

Department of Geology

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The Department of Geology offers programs leading to the degree of Bachelor of Science in Geology and Master of Science degrees in certain areas of the vast field of geological sciences. It also offers a more broadly based program leading to the degree of Bachelor of Science in Petroleum Geosciences. Students wishing to major in Geology or Petroleum Geosciences must secure the approval of the department. In addition, students must have a strong background in sciences and have taken the freshman science program or its equivalent.

The department also offers undergraduate elective courses which include GEOL 101, GEOL 102, GEOL 103, GEOL 104, and GEOL 201 in the area of general Geology, and GEOL 204, GEOL 205, GEOL 206, and GEOL 227 in the fields of environmental and planetary Geology.

Field trips are a required part of most Geology courses.

Mission Statement

The Department of Geology at the American University of Beirut is committed in providing the best Geoscience education in the Middle East, via its emphasis on excellence in teaching, and engaging students in research. The aim is to prepare our students to fulfill the needs of this region in terms of its geological nature, its petroleum and mineral reserves, as well as groundwater resources, and their role in the world economy and environmental implications. This is achieved within the context of learning about the occurrence, distribution and origin of natural resources worldwide. With the structure of our courses which include laboratory components, field work and training, term papers, oral presentations, and problem-solving assignments, we train our students to observe, analyze, critically evaluate, think independently, and derive their own conclusions. We emphasize the development of the conceptual apparatus, and the unbiased and accurate reporting of field and laboratory data (observation) and its significance in reaching a correct interpretation. In this manner, we promote high ethical professional standards, character, and scientific integrity. The program prepares students to be life-long learners and well-rounded individuals, who can lead successful careers in the areas of energy and petroleum resources, hydrogeology, mining, geotechnical sciences and related fields.

^P) Part-time

BS Degree in Geology

Students admitted in Geology are eligible to continue in the program provided they obtain, by the end of their third regular term at AUB, a minimum average of 2.2 (or 70%) in any three out of the following five courses: GEOL 201, GEOL 211, GEOL 212, GEOL 213, and GEOL 222. Otherwise, they will normally be dropped from the department. Consideration for readmission requires a minimum cumulative average of 2.2 (or 70%) overall and a minimum average of 2.2 (or 70%) in any three out of the following five Geology courses: GEOL 201, GEOL 211, GEOL 212, GEOL 213, and GEOL 222, and this should be achieved within the following two regular terms (at the very latest) after being dropped from the major. Majors must complete the following courses, in which a general average of 2.2 (or 70%) or more must be maintained: GEOL 201, GEOL 203, GEOL 211, GEOL 212, GEOL 213, GEOL 214, GEOL 219, GEOL 221, GEOL 222, GEOL 224, GEOL 226, GEOL 227 and GEOL 229, which is a total of 40 credits. In addition, three required elective courses - CMPS 200 or MATH 201 or STAT 210 and 200-level approved General Education economics and education courses (6 credits) - must be completed. No course may be taken without its prerequisite unless authorized by the departmental faculty. Students are encouraged to take additional Geology courses, such as GEOL 204, GEOL 206, GEOL 209 or GEOL 318, and also other courses from the graduate level, provided other requirements permit. A GIS-course is another highly recommended elective.

The requirements for a BS degree in Geology are 90 credits for students entering the department at the sophomore level, including 40 credits in the major. The distribution of university requirements is as follows:

University General Education Requirements

The General Education requirements are English Communication Skills (6 cr.) and Arabic Communication Skills (3 cr.), Humanities (12 cr.), Social Sciences (6 cr.), Natural Sciences (9 cr.), and Quantitative Thought (3 cr.). Also note that two natural sciences must be approved General Education courses from outside the major in physics (PHYS 204, PHYS 205 or PHYS 201), and in chemistry (CHEM 201, CHEM 202, or CHEM 208).

