

GEOLOGY (GEOL)

GEOL 1390 Introductory Environmental & Physical Geology 3 Credits

Department: College of Arts and Sciences

This course is an introduction to the relationship between human activities, geologic resources and processes and environmental quality. Topics include the relationship between human populations and geologic hazards, as well as how human activities may increase the chances of geologic hazards occurring. Emphasis will be from the geologic perspective, but will include all basic sciences. Field trips are an integral part of this course.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 1403 Geology I: Physical Geology 4 Credits

Department: College of Arts and Sciences

Earth materials, structures, tectonics, land forms, mineral resources and processes that formed them.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 1404 Geology II: Historical Geology 4 Credits

Department: College of Arts and Sciences

History of the development of our planet and its inhabitants.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 2373 Optical Mineralogy 3 Credits

Department: College of Arts and Sciences

In this course, the student will learn about light transmission in minerals, become familiar with the operation and care of the petrographic microscope, learn to identify minerals by optical properties and be able to recognize common and important minerals.

Prerequisite(s): GEOL 2471

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 2376 World and Economic Geography 3 Credits

Department: College of Arts and Sciences

Regional, national, and continental units considered from the viewpoint of economic resources, resource development, organization, politics, economy, and physical landscape.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 2377 Physical Geography and Geomorphology 3 Credits

Department: College of Arts and Sciences

Fundamental concepts of local, regional, and global physical geography and geomorphology, including landform features and soils. Geology and Earth Science majors are required to take an additional laboratory component (GEOL 4101 - Geomorphology Lab) to meet degree requirements. (CC No. 1301).

Prerequisite(s): GEOL 1403

Restriction(s):

Students with a class of Freshman may **not** enroll.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 2471 Mineralogy Petrology 4 Credits

Department: College of Arts and Sciences

Classification, properties, occurrence and identification of rock-forming minerals.

Prerequisite(s): GEOL 1403

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 3101 Physical Geology Lab Instruction 1 Credit

Department: College of Arts and Sciences

Advanced laboratory techniques in physical geology. May be repeated for credit.

May be Repeated for a maximum of 3 hours

Prerequisite(s): GEOL 1403

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 3315 Hydrogeology 3 Credits

Department: College of Arts and Sciences

This course is designed to introduce the student to the basic principles of hydrogeology – understanding the geologic factors that control the occurrence, movement, and chemistry of groundwater. We will also examine issues related to groundwater supply and contamination of groundwater.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 3316 Petroleum & Subsurface Geology 3 Credits

Department: College of Arts and Sciences

This course is to introduce the students to the methods used in petroleum exploration and production, including interpretation of subsurface data used in the oil industry, as well as the environmental and mining industries. Skills learned in this course include petrophysical interpretation of well logs, well log correlation, subsurface contour mapping, and determining what geologic conditions are necessary for the potential accumulation of oil and gas deposits. These methods will be taught, using both computer software and hand interpretation techniques. Other goals of this course include increasing the student's critical thinking, writing, and oral communication skills through problem sets, class discussions, and a final exploration play report and presentation. Assessment of how well students learned the skills taught in this course will take place through homework grades, two exams, and grades received on their exploration play report and presentation.

Prerequisite(s)/Corequisite(s): GEOL 3420 and GEOL 4410

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 3370 Engineering Geology 3 Credits**Department:** College of Arts and Sciences

This course aims to provide the students with the tools required to understand and identify geologic features that could have short and long-term consequences to the environment and overall performance of various engineering structures. Emphasis is given in geologic site characterization techniques, technical writing, geologic map analysis, and the evaluation of geological and geotechnical conditions for the design, construction, operation, and maintenance of engineering structures.

The course also intends to provide a key understanding of geological processes involved in natural hazards as well as the techniques used to "forecast" and/or mitigate such events. Fundamental knowledge on rock and soil mechanics, geomorphology, sedimentology, and structural geology are also included in this course for wholistic environmental and site characterizations.

Prerequisite(s): GEOL 4301 and MATH 2312**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 3390 Environmental Geography and Geology 3 Credits****Department:** College of Arts and Sciences

The relationship between human activities, geologic resources and processes, and environmental quality. Topics include the consumption of geologic resources and its impact on the environment. The relationship between human populations and geologic hazards. Field trip and special fee required.

