GEOLOGICAL SCIENCES

The Geological Sciences program offers undergraduate instruction in rigorous research techniques. It allows students to work directly with faculty in research on the geology and paleontology of the Appalachian Mountains, Rocky Mountains, Asia, and elsewhere. The partnerships between students and faculty provide a broad education and hands-on training.

Visit the Department of Geological Sciences website (https://geology.columbian.gwu.edu/) for additional information.

UNDERGRADUATE

Bachelor's programs

- Bachelor of Arts with a major in geological sciences (https://bulletin.gwu.edu/arts-sciences/geological-sciences/ba/)
- Bachelor of Science with a major in geological sciences (https://bulletin.gwu.edu/arts-sciences/geological-sciences/bs/)

Minor

- Minor in geological sciences (https://bulletin.gwu.edu/arts-sciences/geological-sciences/minor/)

FACULTY

Faculty

Committee on Geological Sciences: C. E. Brown, C. Chazen, C. A. Forster, G. Mattietti-Kysar, P. Nassar, R. P. Tollo

COURSES

Explanation of Course Numbers

- Courses in the 1000s are primarily introductory undergraduate courses
- Those in the 2000s to 4000s are upper-level undergraduate courses that also may be taken for graduate credit with permission and additional work assigned
- Those in the 6000s and 8000s are for master's, doctoral, and professional-level students
- The 6000s are open to advanced undergraduate students with approval of the instructor and the dean or advising office

GEOL 1001. Physical Geology. 4 Credits.
Introduction to the principal features of the composition and structure of the earth. The nature of minerals and rocks, surface and deep earth processes, mineral and energy resources, and plate tectonics.

GEOL 1002. Historical Geology. 4 Credits.
Lecture and laboratory. Introduction to the history of the earth. Sedimentary environments, plate tectonics, origin of life, and evolution.

GEOL 1005. Environmental Geology. 4 Credits.
Lecture and laboratory. Introduction to the impact of geology on the environment, with emphasis on the relation of people and society to natural environments. Population evolution, natural hazards, and mineral resources.

GEOL 1099. Variable Topics. 1-36 Credits.

GEOL 2106. Oceanography. 3 Credits.
Origin of the ocean systems and plate tectonics, ocean habitats and their biota, marine hydrology and ocean currents; air–sea interaction and climate control; ocean mapping techniques; environmental regulations covering marine resources. Prerequisites: GEOL 1001, or GEOL 1002, or GEOL 1005.

GEOL 2111. Mineralogy. 4 Credits.
Lecture and laboratory. Introduction to the crystallography and chemical systematics of rock-forming and ore minerals. Exercises emphasize the analysis of mineralogic data and the paragenesis of mineral assemblages. Prerequisites: GEOL 1001, or GEOL 1002, or GEOL 1005.

GEOL 2112. Igneous and Metamorphic Petrology. 4 Credits.
Lecture and laboratory. Introduction to basic light theory and the identification and characterization of minerals through optical properties. Laboratory exercises provide an introduction to petrologic analysis of igneous and metamorphic mineral systems. Prerequisite: GEOL 2111 or permission of the instructor. Laboratory fee.

GEOL 2122. Structural Geology. 3 Credits.
Study of natural and experimental rock deformation and the relationships between stress and strain as recorded by geologic structures. Prerequisites: GEOL 1001 or GEOL 1002 or GEOL 1005.

GEOL 2151. Introduction to Paleontology. 3 Credits.
Review of the origin of life, the geologic record, and the evolutionary history of the major groups of organisms, including the origin of life and evolution of invertebrates, vertebrates, and plants. Prerequisites: GEOL 1002.

GEOL 2190. Special Topics in Geology. 1-3 Credits.
Topic announced in the Schedule of Classes. May be repeated for credit provided the topic differs.