BS Degree in Petroleum Geosciences

The core courses of the Petroleum Geosciences program (totaling 58 credits) are GEOL 201, GEOL 203, GEOL 211, GEOL 212, GEOL 213, GEOL 214, GEOL 219, GEOL 221, GEOL 222, GEOL 225, GEOL 226, GEOL 227, GEOL 229, ACCT 210, MNGT 215, and ECON (GE); one of the following chemistry courses: CHEM 201, CHEM 202, or CHEM 208, as well as one of the following physics courses: PHYS 204, PHYS 205, or PHYS 210. In addition, a required elective course, CMPS 200, MATH 201 or STAT 210, must be completed.

Students admitted in Petroleum Geosciences are eligible to continue in the program provided they obtain, by the end of their third regular term at AUB, a minimum average of 2.2 (or 70%) in any three out of the following courses: GEOL 201, GEOL 211, GEOL 212, GEOL 213, and GEOL 222. Otherwise, they will normally be dropped from the department. Consideration for readmission requires a minimum cumulative average of 2.2 (or 70%) overall and a minimum average of 2.2 (or 70%) in any three out of the following five Geology courses: GEOL 201, GEOL 211, GEOL 212, GEOL 213, and GEOL 222. This should be achieved within the following two regular terms (at the very latest) after being dropped from the major.

The requirements for a BS degree in Petroleum Geosciences are 90 credits for students entering the department at the sophomore level, including 40 credits of Geology courses, 6 credits of chemistry and physics courses, 6 credits of business courses, 3 credits in economics (ECON 211 or 212) and 3 credits in education (EDUC 215 or 230). The distribution of university requirements is as follows:

University General Education Requirements

The General Education requirements are English Communication Skills (6 cr.) and Arabic Communication Skills (3 cr.), Humanities (12 cr.), Social Sciences (6 cr.), Natural Sciences (9 cr.), and Quantitative Thought (3 cr.).

Minor in Geology

To obtain a minor in Geology, students must complete the following core courses: GEOL 201, GEOL 209, GEOL 211, GEOL 222, and GEOL 227 (for a total of 15 credits).

Course Descriptions

GEOL 101 The Earth, Present and Past 3.0; 3 cr.
A freshman level study of the present day processes that shape the Earth we live on, such as plate tectonic activity, rock formation and erosion, coupled with an overview of the origin and history of the Earth and life. *Every term.*

GEOL 102 Environmental Physical Geography 3.0; 3 cr.
An introduction to the structure, classification, physical processes and characteristics of the Earth's atmosphere, hydrosphere and biosphere, dynamics of change, and associated environmental impacts. *Every term.*

GEOL 103 Introduction to Marine Geology 3.0; 3 cr.
A freshman level survey of oceanic geological processes, wave dynamics, submarine springs, marine economic mineral resources, marine communities, pollution, global change, and marine-related environmental issues. *Every term.*

GEOL 104 Natural Disasters 3.0; 3 cr.
A freshman level course covering events involving natural forces that have major devastating effects on humankind. These include mud flows, landslides and slope failure, earthquakes, tsunamis, explosive eruptions and volcanic hazards, meteoritic impacts and mass extinctions, hurricanes and tornadoes, flooding, and forest fires. *Every term.*

GEOL 201 Physical Geology 3.0; 3 cr.
An introduction to minerals, igneous, sedimentary and metamorphic rocks, geological structures, and external Earth processes, including the geologic work of streams, glaciers, groundwater, wind, and the plate tectonics theory. *Every term.*

GEOL 202 Historical Geology 2.2; 3 cr.
 An introduction to Earth's history, including the principles of interpreting the past, origin, and development of the solar system. This course also provides an introduction to the systematic study of fossils, their classification, and identification. *Prerequisite: GEOL 201, GEOL 203, or consent of instructor. Occasionally.*

GEOL 203 Physical Geology Laboratory 0.2; 1 cr.
 An introduction to the identification of rocks and minerals in hand specimen, geographic and geological maps, and basic interpretation of geological data. *Pre- or corequisite: GEOL 101, GEOL 102, GEOL 103, GEOL 201, or consent of instructor. Every term.*