Prerequisite(s): GEOL 1403 or GEOL 2377**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 3420 Structural Geology 4 Credits****Department:** College of Arts and Sciences

Rock deformation and geologic structures. Field trip and special fee required.

Prerequisite(s): GEOL 2471**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 3450 Petrology 4 Credits****Department:** College of Arts and Sciences

Classification, properties, occurrence and origin of rocks. Macro and micro techniques for the identification of rocks. Field trip and special fee required. Prerequisite: GEOL 2471 Offered: Fall

Prerequisite(s): GEOL 2471 and GEOL 2373**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 3600 Summer Field Camp 6 Credits****Department:** College of Arts and Sciences

Description of stratigraphic sections, preparation of geologic maps and field reports. Conducted off-campus at various field locations. Special field trip fees required.

May be Repeated for a maximum of 6 hours

Prerequisite(s): GEOL 3420 and GEOL 3450 and GEOL 4420**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4101 Special Topic Earth Science 1 Credit****Department:** College of Arts and Sciences

An individual library, laboratory, or field project. To receive credit, an acceptable report is required. May be repeated for credit.

May be Repeated for a maximum of 9 hours

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4301 Special Topic Earth Science 3 Credits****Department:** College of Arts and Sciences

An individual library, laboratory, or field project. To receive credit, an acceptable report is required. May be repeated for credit.

May be Repeated for a maximum of 12 hours

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4303 GPS Methods and Applications 3 Credits****Department:** College of Arts and Sciences

This course is designed to train students in using several types of GPS instruments to gather field position data for a variety of applications, including GIS. Lectures on GPS fundamentals will be augmented with hands-on training using GPS equipment; including survey-grade GPS, mapping-grade GPS, GPS base stations, hand-held GPS and smartphone GPS.

Prerequisite(s): GEOL 4311 or GEOL 3311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4311 Fundamentals of GIS 3 Credits****Department:** College of Arts and Sciences

This course is designed to provide students with an applied understanding of the concepts and theory behind GIS including spatial data structures, data sources and transfer methods, projections and coordinate systems, georeferencing, geocoding, geodatabase design and management, how to start a GIS project, as well as fundamentals of spatial analysis techniques such as overlay, extraction and interpolation. Concepts presented in lecture will be put into practice through tutorials using the GIS software product ArcGIS 10.x (ESRI, Inc.). The culmination of the course is the presentation of your research project employing the methods learned.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4312 Advanced GIS 3 Credits****Department:** College of Arts and Sciences

This course is designed to advance a student's knowledge in the rapidly developing field of Geographic Information Science and Systems (GIS).

This course is built on the techniques learned in the Fundamentals of GIS course (GEOL 3311) by exposing the student to more advanced methods in developing and utilizing GIS data. Students will gain skills and knowledge of design, planning and error within GIS data management, analytical decision-making techniques and advanced spatial and statistical analysis. Python Script and Model Builder, web mapping and collector, digital image processing and analysis in ArcGIS, and working with LiDAR datasets. Students will gain deep understanding of the potential value of GIS through lectures, exercises of the latest versions of ArcGIS software and research in a broad range of applications.

Prerequisite(s): GEOL 4311 or GEOL 3311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 4313 GIS Research Project 3 Credits**Department:** College of Arts and Sciences

This course is designed to advance a student's knowledge to design, manage and complete a research project that emphasizes the use of Geographic Information Systems (GIS). This course is built on the techniques learned in GEOL 3311. Undergraduate students will work in groups of 2 to 4. Student groups will agree with the instructor on a suitable problem and then solve it by acquiring, organizing and analyzing data using a GIS. Projects must include a substantive analytical component where GIS is central to the methods used.

Prerequisite(s): GEOL 3311 and GEOL 4311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4314 Fundamentals of Remote Sensing 3 Credits****Department:** College of Arts and Sciences

Remote sensing is a rapidly-evolving science and technology with numerous contributions to the Earth, environmental and ocean sciences, such as monitoring of natural hazards including droughts, floods, landslides, volcanic eruptions, earthquakes and forest fires. This course introduces students to the principles of remote sensing with its wide applications in the Earth and environmental sciences. Fundamental knowledge is offered on the physics of remote sensing, photogrammetry, remote sensing data acquisition, remote sensing data types (multispectral, hyperspectral, RADAR and LiDAR), and numerous applications. The course will also cover digital image processing and analysis techniques using ENVI software.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4317 GIS Seminar 3 Credits****Department:** College of Arts and Sciences

A seminar series on topics related to principles, techniques and applications of Geospatial Sciences, Geographic Information Systems (GIS), Remote Sensing, and Drone Photogrammetry. It is meant to expose students to current research and developments in these rapidly advancing fields. Bi-weekly seminars presented on selected topics by students, and speakers from within and outside Lamar University. A student is required to study and discuss and write a summary of at least five out of the 10 seminar topics.

