GEOLOGY (GEOL)

GEOL 101 - Introduction to Geology and the Environment (4 Hours)
This course explores the relationship between human beings and their geologic environment. First, it provides a construct for understanding geologic concepts by addressing the nature of science, systems, and time. Using this foundation, students examine the earth's internal/external processes and responses within geological systems such as rivers, coasts, aquifers, glaciers, soils, the mantle, and the crust (volcanoes and earthquakes). In the process, students learn: how geology relates to other disciplines; how to respond critically to stories in the media and to arguments by members of interest groups; and how to make wiser business, political, and ethical decisions. Laboratory and field work provide hands-on opportunities to learn the fundamental building blocks of geology and to analyze the impact of human beings on Earth's systems. Three hours of class and one three-hour laboratory session per week. C21:NS, SP.
Curriculum: NS, SP

GEOL 102 - A Geologic History of Earth (4 Hours)
This course traces the physical evolution of the earth and the evolution of life on the earth. Topics covered include the concept of time in geology, the development and chronology of the geologic timetable through analyses of the rock and fossil record, the origin of the oceans and continents, paleoclimate, and mineral resources. Laboratory work provides hands-on opportunities to analyze the formation of the major physiographic provinces of North America, identify and classify fossils, date geologic events using relative and absolute methods, analyze geologic and subsurface maps, and reconstruct paleoenvironments through facies analysis. Three hours of class and one three-hour laboratory session per week. C21:NS, SP.
Curriculum: NS, SP

GEOL 115 - Beaches, Coasts and Oceans (4 Hours)
This course will focus on processes at work in our global oceans and coastal environments and the products produced by those processes. The course starts at a broad scale by examining sea-level changes and landscapes produced by sea-level changes over millions of years (including the Atlantic Coastal Plain). At smaller time and space scales, students will classify the various beaches and island types, examine the geologic and ecologic features associated with each, and investigate the processes that form and modify these landscapes (including the role of humans). Students will be required to attend day-long and overnight field trips to beaches and barrier islands in Virginia and Coastal Plain outcrops (ancient ocean environments). C21:NS, SP.
Curriculum: NS, SP

GEOL 151 - Geology of Hawaii (4 Hours)
This travel course examines the geology of Hawaii in the context of the processes that both build up (or create features on) and wear down the Earth's surface. As such, this course focuses on the geologic/landscape features produced when convection processes within Earth's mantle drag thin oceanic lithosphere over a hot magma plume, and how atmospheric and hydrologic processes modify those features over time. Specific course topics include volcanism, earthquakes (seismicity), the Theory of Plate Tectonics, mineralogy and petrology, structural geology, hydrologic processes, glaciation, weathering, soil development, tsunamis, coastal processes, weather, climate, ecosystems and human interactions with the environment. The course will begin with a lecture/lab-based format to acquire the theoretical background, geologic knowledge, and field skills required to conduct the travel and field-based portion of this course. The field portion of this course will involve 10 days of travel beginning with an introduction to the Hawaiian culture and its relevance to geology and environmental issues, followed by multiple stops on the main island of Hawaii and Kauai. Students may not receive credit for both GEOL 151 and GEOL 251. C21:EL.
Curriculum: EL

GEOL 152 - Geology of Iceland (4 Hours)
Iceland owes its dramatic landscape features to its distinctive geologic setting on top of a tectonic "spreading center" at the Arctic Circle. In Iceland, magma rises from the Earth's mantle to "rest" precariously close to the surface where it regularly emerges through fissure cracks and volcanoes. This travel course to Iceland will enable students to examine, analyze, and map individual volcanic and glacial features and processes, as well as the landscape features produced by the interaction of fire, ice, and the ocean. Students will also investigate how the combination of fire and ice (glaciers) has produced a country socially, economically, and culturally tied to its geology and how humans have survived in this harsh geologic environment during the past 1,300 years. In particular, students will evaluate the impact of humans on the environment by analyzing first contemporary geologic environmental issues such as climate change, soil erosion, and renewable energy (over 80% of Iceland's energy comes from geothermal and hydrologic sources). Prior to departure, students will conduct a variety of class and laboratory exercises that will provide geologic background on plate tectonic dynamics, rocks and minerals, Earth processes (e.g., volcanic, glacial, hydrologic, coastal), climate change, and energy. Students may not receive credit for both GEOL 152 and GEOL 252. C21:EL.
Curriculum: EL