GEOL 204 Dinosaurs and Life History 3.0; 3 cr.
 A sophomore and higher-level course covering topics that include structure and tectonics of the Earth, origin and evolution of life, climatic changes through time, life forms throughout the geologic eras, bacteria and algae in the Precambrian, trilobites, fishes and first trees, in the Paleozoic, dinosaurs, birds and reptiles, in the Mesozoic, mammals, in the Cenozoic, major extinction events in Earth's history, and the theory of evolution. *Every term.*

GEOL 205 Earth Resources and Energy 3.0; 3 cr.
 A study of the main economic mineral resources and traditional and alternate energy resources, with an emphasis on the environmental impacts of their use and misuse. A special emphasis is given to regional issues. *Open to both arts and sciences students, but not to Geology and Petroleum Geosciences students. Every term.*

GEOL 206 Planetary Geology 3.0; 3 cr.
 A sophomore and higher-level course covering topics that include origin of the solar system, Earth as a model of planetary evolution, meteorites and impact craters, planetary geology of planets Mercury, Venus, Mars and its recent discoveries, Jupiter and the asteroidal belt, Saturn and Titan, Uranus, Neptune and Pluto and their major satellites, with some emphasis on the patterns of variation among planets. Planetary magnetic fields, atmospheres, bulk chemical compositions, internal structure, and present geologic activities are covered. *Every term.*

GEOL 209 Building & Destruction of Mountains 3.0; 3 cr.
 A sophomore and higher-level (GE natural-science) course covering topics that include global landforms and tectonics, endogenic processes and the role of Earth's mantle, exogenic processes (fundamentals of weathering and erosional agents), fluvial, groundwater and aeolian processes, coastal processes and reshaping of the seashore, glacial / periglacial processes and landforms, sea-level change, uplift and inundation, as well as present geologic activities related to Earth's landforms. *Every term.*

GEOL 210 Geomorphology 3.0; 3 cr.
 An introduction to the study of land forms and the interaction of external geological forces and erosion agents with the structure and composition of their surface rocks. This course is also an examination of the interaction between the internal and external Earth processes responsible for the development of land forms. *Prerequisites: GEOL 201 and GEOL 203, or consent of instructor. Occasionally.*

- GEOL 211 Crystallography and Physical Mineralogy 2.2; 3 cr.**
An introduction to the study and classification of crystals; properties of minerals as related to their crystal structure; identification, description, and classification of minerals. This course entails practical work with crystal models and hand specimens of common minerals. *Annually.*
- GEOL 212 Optical Mineralogy 2.2; 3 cr.**
An introduction to the theory of crystal optics, the polarizing microscope, and methods of mineral identification based on their optical properties. This course is also a systematic study of the common rock forming minerals in thin section. *Prerequisite: GEOL 211 or consent of instructor. Annually.*
- GEOL 213 Structural Geology 2.2; 3 cr.**
An introduction to the study of rock deformation, the relationship between stress and strain, and the interpretation of structures and their significance to regional and global tectonics. *Prerequisite: GEOL 201. Annually.*
- GEOL 214 Stratigraphy 2.2; 3 cr.**
A course on the principles of interpretation of the sedimentary rocks and methods of correlation and an introduction to the stratigraphy of Lebanon in the context of the regional geology of the Middle East. *Prerequisite: GEOL 222 or consent of instructor. Annually.*
- GEOL 219 Geologic Field Methods 0.6; 3 cr.**
An introduction to the applied methods used in field geological mapping. This course also provides a description and interpretation of geological maps, and construction of cross-sections as well as a brief introduction to GIS. *Prerequisites: GEOL 201, GEOL 213, GEOL 222, or consent of instructor. Annually.*
- GEOL 221 Petrology 2.2; 3 cr.**
A course on the origin, composition, occurrence, and classification of igneous and metamorphic rocks and their systematic identification in hand specimens and in thin section. *Prerequisite: GEOL 212 or consent of instructor. Annually.*
- GEOL 222 Sedimentology 2.2; 3 cr.**
A study of the characteristics and classification of sedimentary rocks using petrographic and field study methods, with some focus on diagenetic processes, depositional environments, and elementary basin analysis. *Pre- or corequisites: GEOL 212 or consent of instructor. Annually.*
- GEOL 224 Regional Geology 3.0; 3 cr.**
A course on the geology of the Middle East region, with emphasis on its stratigraphy, structure, geological history, and tectonic evolution, and with reference to oil and mineral resources in the region. *Prerequisites: GEOL 213 and GEOL 222, or consent of instructor. Annually.*
- GEOL 225 Petroleum Geology 3.0; 3 cr.**
A course on hydrocarbon formation and occurrence as oil and gas fields, source and reservoir rocks, petroleum traps, as well as exploration and extraction methods. *Prerequisites: GEOL 213, GEOL 222, or consent of instructor. Annually.*

