GEO Geosciences

GEO 101-E Environmental Geology
Fundamental earth science concepts are used to assess the impact of increasing global population and development on Earth’s natural resources and also to examine how natural processes affect human activities. Topics include water usage and pollution, soil pollution and erosion, radioactive and solid waste disposal, landslides, stream flooding, coastal erosion, environmental consequences of energy and mineral resource utilization, acid rain, global climate change, and the environment effects on human health. Aspects of environmental geology that are particularly applicable to Long Island and metropolitan New York are emphasized.
3 credits

GEO 102-E The Earth
A summary of the processes that have shaped the Earth and the other terrestrial planets as inferred from study of their surface materials, structural features, and interiors. Topics include the Earth in the solar system; Earth materials and rock-forming processes; surface processes and their bearing on human activities; crustal deformation and global tectonics; the Earth’s interior; and the geological features, compositions, and evolution of the terrestrial planets.
3 credits

GEO 103-E The Earth Through Time
The history of the Earth from its formation 4.5 billion years ago to the present. Major issues to be addressed include formation and early history of the Earth and moon; evolution of continents, oceans, and atmospheres within the framework of plate tectonics; origin of life; and evidence of past climates.
3 credits

GEO 107-E Natural Hazards
An introduction to the concepts, techniques, and scientific methods used in the earth sciences. The natural hazards posed by earthquakes and volcanic eruptions are used as a focus. These phenomena are examined in the context of the theory of plate tectonics to determine their cause, destructive potential, and the possibility of predicting and controlling their occurrence. Elementary probability methods are introduced in the treatment of approaches to prediction. Societal responses to forecasts are also considered.
3 credits

GEO 109-E Life Through Time
An examination of biodiversity as preserved in the fossil record and how it contributes to the understanding of evolution. Species examined include invertebrates, plants, dinosaurs, and mammals and the ultimate origin and evolution of humans. Principles of evolution, paleontology, phylogeny reconstruction, and conservation are discussed. This course is offered as both GEO 109 and HBA 109.
3 credits

GEO 111 Environmental Geology Laboratory
Enthusiasm is on collecting geologic data in the field and laboratory and preparing professional quality reports. Exercises include basic field mapping; determination of hydraulic properties of sediment; analysis of soil and water; and observing a drill site, a water supply well system, a sewage treatment system, and a waste to energy system.
Pre-or Corequisite: GEO 101
1 credit

GEO 112 Physical Geology Laboratory
Rock and mineral identification, introduction to topographic and geologic maps.
Pre-or Corequisite: GEO 102
1 credit

GEO 113 Historical Geology Laboratory
An introduction to basic techniques used for interpreting geological history. Topics include interpretation of topographic and geological maps and cross sections, introduction to fossils, and basic stratigraphic techniques. One three-hour laboratory per week.
Pre-or Corequisite: GEO 103
1 credit

GEO 122-E Physical Geology
The nature of the Earth and of the processes that shape it: the Earth’s external and internal energy; minerals and rocks; external processes and the evolution of the landscape; internal processes and the structure of the Earth; the Earth compared with other planets; sources of materials and energy. Laboratory includes study of minerals and rocks; landforms as shown on topographic maps and aerial photographs; geologic structures inferred from maps and block diagrams; problem sets. Two lectures and one three-hour laboratory and recitation per week. GEO 102/112 and GEO 122 may not both be taken for credit.
Advisory Prerequisite: High school chemistry or CHE 123
4 credits

GEO 287 Introductory Research in Geology
Independent research, under the supervision of a faculty member, at a level appropriate to lower-division students. Prerequisites: U1 or U2 standing; one GEO course; permission of instructor and departmental research coordinator
0-3 credits, S/U grading

GEO 302 GIS For Geologists
[Effective Fall 2000: new course] A practical introduction to geographic information system GIS software. Participants learn to use direct measurement and mathematical techniques to compute the location of features and gain practical experience in rendering imagery and tabular geographic data as layers on maps. The course consists of two three-hour sessions per week for five weeks of semester, which include fieldwork, lectures, demonstrations and software-based analysis of data. This course meets with GEO 305 Field Geology for the first five weeks of the term. Students cannot take both GEO 302 and GEO 305 for credit.
Prerequisites: GEO 102 or GEO 102/112, GEO 103 and 113, or GEO 109 and 111
1 credit

A survey of the origin, distribution, and importance to modern civilization of the fuels and minerals won from the Earth. Geology of mineral resources and problems of finding, extracting, and supplying fossil fuels, metallic ores, water, and non-metallic commodities to industry and community as well as the ultimate limits of their abundances. Environmental concerns related to the exploitation of mineral resources with review of legislation and other steps being taken to minimize environmental damage.
Advisory Prerequisite: GEO 101 or GEO 102
Advisory Prerequisite: CHE 125 or high school chemistry
3 credits

