

# GEOLOGY (GEOL)

## 100 Level Courses

**GEOL 101: *Introductory Geology I.*** 4 credits.

Covers Earth, processes that operate within Earth and on surface, and human interaction with Earth. Topics include minerals, earthquakes and seismology, isostasy, igneous processes and rocks, paleomagnetism and plate tectonics, weathering, mass movements, rivers and streams, groundwater, glaciers, and marine processes. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Mason Core:** Natural Science with Lab, Encore:Sustainability

**Specialized Designation:** Green Leaf Course

**Schedule Type:** Laboratory, Lecture

**GEOL 102: *Introductory Geology II.*** 4 credits.

Earth processes in historical context. Topics include sedimentary rocks and principles, deformation and metamorphism, mountain building and plate tectonics, geologic time, fossils, and historical development of continents. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Mason Core:** Natural Science with Lab, Encore:Sustainability

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 101.

**Schedule Type:** Laboratory, Lecture

**GEOL 134: *Evolution and Extinction.*** 3 credits.

Evolution and Extinction is a science class for non-science majors that explores how diversity of animals and plants has changed through geologic time, when mass extinctions occurred, when major diversifications of life occurred, and how the position of continents on the surface of the earth influenced the evolution, extinction, and distribution of life, landforms and the atmosphere. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Mason Core:** Natural Science Overview, Encore:Sustainability

**Specialized Designation:** Green Leaf Course

**Schedule Type:** Lecture

## 200 Level Courses

**GEOL 206: *Topics in Geology I.*** 1-3 credits.

Discusses particular topic in geology. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the term for a maximum 6 credits.

**Schedule Type:** Lecture

## 300 Level Courses

**GEOL 302: *Mineralogy.*** 4 credits.

Crystallographic, optical, chemical, and physical properties of minerals. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Discovery of Scholarship

**Recommended Prerequisite:** GEOL 101 and 102 with a grade of 2.0 or better and CHEM 211.

**Schedule Type:** Laboratory, Lecture

**GEOL 303: *Field Mapping Techniques.*** 3 credits.

Basic techniques for collecting, recording, and plotting spatial field data including use of topographic maps, compasses, transit, alidade, and global positioning systems (GPS). Designated a Green Leaf Course. Notes: Includes field work. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course, Scholarly Inquiry

**Recommended Prerequisite:** 30 credits including MATH 105 or equivalent and GGS 102 or GEOL 102.

**Schedule Type:** Laboratory

**GEOL 304: *Sedimentary Geology.*** 4 credits.

Introduces sedimentation, sedimentary petrology, facies analysis, and stratigraphy. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101, 102, and a grade of C or better in GEOL 302.

**Schedule Type:** Laboratory, Lecture

**GEOL 305: *Environmental Geology.*** 3 credits.

Investigates geological principles directly relating to environmental hazards. Geological causes and effects of natural disasters such as earthquakes, tsunamis, volcanoes, floods and landslides; climate variability and change; prediction of, and planning for geological hazards and disasters and understanding their major societal impacts; and medical geology. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course, Writing Intensive in the Major

**Recommended Prerequisite:** GEOL 101 and one of the following: GEOL 102, GEOL/BIO 309, GGS 309.

**Schedule Type:** Lecture

**GEOL 306: *Soil Science.*** 3 credits.

Composition, classification, physical properties, and origin of soils. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course, Scholarly Inquiry

**Recommended Prerequisite:** GEOL 101 and CHEM 103 or 211.

**Schedule Type:** Lecture

**GEOL 308: *Igneous and Metamorphic Petrology.*** 4 credits.

Genesis, classification, and recognition of igneous and metamorphic rocks. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101, 102, a grade of C or better in GEOL 302, and MATH 105 or equivalent.

**Schedule Type:** Laboratory, Lecture

**GEOL 309:** *Introduction to Oceanography*. 3 credits.

Introduces physical, chemical, biological, and geological aspects of oceanic environment. Notes: May include field trip. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to BIOL 309, EVPP 309.

**Recommended Prerequisite:** Two of the following lab sciences courses are required for a total of 8 credits: [GEOL 101 or 102], [EVPP 110 or 111 or 210], CHEM 211, [BIOL 103 or 213], [PHYS 160 and 161 or 243 and 244].

**Schedule Type:** Lecture

**GEOL 312:** *Invertebrate Paleontology*. 4 credits.

Classification, evolutionary trends, and distribution of common invertebrate fossils. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to BIOL 336.