GEOL 226 Introduction to Geophysics 3.0; 3 cr.

A junior/senior level course covering the basic principles and fundamental concepts of the main geophysical methods: seismic, electrical, electromagnetic, and geophysical borehole logging techniques, as well as gravimetry and magnetometry. Applications of the various geophysical techniques in some domains as mining of ore minerals, the geotechnical field and the exploration of hydrocarbons and other natural resources are covered briefly. *Prerequisite: GEOL 201. Annually.*

GEOL 227 Alternate Energy & Climate 3.0; 3 cr.

A sophomore and higher-level (GE natural-science) course that offers a wide overview on fossil fuels and environmental impacts, principles & processes involved in harvesting alternate energy resources: solar energy, hydropower and water resources, wind power, biomass energy, geothermal and tidal energy, nuclear energy and its impacts, climate science, anthropogenic climate forces and the resultant effect on climate change. *Every term.*

GEOL 229 Individual Field Work Project 0.18; 6 cr.

A complete and independent geological investigation of a designated area and preparation of a detailed geological map, cross-sections, and report. *For geology majors who have junior or senior standing. Pre- or corequisite: GEOL 219. Annually.*

GEOL 271/272 Directed Study in Geology 1.0-3.0; 1-3 cr.

A tutorial that may be repeated for credit with different topics or may replace a required course. *Occasionally.*

GEOL 290 Special Topics in Geology 1.0-3.0; 1-3 cr.

A course that covers a variety of topics in Geology not typically offered by the department. *May be repeated for credit. Every term.*

40 Credits¹ in Geology²³⁴

Modes of Analysis	English and Arabic (9)	Humanities (12)	Social Sciences (12)	Natural Sciences (37+6)	Quantitative Thought (3)
Lecture Courses (9+12+3+40+3)	<ul style="list-style-type: none"> Required Arabic course (3) Required English courses: 203(3), 204(3) 	<ul style="list-style-type: none"> Required credits in the humanities: 12 credits including 6 credits from CVSP 	<ul style="list-style-type: none"> Required elective economics courses: A 200-level approved GE economics course (3): ECON 211(3), or ECON 212(3); and a 200-level approved GE education course (3): EDUC 215 or 230 	<ul style="list-style-type: none"> Required Geology courses: GEOL 201²(3), 211⁴(3), 212^{2,4}(3), 213^{2,3,4}(3), 214^{2,3}(3), 219^{2,4}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 224^{2,3}(3), 226⁴(3), 227⁴(3), 229^{2,3}(6) Elective geology courses: GEOL 204, 205^{2,3}(3), 206, 209, 225^{2,3}(3), 271^{2,3}(3), 272^{2,3}(3), 318(3) Two natural sciences must be an approved general education course from outside the major (in PHYS and CHEM) 	<ul style="list-style-type: none"> Required elective quantitative thought courses: CMPS 200(3) or MATH 201(3) or STAT 210(3)
Seminar (24+12)				<ul style="list-style-type: none"> Required geology courses: GEOL 201B(3), 202^{2,3}(3), 213^{2,3,4}(3), 214^{2,3}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 224^{2,3}(3), 226(3), 227(3) Elective geology courses: GEOL 205^{2,3}(3), 225^{2,3}(3), 271^{2,3}(3), 272^{2,3}(3), 318³(3) 	
Laboratory (25+3)				<ul style="list-style-type: none"> Required geology courses: GEOL 203(1), 211B(3), 212^{2,4}(3), 213^{2,3,4}(3), 219^{2,4}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 226⁴(3), 229^{2,3}(6) 	
Research Project (36+12)				<ul style="list-style-type: none"> Required geology courses: 201²(3), 212^{2,4}(3), 213^{2,3,4}(3), 214^{2,3}(3), 219^{2,4}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 224^{2,3}(3), 229^{2,3}(6) Elective geology courses: GEOL 205^{2,3}(3), 206³(3), 225^{2,3}(3), 271^{2,3}(3), 272^{2,3}(3) 	