GEO 305 Field Geology
Geological field studies on and near the Stony Brook campus. Labs emphasize mapping techniques and field studies of glacial and environmental geology, and include geophysical and hydrological analyses and mapping. Course consists of two three-hour sessions per week, divided between lecture and outdoor labs.
Prerequisites: GEO 102/112 or GEO 112 and 103 and 113 or GEO 112 and 101 and 111
3 credits

GEO 306 Mineralogy and Petrology I
An introduction to mineralogy and petrology. Topics in mineralogy include basic crystallography, crystal chemistry, and identification of the important rock-forming and ore minerals. Topics in petrology focus on the processes that govern the formation and distribution of igneous and metamorphic rocks. Laboratory exercises include crystallography, mineral and rock identification, and interpretation of igneous and metamorphic histories of selected rock suites. Three hours of lecture and one three-hour laboratory per week.
Prerequisites: GEO 120, or GEO 102 and 112
Pre-or Corequisite: CHE 132 or 142
4 credits

GEO 309 Structural Geology
Principles of structural geology, including classification, criteria for recognition, and mechanics of formation of crustal structural features. Elementary concepts of rock mechanics. Discussion of important tectonic features of the continents and oceans. Accompanying laboratory to cover map interpretation and algebraic and graphical solutions of structural problems. Three hours of lecture and one three-hour laboratory per week. A two-day weekend field trip visits “classic” structural localities in the East.
Prerequisites: GEO 102, or GEO 102 and 112; one semester of physics; PHY 121/123 or 131/133 or 141 or PHY 125 and 126
4 credits

GEO 310 Introduction to Geophysics
An introduction to theoretical and applied geophysics. Topics in global geophysics include seismology, gravity, geomagnetics and heat flow, with applications to the structure and dynamics of the Earth’s interior. Students conduct computer-based analysis of geophysical data, some of which they collect using techniques of geophysical exploration and environmental geophysics. Three hours of lecture per week, plus group field experiments and analysis.
Prerequisites: MAT 127 or 132 or 142 or AMS 161; GEO 122, or GEO 102 and 112; PHY 122/124 or 132/134 or 142, or PHY 126 and 127
3 credits

GEO 311-H Geoscience and Global Concerns
An exploration of how technologically based problems facing the United States and the world are related to the basic scientific principles that explain the properties of the lithosphere, hydrosphere, and atmosphere. The set of issues include such geoscience-based topics as global warming, fossil fuel resources, nuclear waste disposal, and earthquake prediction and preparedness.
Prerequisites: GEO 101 or GEO 102 or 107 or 122
3 credits

GEO 315 Groundwater Hydrogeology
Physical and chemical principles of geohydrology. Concepts of groundwater geology. Introduction to quantitative models of regional fluid flow and groundwater contamination. Groundwater and geologic processes, with examples from tectonic, petroleum geology, geothermics, and economic mineralization.
Prerequisites: GEO 102 or 122; MAT 127 or 132 or 142 or AMS 161
3 credits
GEO 316 Geochemistry of Surficial Processes
Chemical principles used in the study of surface and near-surface water, rocks, and soils. Application of equilibrium concepts and reaction rates to reactions involving gases, fluids, and minerals in nature. Consideration of soil properties and processes.
Prerequisites: GEO 122, or 102 and 112; CHE 132 or 142.
3 credits

GEO 318 Engineering Geology and Coastal Processes
Fundamental concepts of soil, sediment, and rock mechanics and the physics of surficial processes. Application is made to problems of geotechnical and coastal engineering. Topics include consolidation, loose boundary hydraulics, slope stability, underwater ground excavations and beach and tidal inlet stability, and channel sedimentation. This course is offered as both GEO 318 and MAR 318.
Prerequisites: GEO 122 or GEO 102 and 112; MAT 127 or 132 or 142 or AMS 161.
3 credits

GEO 320-E Glacial Geology
History of glaciation on earth; formation and dynamics of glaciers and ice sheets; processes of glacial erosion and deposition; and the nature of glacial sediments and landforms particularly relating to the development of Long Island.
Prerequisite: GEO 102 or 122.
3 credits

GEO 327 Computerized Modeling of Geological Phenomena
Practical experience in creating software that implements mathematical models of selected geological phenomena. Through lectures, discussions, and homework exercises, students familiarize themselves with the details of a mathematical model that describes a selected phenomenon. Students develop specifications for a software user interface and an output design for the design of a software model. As a team, the class develops, tests, and refines the software, with each student writing a particular portion of the software according to the specifications. The course requires a significant amount of computer work outside of class time.
Prerequisites: GEO 122 or GEO 102/112; MAT 131 or 126 or AMS 151; U3 or U4 standing; permission of instructor.
4 credits