Prerequisite(s): GEOL 4311 and GEOL 3311**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4318 Drone Photogrammetry 3 Credits****Department:** College of Arts and Sciences

Drones, aka "Unmanned Aerial Systems" (UASs) or "Unmanned "Aerial Vehicle" (UAV), refer to an unpiloted aircraft or spacecraft. This course is specifically designed to teach students the ins and outs of operating drones. Topics covered include drone safety and current policies, principles of photogrammetry, cameras and imaging systems, georeferencing, flight planning and how to take aerial photos and videos.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4330 Geophysics 3 Credits****Department:** College of Arts and Sciences

Application of the principles of physics to geologic problems. Use of geophysical techniques in exploration.

Prerequisite(s): MATH 2312**Prerequisite(s)/Corequisite(s):** PHYS 1401 or PHYS 2425**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4360 Field Geology of Texas 3 Credits****Department:** College of Arts and Sciences

Geologic history, topography, physiography, structure and mineral deposits of Texas observed on location at classic geologic exposures across Texas and adjacent states. Camping on and hiking across geologic outcrops will be an integral part of this field experience. Field trip and special fee required. May be repeated for credit as field trip locations change.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4361 Geochemistry 3 Credits****Department:** College of Arts and Sciences

Application of chemistry to the solution of geological problems.

Prerequisite(s): CHEM 1412 and GEOL 2471**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4370 Meteorology 3 Credits****Department:** College of Arts and Sciences

Composition and processes of the atmosphere. Weather and climate and their effect on human activities. Air pollution and other human induced changes to the atmosphere.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4380 Oceanography 3 Credits****Department:** College of Arts and Sciences

Structure, properties and processes of the hydrosphere emphasizing geologic aspects. Role of the seas and oceans in the total environment.

Corequisite(s): GEOL 4101**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4390 Rocks and Stars 3 Credits****Department:** College of Arts and Sciences

A conceptual introduction to space science with emphasis on planetary exploration. Visual programs and guest speakers from NASA and other space research facilities are included. For both non-science and science majors.

Grade Mode(s): Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4410 Stratigraphy and Sedimentology 4 Credits****Department:** College of Arts and Sciences

Fundamental principles of outcrop, subsurface and sequence stratigraphy. Derivation and deposition of sediments, and environmental interpretation of sedimentary strata.

Prerequisite(s): GEOL 1404**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 4420 Paleontology 4 Credits****Department:** College of Arts and Sciences

Principles of paleontologic interpretation including classification, morphologic analysis and identification of invertebrate and vertebrate fossils. Application of paleontology to stratigraphic correlation. Field trip and special fee required.

Prerequisite(s): GEOL 1404**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 5101 Institutes in Earth Science 1 Credit**Department:** College of Arts and Sciences

Summer, in service, or other institutes for earth science teachers. Credit varies with duration. The description of the area of study of each institute will appear on the printed schedule. May be repeated for credit when nature of institute differs sufficiently from those taken previously.

Offered: Other

May be Repeated for a maximum of 2 hours

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5301 Special Topic Env Geo 3 Credits****Department:** College of Arts and Sciences

Summer, in service, or other institutes for earth science teachers. Credit varies with duration. The description of the area of study of each institute will appear on the printed schedule. May be repeated for credit when nature of institute differs sufficiently from those taken previously.

May be Repeated for a maximum of 99 hours

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5303 Advanced GPS methods and Applications 3 Credits****Department:** College of Arts and Sciences

This course is designed for graduate students to demonstrate a clear understanding of the GPS signal, codes and biases, describe the differences between relative and autonomous GPS positioning, code phase carries phase, DGPS and RTK. Students will learn the practical applications of GPS and the implications of its modernization. Lectures on GPS fundamentals will be augmented with hands-on training using GPS equipment. Students will use GPA equipment to perform survey and mapping. final project is required.