1) Plus 50 required and elective credits

2) Combined lecture, laboratory (field), and research project courses

3) Combined lecture and seminar courses

4) Combined lecture and lab courses

40 Credits in Petroleum Geoscience¹

Modes of Analysis	English and Arabic (9)	Humanities (12)	Social Sciences (12)	Natural Sciences (39+6+3)	Quantitative Thought (3)
Lecture Courses (9+12+9+3+37+6+3)	<ul style="list-style-type: none"> Required Arabic course (3) Required English courses: 203(3), 204(3) 	<ul style="list-style-type: none"> Required credits in the humanities: 12 credits including 6 credits from CVSP 	<ul style="list-style-type: none"> Required business courses: ACCT 210(3), MNGT 215(3) Economics courses: ECON 211(3), or ECON 212(3) One approved GE social science course (3): EDUC 215(3), or EDUC 230(3) 	<ul style="list-style-type: none"> Required geology courses: GEOL 201²(3), 211⁴(3), 212^{2,4}(3), 213^{2,3,4}(3), 214^{2,3}(3), 219^{2,4}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 225^{2,3}(3), 226⁴(3), 227⁴(3), 229^{2,3}(6) Chemistry and physics courses: CHEM 201(3) and one of PHYS 204(3), PHYS 205(3), or PHYS 210(3) Elective geology courses: GEOL 205^{2,3}(3), GEOL 206, GEOL 209^{2,3}(3), 271^{2,3}(3), 272^{2,3}(3) 	<ul style="list-style-type: none"> Required elective computer science courses: MATH 201(3), STAT 210(3), or CMPS 200(3)
Seminar (30+12)				<ul style="list-style-type: none"> Required geology courses: GEOL 201²(3), 213^{2,3,4}(3), 214^{2,3}(3), 219^{2,4}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 225^{2,3}(3), 229^{2,3}(6) Elective geology courses: GEOL 205^{2,3}(3), 210^{2,3}(3), 271^{2,3}(3), 272^{2,3}(3) 	
Laboratory (13,3)				<ul style="list-style-type: none"> Required geology courses: GEOL 203(1), 211D(3), 212^{2,4}(3), 213^{2,3,4}(3), 222^{2,3,4}(3), 226⁴(3), 227⁴(3) 	
Research Project (27+12)				<ul style="list-style-type: none"> Required geology courses: GEOL 201⁴(3), 213^{2,3,4}(3), 214^{2,3}(3), 219^{2,4}(3), 221^{2,3,4}(3), 222^{2,3,4}(3), 225^{2,3}(3), 229^{2,3}(6) Elective geology courses: GEOL 205^{2,3}(3), GEOL 206³(3), GEOL 209^{2,3}(3), 271^{2,3}(3), 272^{2,3}(3), 318^{3,4}(3) 	

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1) Plus 50 required and elective credits
2) Combined lecture, laboratory (field), and research project courses
3) Combined lecture and seminar courses
4) Combined lecture and lab courses