GEO 353 Marine Ecology
A survey of biotic responses to ecological challenges in different marine realms. Controls of diversity and trophic structure in the marine ecosystem, historical aspects of marine realms, productivity in the oceans, plankton, soft-bottom communities, intertidal habitats, coral reefs, deep-sea environments, and effects of pollution in the ocean are discussed. This course is offered as both BIO 353 and GEO 353.
Prerequisite: BIO 201 or MAR 104.
3 credits

GEO 401 Optical Mineralogy
An introduction to the use of optical crystallography for mineral identification using polarized light microscopy. Topics include indices of refraction of isotropic, uniaxial, and biaxial minerals; optical indicatrix theory; interference figures, and other optical characteristics of minerals. Laboratory exercises provide hands-on experience in using the polarizing light microscope for mineral identification.
Prerequisite: GEO 306.
1 credit

GEO 403 Stratigraphy
The history and practice of defining units of layered rocks and interpreting their spatial relationships. Topics include the basis for the geologic time scale, lithostratigraphic versus chronostratigraphic units, biostratigraphy, magnetostratigraphy, facies patterns and Walther’s Law, subsurface stratigraphy, and the application of stratigraphy to geological problems. Laboratory emphasizes practical techniques in stratigraphy.
Prerequisite: GEO 306.
Corequisite: GEO 401.
3 credits

GEO 405 Field Camp
A field course that may be taken at any one of several approved university field stations.
Prerequisites: Two upper-division GEO courses.
1-6 credits

GEO 407 Mineralogy and Petrology II
Topics focus on the use of thin sections to interpret evolutionary histories of igneous and metamorphic rocks, integrating petrography, phase equilibria, and the physical properties of magma and rocks. Three hours of lecture and one three-hour laboratory per week.
Prerequisites: GEO 306 and 401.
3 credits

GEO 420 Environmental Analysis Using Remote Sensing and Geographic Information Systems
The use of aerial and satellite imagery in environmental analysis and the manipulation of geographic data sets of all types using Geographic Information Systems. Concentrating on Long Island, each student designs and completes a research project on a particular section of the area, focusing on the habitats of local wildlife, the locations of archaeological sites, coastal regimes, etc. Students should expect to spend approximately 10 hours per week beyond regularly scheduled classes in a University computer laboratory. This course is offered as both ANT 420 and GEO 420.
Prerequisite: Upper-division course in ANT or BIO or GEO or MAR.
4 credits

GEO 447 Senior Tutorial in Geology
Independent readings in advanced topics. May be repeated once.
Prerequisites: Permission of instructor and chairperson.
0-6 credits, S/U grading

GEO 448 Internship
Participation in local, state, or national private enterprises, public agencies, or nonprofit institutions. May be repeated to a limit of six credits.
Prerequisite: Permission of instructor and department.
0-6 credits, S/U grading

GEO 475, 476 Undergraduate Teaching Practica I, II
Work with a faculty member as an assistant in one of the faculty member’s regularly scheduled classes. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course. In GEO 476, students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice.
Prerequisites to GEO 475: U4 standing; previous preparation in subject field; interview; permission of instructor.
Prerequisites to GEO 476: GEO 475; previous preparation in subject field; interview; permission of instructor and department.
3 credits per course, S/U grading

GEO 487 Senior Research in Geology
Under the supervision of a faculty member, a major in the department may conduct research for academic credit.
Prerequisites: Permission of instructor and chairperson.
0-6 credits, S/U grading

GEO 488 Internship
Participation in local, state, or national private enterprises, public agencies, or nonprofit institutions. May be repeated to a limit of six credits.
Prerequisite: Permission of instructor and department.
0-6 credits, S/U grading

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GEO 476, Undergraduate Teaching Practica I, II
Work with a faculty member as an assistant in one of the faculty member’s regularly scheduled classes. The student is required to attend all the classes, do all the regularly assigned work, and meet with the faculty member at regularly scheduled times to discuss the intellectual and pedagogical matters relating to the course. In GEO 476, students assume greater responsibility in such areas as leading discussions and analyzing results of tests that have already been graded. Students may not serve as teaching assistants in the same course twice.
Prerequisites to GEO 475: U4 standing; previous preparation in subject field; interview; permission of instructor.
Prerequisites to GEO 476: GEO 475; previous preparation in subject field; interview; permission of instructor and department.
3 credits per course, S/U grading

GEO 487 Senior Research in Geology
Under the supervision of a faculty member, a major in the department may conduct research for academic credit.
Prerequisites: Permission of instructor and chairperson.
0-6 credits, S/U grading

GEO 488 Internship
Participation in local, state, or national private enterprises, public agencies, or nonprofit institutions. May be repeated to a limit of six credits.
Prerequisite: Permission of instructor and department.
0-6 credits, S/U grading

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