GEOL 201 - Watershed Hydrology and Water Resources (4 Hours)
This course introduces students to the basic physical and chemical aspects of the applied interdisciplinary science of hydrology. The scale of the watershed allows analysis of the details of hydrologic processes, study of water motion as a continuum through interconnected systems, and application of these concepts to water resource issues. The laboratory and course components are taught in an integrated lecture-field format which focuses on a local and current water "problem" (for example, a Phase II site assessment to determine the yield and quality of water in the aquifer beneath the college). Projects may involve aquifer slug and pump tests, quantitative analyses, modeling, water sample tests, field mapping, sediment/soil textural analyses, stream flow measurements, and water budget data collection and analysis. Three hours of class and one three-hour laboratory session per week.
Prerequisite(s): GEOL 101 or permission of the instructor

GEOL 251 - Advanced Geology of Hawaii (4 Hours)
This upper-level geology travel course to Hawaii satisfies the geology of expertise requirement for the EVST major. As such, this course replicates GEOL 151 (see GEOL 151 course description) and adds advanced geologic material to the GEOL 151 course content. Additional topics may include petrological and geochemical aspects of magma and lava, geophysics (e.g., seismic), Earth surface processes (e.g., mass wasting, weathering), fluvial processes, and coastal processes. Students who have successfully completed GEOL 151 may not take GEOL 251 for credit and vice versa. C21:EL.
Prerequisite(s): GEOL 101

Curriculum: EL

GEOL 252 - Advanced Geology of Iceland (4 Hours)
This upper-level geology travel course to Iceland satisfies the geology of expertise requirement for the EVST major. As such, this course replicates GEOL 152 (see GEOL 152 course description) and adds advanced geologic material to the GEOL 152 course content. Additional topics may include petrological and geochemical aspects of magma and lava, geophysics (e.g., seismic), Earth surface processes (e.g., mass wasting, weathering, soil formation), fluvial processes, geothermal energy, glaciology, and coastal processes. Students who have successfully completed GEOL 152 may not take GEOL 252 for credit and vice versa. C21:EL.
Prerequisite(s): GEOL 101

Curriculum: EL

GEOL 305 - Chemistry in Earth Systems (3 Hours)
This course investigates environmental chemistry topics from an Earth systems science perspective, with an emphasis on the atmosphere and the hydrosphere. The first half of the course focuses on Earth system science: introducing box modelling, reservoirs, and element cycling (C, N, and S in particular). The second half of the course will survey topics that build on the first half, such as climate change, stratospheric ozone depletion, and types of pollution. While there is no laboratory component, the course will be activity-based, including environmental data analysis and modeling. This course serves as an upper-level elective for chemistry majors and an area of expertise course for EVST majors with either a chemistry or geology focus. Chemistry majors and EVST majors with a chemistry area of expertise should register for CHEM 305. EVST majors with a geology area of expertise should register for GEOL 305.
Prerequisite(s): CHEM 220 or CHEM 230 and CHEM 261

Cross-list: CHEM 305

GEOL 312 - Coastal Geology (4 Hours)
This course provides an analysis of the geologic controls and oceanographic processes that govern the evolution and nature of coastal environments. It also examines the impact of humans on coastal environments such as sedimentary beaches, rocky headlands, and estuaries. Students learn to detect and predict coastal hazards as well as to analyze the effectiveness of methods used to mitigate coastal erosion and to protect coastal development from the impact of storms, storm surge and sea-level rise. Students will critically examine various controversies surrounding coastal issues, management strategies, and policy programs in scientific, socioeconomic, historical, political, and ethical contexts. Includes a national and global survey of beaches and estuaries. Field methods, such as beach profiling, coring, and grain size analyses are conducted at various coastal settings. Thus, field labs and data analyses constitute a significant portion of the laboratory. Three hours of class and one three-hour laboratory session per week.
Prerequisite(s): GEOL 101 or permission of the instructor

GEOL 381 - Special Topics (4 Hours)
These courses are designed to treat advanced topics not otherwise dealt with in the rest of the geology curriculum.

GEOL 382 - Special Topics (4 Hours)
These courses are designed to treat advanced topics not otherwise dealt with in the rest of the geology curriculum.