**Recommended Prerequisite:** GEOL 101 and GEOL 102, or BIOL 103, 104, or BIOL 213, 303, 304.

**Schedule Type:** Laboratory, Lecture

**GEOL 313:** *Hydrogeology*. 3 credits.

Geological and hydrologic factors controlling occurrence, distribution, movement, quality, and development of groundwater. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 101 or GGS 102, MATH 113 and CHEM 211.

**Schedule Type:** Lecture

**GEOL 315:** *Topics in Geology II*. 1-3 credits.

Discusses particular topic in geology. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the term for a maximum 12 credits.

**Recommended Prerequisite:** GEOL 101 or GEOL 102 or permission of instructor.

**Schedule Type:** Lecture

**GEOL 316:** *Computers in Geology*. 3 credits.

Uses of mainframe and microcomputers, with emphasis on geologic applications. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101, 102, 302, one semester of mathematics, or permission of instructor.

**Schedule Type:** Lecture

**GEOL 317:** *Geomorphology*. 4 credits.

Analyzes processes that occur at Earth's surface and resulting landforms. Labs stress recognition and evaluation of landforms using maps and aerial photographs, and methods of data collection used in

study of surficial geology. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Writing Intensive in the Major

**Recommended Prerequisite:** Grade of 2.0 or better in GEOL 101 and 102, or 6 credits of GGS, including GGS 102; GGS 412 is strongly recommended.

**Schedule Type:** Laboratory, Lecture

**GEOL 320:** *Geology of Earth Resources*. 3 credits.

A survey of earth resources, including metallic and non-metallic ore deposits, mineral resources, precious gems, sand and gravel, water, and air. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 101, GEOL 102, GEOL 302. GEOL 305 strongly suggested.

**Schedule Type:** Lecture

**GEOL 321:** *Geology of Energy Resources*. 3 credits.

A survey of energy resources, including fossil fuels, renewable, nuclear and unconventional sources. Emphasis on origin, use and implications of development. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 101 or GEOL 102, and completion of all Mason Core science requirements.

**Schedule Type:** Lecture

**GEOL 332:** *Paleoclimatology*. 3 credits.

Explores the natural evolution of Earth's climate with the goal of providing a baseline for understanding present climate variability and future trends through increased knowledge of the physical, chemical, and biological processes that influence climate over the long-term. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 102 or BIOL 103 or EVPP 110.

**Schedule Type:** Lecture

**GEOL 334:** *Vertebrate Paleontology*. 4 credits.

Vertebrate Paleontology explores the evolution of vertebrates from the early Paleozoic to Recent. The course will cover the systematics, anatomy, paleogeography, and ecology of extinct vertebrates. Discussions will include fishes, early tetrapods & amniotes, dinosaurs, birds and mammals. Lab portion includes paleontology techniques, analysis, and study of fossil specimens and casts. A weekend field trip is included. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to BIOL 334.

**Specialized Designation:** Writing Intensive in the Major

**Recommended Prerequisite:** Any two courses from the following list: GEOL 101, GEOL 102, BIOL 103, BIOL 104, BIOL 213, BIOL 303 or the permission of the instructor.

**Schedule Type:** Laboratory, Lecture

**GEOL 363:** *Coastal Morphology and Processes*. 4 credits.

Studies global coastal geomorphology and processes with emphasis on U.S. Atlantic and Gulf coasts. Topics include plate tectonics, sea level changes, sediment supply, waves, tides, storm impacts, and human activities. Lecture and extended weekend field trips to mid-Atlantic coast. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to EVPP 363.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 309 or BIOL 309 or GEOL 317 or 9 credit hours in Geography including GGS 309.

**Schedule Type:** Laboratory, Lecture

**GEOL 364:** *Marine Geology*. 3 credits.

This course will present a global overview of the geologic origin and composition of the ocean seafloor, and an introduction to the basic principles of the geologic processes occurring in the marine environment. Primary topics include geologic, tectonic and sedimentary characteristics of the deep ocean basins and continental margins; transport and deposition of marine sediments; micropaleontology and paleoceanography; geochemistry and hydrothermal systems; and marine mineral resources. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101, GEOL 102, GEOL 302, and CHEM 211.

**Schedule Type:** Lecture

**GEOL 392:** *Geology and Earth Science Seminar*. 1 credit.

Undergraduate experience that includes discussion of scientific articles and attending seminars presented by outside experts, faculty, or students. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 4 credits.

