Department of Geology

Chairperson: Abdel-Rahman, Abdel-Fattah M.
Professor: Abdel-Rahman, Abdel-Fattah M.
Associate Professor: Salah, Mohamed K.
Assistant Professors: Alqudah, Mohammad (Visiting); Doummar, Joanna J.; Haidar, Ali T; Nemer, Tony; Sanjuan, Josep.
Instructors: Khadra, Wisam M.; Oueida, Raghida S.

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 205 in environmental 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 resources, as well as groundwater resources, and their role in 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 components, 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 our 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.

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 semester at AUB, a minimum average of 70 percent in any three out of these six courses, GEOL 201, 202, 211, 212, 213 and 222. Otherwise, they will normally be dropped from the department. Consideration for readmission requires a minimum cumulative average of 70 percent overall and a minimum average of 70 percent in any three out of these six Geology courses, GEOL 201, 202, 211, 212, 213 or 222, and this should be achieved within the following two regular semesters (at the very latest) after being dropped from the major. Majors must complete the following courses, in which a general average of 70 or more must be maintained: GEOL 201, GEOL 202, GEOL 203, GEOL 210, GEOL 211, GEOL 212, GEOL 213, GEOL 214, GEOL 219, GEOL 221, GEOL 222, GEOL 224, and GEOL 229, which is a total of 40 credits. In addition, three required elective courses - CMPS 200 or CMPS 209 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 205, GEOL 207, GEOL 215 or GEOL 225, and also courses from the graduate level, provided other requirements permit.

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 one natural science must be an approved General Education course from outside the major in Physics: PHYS 204, PHYS 205, or PHYS 210, Chemistry: CHEM 201, CHEM 202, or CHEM 208, or Biology: BIOL 201, BIOL 209, or BIOL 250.

BS Degree in Petroleum Geosciences

The core courses of the Petroleum Geosciences program (totaling 58 credits) are GEOL 201, GEOL 202, GEOL 203, GEOL 211, GEOL 212, GEOL 213, GEOL 214, GEOL 219, GEOL 221, GEOL 222, GEOL 225, GEOL 229, CHEM 201, CHEM 208, ACCT 210, MNGT 215, MKTG 210, and ECON (GE). In addition, a required elective course, CMPS 200 or CMPS 209 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 semester at AUB, a minimum average of 70 percent in any three out of the GEOL-201, 202, 211, 212, 213 and 222 courses. Otherwise, they will normally be dropped from the department. Consideration for readmission requires a minimum cumulative average of 70 percent overall and a minimum average of 70 percent in any three out of these six Geology courses, GEOL-201, 202, 211, 212, 213 & 222. This should be achieved within the following two regular semesters (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 37 credits of Geology courses, 6 credits of chemistry courses, 9 credits of business courses, and 3 credits in economics. 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 202, GEOL 203, and GEOL 205, and two of the following elective courses: GEOL 210, GEOL 211, and GEOL 222 (for a total of 16 credits).

Course Descriptions

GEOL 101  The Earth, Present and Past  3.0; 3 cr.
A freshman level survey 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 semester.

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 semester.

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 semester.

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 impact and mass extinctions, hurricanes and tornadoes, flooding, and forest fires. Every semester.

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 plate tectonic theory. Every semester.

GEOL 202  Historical Geology  2.2; 3 cr.
An introduction to earth 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. Annually.
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 co-requisite: GEOL 101, GEOL 102, GEOL 103, GEOL 201, or consent of instructor. Every semester.

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. Not open to GEOL or PTST majors. Every semester.

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. Every semester.

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 asteroid 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 will be covered. Not open to GEOL or PTST majors. Every semester.

GEOL 207  Map Interpretation  2.2; 3 cr.
A course on the description, reading and interpretation of topographic and geological maps. This course also introduces stereographic projections, construction of cross-sections across geologic structures, and basic field mapping techniques. Prerequisites: GEOL 201, GEOL 203, or consent of instructor. Occasionally.

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 will be covered. Every semester.

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. Annually.
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.
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 215  Invertebrate Paleontology  2.2; 3 cr.
An introduction to the systematic study of invertebrate fossils, their classification and identification, using macro-specimens and thin sections. Prerequisite: GEOL 202. Annually.

GEOL 219  Geologic Field Methods  0.6; 3 cr.
An introduction to applied methods used in field geological mapping. This course also provides a description and interpretation of geological maps, and construction of cross-sections. 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 co-requisites: GEOL 202 and 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, 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 petroleum industry will be 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. *Not open to GEOL or PTST majors. Every semester.*

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 juniors and seniors in the major. *Pre- or co-requisite: 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.*
40 Credits\(^1\) in Geology

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<tr>
<th>Modes of Analysis</th>
<th>English and Arabic (9)</th>
<th>Humanities (12)</th>
<th>Social Sciences (12)</th>
<th>Natural Sciences (37+6)</th>
<th>Quantitative Thought (3)</th>
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<tr>
<td>Lecture Courses (9+12+3+6+3)</td>
<td>• Required Arabic course (3)</td>
<td>• Required credits in the humanities: 12 credits including 6 credits from CVSP</td>
<td>• 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</td>
<td>• Required Geology courses: GEOL 201(3), 202(^2)(^3)(^4)(3), 210(^2)(^3)(3), 211(3), 212(^2)(3), 213(^2)(^3)(^4)(3), 214(^2)(^3)(^4)(3), 219(^2)(^3)(^4)(3), 221(^2)(^3)(3), 222(^2)(3), 224(^2)(^3)(3), 229(^2)(^3)(^4)(6)</td>
<td>• Required elective computer science courses: CMPS 200(3) or CMPS 209(3)</td>
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<td>Seminar (24+12)</td>
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<td>• Required Geology courses: GEOL 201B(3), 202(^2)(^3)(^4)(3), 210(^2)(^3)(^4)(3), 211(3), 212(^2)(3), 213(^2)(^3)(^4)(3), 214(^2)(^3)(^4)(3), 221(^2)(^3)(3), 222(^2)(3), 224(^2)(^3)(3)</td>
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<td>Laboratory (25+3)</td>
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<td>Research Project (36+12)</td>
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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
## 37 Credits in Petroleum Geoscience

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<tr>
<th>Modes of Analysis</th>
<th>English and Arabic (9)</th>
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<th>Quantitative Thought (3)</th>
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<td>Economics courses: ECON 211(3), or ECON 212(3)</td>
<td>Combined lecture, laboratory (field), and research project courses</td>
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<td>One approved General Education social science course (3): EDUC 215(3), or EDUC 230(3)</td>
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<td>Elective Geology courses: GEOL 205(3), 210(3), 271(3), 272(3)</td>
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<td>Laboratory (13,3)</td>
<td>Required Geology courses: GEOL 203(1), 211D(3), 212(3), 213(3), 214(3), 222(3), 225(3)</td>
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<td>(30+12)</td>
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<td>Elective Geology courses: GEOL 205(3), 210(3), 271(3), 272(3)</td>
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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