GEOL 2333. Evolution and Extinction of Dinosaurs. 3 Credits.
The 165-million-year history of dinosaurs; different groups and their evolution, end-Cretaceous extinction event, the origin of birds, and the biology of the group. Prerequisites: BISC 1111 and BISC 1112; or GEOL 1001 and GEOL 1002; or GEOL 1002 and GEOL 1005. Credit cannot be earned for this course and BISC 2333.

GEOL 3099. Variable Topics. 1-12 Credits.

GEOL 3118. Volcanology. 3 Credits.
Fundamental principles and geologic processes associated with volcanism. Eruptive styles, processes leading to magma production and transport, triggering mechanisms, plate tectonic settings, volcanic hazards, and disaster mitigation. Case histories of selected volcanic eruptions examined in detail. Laboratory fee. Prerequisites: GEOL 2111 or permission of the instructor.

GEOL 3119. Field Experience in Volcanology. 1 Credit.
Weeklong field exercise at a major volcanic center in the western United States; field-based interpretation and analysis of volcanic and related rocks.Classroom discussion focuses on the processes responsible for volcanism. Deposit for expenses is required. Recommended background: Prior completion or concurrent enrollment in GEOL 2112 and GEOL 3118.

GEOL 3123. Crustal Dynamics. 3 Credits.
Basic plate tectonic processes and features; the plate tectonic paradigm in historical evolutionary framework. Students present an original research project orally and in writing. Prerequisite: GEOL 2122. Laboratory fee.

GEOL 3128. Sedimentology and Stratigraphy. 3 Credits.
Introduction to sedimentation and stratigraphy; origin and classification of sediments and sedimentary rocks; introduction to clastic and carbonate depositional environments and stratigraphic principles. Prerequisites: GEOL 1001, or GEOL 1002, or GEOL 1005.

GEOL 3129. Sedimentology and Stratigraphy Lab. 1 Credit.
Introduction to sedimentary petrology of sandstones, mudrocks, and carbonates. Prerequisites: GEOL 2112.

GEOL 3131. Global Climate Change. 3 Credits.
Fundamental causes and patterns of climate change. Methods of reconstruction of past climates; modeling and predicting climate change.

GEOL 3138. Hydrogeology. 3 Credits.
Principles and theory of basic applied hydrology: surface water hydrology, geology of groundwater systems, groundwater flow, surface water–groundwater interactions, contamination and remediation technologies, conservation, management and regulations. Prerequisites: GEOL 1001, or GEOL 1002, or GEOL 1005.

GEOL 3140. Geochemistry. 3 Credits.
Chemical systems and processes on the planet Earth; origins and interactions among and within the Earth's lithosphere, oceans, and atmosphere; origin, distribution, and behavior of the elements; radioactive and stable isotope systems. Aqueous geochemistry; geochemical cycles. Prerequisites: GEOL 1001 or GEOL 1005; and CHEM 1111 and CHEM 1112. (Same as CHEM 3140)

GEOL 3189. Geophysics. 3 Credits.
Principles of magnetic, gravity, seismic and electrical methods applied to geological problem-solving. Prerequisite: GEOL 2122 or permission of instructor.

GEOL 3191. Geology of Energy Resources. 3 Credits.
Principles of geology applied in energy exploration, exploitation, and production. The geology and regulation of energy resources. Sustainability, efficiency, supply chain, and conservation issues. Prerequisites: GEOL 1001, or GEOL 1002, or GEOL 1005.

GEOL 4195. Geological Field Methods. 4 Credits.
Weekend field trips. Methods of outcrop analysis, geologic mapping, and data interpretation. The geological evolution of the central Appalachian mountains and the plate tectonic processes responsible for their formation emphasized. Field trip fee. Prerequisites: GEOL 2111 and GEOL 2122.

GEOL 4195W. Geological Field Methods. 4 Credits.
Includes a significant engagement in writing as a form of critical inquiry and scholarly expression to satisfy the WID requirement.

GEOL 4199. Undergraduate Research or Reading. 1-12 Credits.
Problems approved by the staff. May be repeated for credit.

GEOL 5099. Variable Topics. 1-99 Credits.