**Recommended Prerequisite:** 30 credit hours.

**Schedule Type:** Seminar

## 400 Level Courses

**GEOL 401:** *Structural Geology*. 4 credits.

Igneous, sedimentary, and metamorphic rocks in folded, faulted, and metamorphosed terrains. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 302, GEOL 317 (grade of C or better in both), and GEOL 304, or GEOL 308 (grade of C or better); MATH 110, MATH 111, or MATH 113. PHYS 160 or PHYS 243 is highly recommended.

**Schedule Type:** Laboratory, Lecture

**GEOL 402:** *Geological Development of North America*. 3 credits.

Geological history of North America in terms of plate tectonics. Geological development and history of North America's major regions. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101, 102, 302, 304, 308 and 401.

**Schedule Type:** Lecture

**GEOL 403:** *Geochemistry*. 3 credits.

Includes stable isotope, crystal, water, and organic geochemistry; geochronology; and geochemistry of rocks. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101 and 102, and CHEM 211.

**Schedule Type:** Lecture

**GEOL 404:** *Geological Field Techniques*. 1-6 credits.

Mapping techniques involved in collecting geological field data. Notes: Includes field work. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 6 credits.

**Recommended Prerequisite:** GEOL 101, 102, 302, 304, 308, and 401.

**Schedule Type:** Laboratory

**GEOL 405:** *Advanced Seminar in Earth Resources*. 3 credits.

Analyzes current issues involving renewable and non-renewable earth resources with consideration of the economic, political, social and aesthetic significance of these resources and their utilization. Taught seminar style examining case-studies, with emphasis on discussion, reading, writing and student oral presentations. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** GEOL 101 and 102 and GEOL 302, 304 and 308 OR GEOL 305, 320 and 321 and completion of Mason Core requirements.

**Schedule Type:** Lecture

**GEOL 406:** *Seminar in Earth and Environmental Science*. 3 credits.

Students read, discuss research literature; produce, present original papers. Notes: Capstone seminar for Earth and environmental science majors. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** 90 credits.

**Schedule Type:** Seminar

**GEOL 408:** *Practicum for Geology Laboratories*. 1 credit.

Studies techniques to make geology lab effective component in geological education. Discusses developing testing materials, supplemented by experience operating geology course lab section. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Corequisite:** Open only to GEOL/ESS majors with 80 credit hours and permission of Chair.

**Schedule Type:** Internship

**GEOL 409:** *Practicum for Geology Laboratories*. 1 credit.

Studies techniques to make geology lab effective component in geological education. Discusses developing testing materials, supplemented by experience operating geology course lab section. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** Open only to GEOL/ESS majors with 80 credit hours and permission of Chair.

**Schedule Type:** Internship**GEOL 410:** *Research Proposal Preparation*. 1 credit.

Prepares students for research in GEOL 411. Includes literature research, initial data collection, and preparing research proposal. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** Geology or Earth Science major with 90 credits, cumulative GPA of 2.80 or higher, and permission of the Geology undergraduate coordinator.

**Schedule Type:** Research**GEOL 411:** *Geological Research*. 3 credits.

Geological research: data collection and reduction, interpretation, preparation of written report, and oral presentation of results. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 410.

**Schedule Type:** Research**GEOL 412:** *Physical Oceanography*. 3 credits.

Course describes the global patterns of temperature, salinity, currents and waves in the world's oceans, and how these patterns influence marine biota, climate, and human activity. Course introduces key concepts which explain physical features of the ocean ranging from microscopic turbulence to global circulation. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to CLIM 412.

**Recommended Prerequisite:** MATH 113 or MATH 115, and PHYS 160 or PHYS 243, or permission of instructor.

**Schedule Type:** Lecture**GEOL 417:** *Geophysics*. 3 credits.

Basic principles of geophysics including gravity, magnetism, and seismic reflection and refraction. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to PHYS 417.

**Recommended Prerequisite:** GEOL 101, MATH 113, one year of PHYS or permission of instructor.

**Schedule Type:** Lecture**GEOL 420:** *Earth Science and Policy*. 3 credits.

Discusses Earth science issues that have policy implications. Course uses a broad definition of Earth science, from atmosphere to geosphere. Taught seminar-style, with emphasis on discussion, reading, writing, critical analysis, and student oral presentations. Notes: Course may include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Mason Core:** Encore:Sustainability, Synthesis

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** 18 credit hours in major or minor (geology, Earth science, ocean and estuarine science, or global and environmental change), and one of the following social science based courses: EVPP 361; ECON 103; ANTH 114; GGS 103; GLOA 101; GOVT 132 or 133; HIST 125 or 130; or SOCI 101, 102, or 120.