May be Repeated for a maximum of 3 hours

Prerequisite(s): GEOL 5311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5311 Principles of GIS 3 Credits****Department:** College of Arts and Sciences

This course will provide graduate students with an applied knowledge in making professional GIS maps, cartography methods, types of geospatial data, choosing and applying analytical methods for geospatial data including density analysis, interpolation and overlay analysis. Each graduate student will be assigned a research project. You will choose a research topic for your project. You will work on designing your project, data collection, data processing and analysis. You must write a scientific report of your project and present the results to the class.

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5312 Advanced GIS Analysis and Applications 3 Credits****Department:** College of Arts and Sciences

This course is designed to advance students' knowledge in the rapidly developing field of Geographical Information Science and Systems (GIS). This course is built on the techniques learned in the Fundamentals of GIS (GEOL 5311) course by exposing the student to more advanced methods in developing and utilizing GIS data. Students will gain skills and knowledge of design, planning and error within GIS data management, analytical decision-making techniques and advanced spatial and statistical analysis, Python Script and Model Builder, web mapping and collector, digital image processing and analysis in ArcGIS, and working with LiDAR datasets. Students will gain deep understanding of the potential value of GIS through lectures, exercises of the latest versions of ArcGIS software and research projects in a broad range of applications.

Prerequisite(s): GEOL 5311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5313 Geospatial Research project 3 Credits****Department:** College of Arts and Sciences

This course is designed to advance a student's knowledge to design, manage and complete a research project that emphasizes the use of Geographic Information Systems (GIS). This course is built on the techniques learned in GEOL 3311. Undergraduate students will work in groups of 2 to 4. Student groups will agree with the instructor on a suitable problem and then solve it by acquiring, organizing and analyzing data using a GIS. Projects must include a substantive analytical component where GIS is central to the methods used.

Prerequisite(s): GEOL 5311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5314 Principles of Remote Sensing 3 Credits****Department:** College of Arts and Sciences

This course will introduce fundamental concepts and develop basic skills related to the use of remote sensing data. The primary goal of the course is to introduce students to the principles of remote sensing, physics of remote sensing, spaceborne satellite systems and remote sensing data types including multispectral, hyperspectral and RADAR. Hands-on exercises will be provided to teach students how to obtain and process satellite imagery, analyze and synthesize information from remotely sensed data. Students will also be able to communicate findings. In addition, students will be assigned a research project for mastering digital image processing techniques for environmental applications. Each student will be required to give a 15 minute oral presentation on their research project and submit a final project report.

May be Repeated for a maximum of 3 hours

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS

GEOL 5316 Remote Sensing Data and Applications 3 Credits**Department:** College of Arts and Sciences

This course assumes students have a prior knowledge in the basics of remote sensing and have experience with digital image processing software, particularly ENVI. Students will develop a strong understanding of the tools and techniques used to display, process and analyze remotely sensed data. Upon completion of this course students will be able to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications that include wetlands, water quality, coastal changes, vegetation analysis, mineral resources, land use and land cover changes. throughout the course students confront realistic problem scenarios that will test their ability to apply the tools and techniques covered in the course. The culmination of this course is an independent final project in which students will demonstrate their ability to apply new skills to a real-world situation of personal or professional interest.

May be Repeated for a maximum of 3 hours

Prerequisite(s): GEOL 5314**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5317 Seminar in Geospatial Science 3 Credits****Department:** College of Arts and Sciences

The seminar series will provide a forum for graduate students to learn about current and cutting-edge activities in Geospatial Sciences, GIS, Remote Sensing, and Drone Photogrammetry. To meet these expectations, a student must conduct research on a current topic from published papers, write an abstract that relates a general synopsis of the research paper, develop a presentation based on the findings, and deliver a presentation. A student is expected to create and present a PowerPoint presentation on one of the seminar topics. Furthermore, a student is expected to question speakers competently and probingly.

Prerequisite(s): GEOL 5311**Restriction(s):**Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS**GEOL 5318 Drone Photogrammetry & Apps 3 Credits****Department:** College of Arts and Sciences

Drone technology is developing aggressively and many governments and non-government agencies are considering acquiring such systems. Throughout the course, students will learn about drone safety and current policies, components, principles of photogrammetry, cameras and imaging systems. A student will write and submit a scientific report and prepare a Powerpoint presentation on the report followed by 5 minutes for questions from the audience.

Restriction(s):Undergraduate level students may **not** enroll.**Grade Mode(s):** Standard Letter, Registrar do not use FN, Registrar do not use FS