.

Prerequisites: D or better in MATH 241.

GEOL 556 - Seismic Reflection Interpretation (3 Credits)

The interpretation of geologic structure using seismic sections. Recognition of apparent structure caused by velocity anomalies, multiples, and complex reflector geometry. Application to hydrocarbon exploration.

GEOL 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: MSCI 557

GEOL 560 - Earth Resource Management (3 Credits)

An approach to problems of resource management by lecture and seminar using case studies in mineral, energy, hydrogeological, and environmental science.

Graduation with Leadership Distinction: GLD: Research

Experiential Learning: Experiential Learning Opportunity

GEOL 561 - Environmental Field Geology (6 Credits)

An introduction to field methods in sedimentology, structural geology, hydrogeology and geophysics with special reference to geological hazards and environmental problems.

GEOL 567 - Long-Term Environmental Change (3 Credits)

Climatic changes of the past and their impact on the physical landscape, with an emphasis on the Quaternary period.

Prerequisites: C or better in a 200-level course in physical geography or geology or equivalent.

Cross-listed course: GEOG 567

GEOL 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: MSCI 568

GEOL 570 - Environmental Hydrogeology (3 Credits)

Environmental considerations of the hydrologic cycle, occurrence and movement of ground water, aquifer analysis, and water well emplacement and construction. Water quality, pollution parameters, and the geochemistry of selected natural systems. The effects of environmental problems, waste disposal, and urban development upon the aqueous geochemical regime.

Prerequisites: C or better in GEOL 101 and D or better in CHEM 111 or their equivalents.

GEOL 571 - Soil Hydrology (4 Credits)

Saturated and unsaturated water flow through soils, pore pressure development, runoff generation, and watershed response to rainfall. Three lecture and three laboratory hours per week.

Prerequisites: D or better in PHYS 202 and MATH 142.

GEOL 575 - Numerical Modeling for Earth Science Applications (3 Credits)

Finite difference and finite element methods for solving the diffusion equation and advection-dispersion equation, with applications in hydrogeology, geophysics, geology, and marine science.

Prerequisites: D or better in MATH 142; MATH 241 is recommended.

GEOL 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: MSCI 579

GEOL 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: MSCI 580

GEOL 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: MSCI 581

GEOL 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: MSCI 582

GEOL 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: MSCI 583

GEOL 599 - Topics in Geological Science (1-3 Credits)

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

Prerequisites: C or better in GEOL 101, GEOL 103 or GEOL 201 or graduate student standing in the School of the Earth, Ocean and Environment (SEOE).

GEOL 600 - Senior Seminar in Geology and Geophysics (2 Credits)

Advanced research topics in geology and geophysics; critical reading of literature, technical presentations, and written reports. Senior standing.

GEOL 650 - Electron Microscopy and Microanalysis (4 Credits)

SEM, ESEM, TEM, and EMPA, WDS quantitative analysis, EDS semi-quantitative analysis, EBSD, methods of sample preparation, and applications in varieties of disciplines. Two lecture and three laboratory hours per week.

Prerequisites: D or better in CHEM 111 or equivalent.

GEOL 699 - Senior Thesis (3-6 Credits)

Senior capstone experience, research on a problem of fundamental significance, supervised by faculty member; must include field study component, written final project report, and oral presentation at departmental seminar.

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 strategizes 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