**Recommended Corequisite:** All other required Mason Core courses.

**Schedule Type:** Seminar**GEOL 458:** *Chemical Oceanography*. 3 credits.

The world's oceans, including a variety of closed basins and estuaries, comprise a complex and dynamic system of chemical processes that interact with biological, geological, physical, and atmospheric processes to play a significant role in defining the earth's fragile environment. This course will present an overview of the origin, occurrence, and distribution of the chemical components in sea water and an introduction to the basic principals of the chemical processes taking place in the marine environment. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to CHEM 458.

**Specialized Designation:** Green Leaf Course

**Recommended Prerequisite:** CHEM 211 and CHEM 212, and CHEM 321 or GEOL 302.

**Schedule Type:** Lecture**GEOL 480:** *Internship*. 1-3 credits.

Approved study programs with specific employers. Notes: Contact department one semester before enrollment. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Corequisite:** Open only to authorized majors with 90 credit.

**Schedule Type:** Internship**500 Level Courses****GEOL 500:** *Selected Topics in Modern Geology*. 1-3 credits.

Topic designated in class schedule. Notes: Lecture, lab, field trip. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree.

**Recommended Prerequisite:** Baccalaureate degree in geology, or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture**GEOL 501:** *Selected Topics in Modern Geology*. 1-3 credits.

Topic designated in class schedule. Lecture, lab, field trip. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree.

**Recommended Prerequisite:** Baccalaureate degree in geology or Permission of Instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture**GEOL 503:** *Special Topics in Earth Science*. 1-6 credits.

In-service course to strengthen and update knowledge of Earth science. Notes: May include field trips. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree.

**Recommended Prerequisite:** Employment or anticipated employment as an Earth Science teacher.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture**GEOL 506:** *Soil Science*. 3 credits.

Explores the composition, classification, physical properties, and origin of soils. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to EVPP 503.

**Recommended Prerequisite:** Previous lab-science courses in each of the following: geology and chemistry (8 credit hours); or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

**Schedule Type:** Lecture**GEOL 513:** *Hydrogeology*. 3 credits.

Geological and hydrologic factors controlling occurrence, distribution, movement, quality, and development of groundwater. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** Previous lab-science courses in each of the following: geology, calculus, and chemistry (12 credit hours); or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture**GEOL 521:** *Geology of Energy Resources*. 3 credits.

Survey of global non-renewable and renewable energy resources. Topics include petroleum, natural gas, coal, nuclear, geothermal, solar, wind, and hydro power, and biofuels. Course discusses global production, usage, impacts and future prospects of these resources, and data capture, analysis and modeling of finite resources. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** GEOL 101 or GEOL 102, and completion of all Mason Core Natural Science requirements or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture**GEOL 525:** *Modeling Earth Signals and Systems*. 3 credits.

Provides instruction on time series analysis customized for Earth signals and systems such as climate, Earth-space orientation, earthquakes, geomagnetism, river flow, tides and many other time-dependent phenomena. Concepts including linear systems, filtering, spectrum estimation, harmonic analysis and hypothesis testing are applied to time series data sampled from natural processes to address a variety of scientific problems. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** MATH 114 and STAT 250 or equivalent or permission of instructor.

**Schedule Type:** Lecture**GEOL 532:** *Paleoclimatology*. 3 credits.

Explores the natural evolution of Earth's climate with the goal of providing a baseline for understanding present climate variability and future trends through increase knowledge of the physical, chemical, and biological processes that influence climate over the long-term. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** Previous lab-science courses in geology and/or atmospheric science and/or oceanography (12 credit hours); or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture**GEOL 534:** *Vertebrate Paleontology*. 4 credits.

Explores the evolution of vertebrates from the early Paleozoic to Recent. Covers systematics, anatomy, paleogeography, and ecology of extinct vertebrates. Discussions include fishes, early tetrapods and amniotes, dinosaurs, birds, and mammals. Lab portion includes paleontology techniques, analysis, and study of fossil specimens and casts. Notes: A weekend field trip is included. Students who have taken GEOL 334 as an undergraduate may not take 534 as a graduate student. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** Undergraduate degree in biology or geology or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory, Lecture

**GEOL 535:** *Quantitative Stratigraphy*. 3 credits.

Quantitative stratigraphy is a branch of geology that applies statistics to reconstruct the time sequence of geological events recorded in sedimentary strata. Methods of interpolation and error analysis used for defining stratigraphic boundaries and events, time scale estimation using integrated chronostratigraphy, and intercalibration are examined. Students receive advanced training in graphic correlation, constrained optimization, ranking and scaling, and dynamic programming. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** MATH 114 and STAT 250 or equivalent or permission of instructor.

**Schedule Type:** Lecture

**GEOL 536:** *Paleontology Seminar*. 1-2 credits.

Paleontology Seminar presents topical research in paleontology and paleobiology in a structured discussion among graduate students and paleontology faculty. A theme for the seminar is chosen each semester the course is offered, tailored to the interests of the students. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 12 credits.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Seminar

**GEOL 553:** *Field Mapping Techniques*. 3 credits.

Explores basic techniques for collecting, recording, and plotting spatial field data, including topographic maps, compass, transit, alidade, and global positioning systems. Field work and field based research project. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to EVPP 503.

**Recommended Prerequisite:** Previous courses in geometry or trigonometry or equivalent; and environmental science, geography, or geology or equivalent.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Laboratory

**GEOL 563:** *Coastal Morphology and Processes*. 4 credits.

Investigates global coastal geomorphology and processes, with emphasis on U.S. Atlantic and Gulf coasts. Topics include plate tectonics; sea-level changes; sediment supply; impacts of waves, tides, storms; and human activities. Lecture and extended weekend field trips to U.S. mid-Atlantic coast. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to EVPP 563.

**Recommended Prerequisite:** Previous courses in geology, oceanography marine science, earth science, or physical geography; or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

**GEOL 565:** *Paleoceanography*. 3 credits.

Investigates ocean evolution through geologic time. Earth's sediment archive provides proxy data on paleo-ocean chemistry, biology, geology, and physical properties. Class examines proxy reconstructions of oceanic conditions such as circulation, salinity, stratification, anoxia, and biogeochemistry. Discusses the history of ocean basins, with case studies from Precambrian to Holocene. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit.

**Recommended Prerequisite:** Previous course in oceanography or marine science and 16 credits of geology or earth science courses, or permission of instructor.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

## 600 Level Courses

**GEOL 601:** *The Lithosphere*. 3 credits.

Global-scale overview of lithosphere, solid non-living Earth, materials, cycles, plate tectonic and geomorphic processes; and history, including interactions with and history of hydrosphere, atmosphere and biosphere, and methods of analysis. Offered by Atmospheric/Oceanic/Earth Sci. May not be repeated for credit. Equivalent to GGS 657.

**Registration Restrictions:**

Enrollment limited to students with a class of Advanced to Candidacy, Graduate, Non Degree or Senior Plus.

Enrollment is limited to Graduate, Non-Degree or Undergraduate level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Lecture

## 700 Level Courses

**GEOL 700:** *Comprehensive Exam.* 1 credit.

Preparation for and completion of written comprehensive exam within AOES department. The comprehensive exam is given as part of the degree requirements in lieu of writing a master's thesis. Instructor should be the chair of the examination committee. The exam committee will specify exam content. Notes: No more than 1 credit of GEOL 700 may be applied toward the master's degree. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 2 credits.

**Recommended Prerequisite:** At least 15 graduate credits, approved project proposal, and permission of major advisor or chair of the examination committee.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Independent Study

**GEOL 792:** *Seminar in Earth Systems Science, Geology, & Earth Science.* 1 credit.

Capstone experience that includes discussion of scientific articles and attending seminars. Seminars presented by outside experts, faculty, and students. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 12 credits.

**Recommended Prerequisite:** 15 Graduate Credits including GEOL 601 or equivalent, or permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Seminar

**GEOL 798:** *Master's Research Project in Earth Systems Science.* 1-6 credits.

Experimental, observational, literature-based, or theoretical research project chosen and completed under guidance of faculty member. Proposal required before enrollment. Comprehensive technical report acceptable to student's committee required for completion. Notes: No more than 6 credits of GEOL 798 may be applied to master's degree. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 12 credits.

**Recommended Prerequisite:** 15 graduate credits, approved project or thesis proposal, and permission of instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Thesis

**GEOL 799:** *Master's Thesis in Earth Systems Science.* 1-6 credits.

Experimental, observational, or theoretical research under major advisor's supervision that culminates in production of thesis. Thesis work should be potentially publishable. Offered by Atmospheric/Oceanic/Earth Sci. May be repeated within the degree for a maximum 18 credits.

**Recommended Prerequisite:** Approved thesis proposal by thesis committee, and permission of major advisor or instructor.

**Registration Restrictions:**

Enrollment is limited to Graduate or Non-Degree level students.

Students in a Non-Degree Undergraduate degree may **not** enroll.

**Schedule Type:** Thesis