Geosciences

GEOS 1103 (GEOL 1103) Physical Geology Laboratory (1 semester credit hour) A laboratory to accompany GEOS 1303. The exercises include mineral and rock identification. Topographic maps, geologic maps, and aerial photographs are used to study surface landforms, geologic phenomena and tectonic processes. Prerequisite or Corequisite: GEOS 1303. (0-3) S

GEOS 1104 (GEOL 1104) History of Earth and Life Laboratory (1 semester credit hour) A laboratory to accompany GEOS 1304. Exercises include fossil identification, stratigraphy, and correlation, the geologic time scale, age-determination techniques, and maps. Prerequisite or Corequisite: GEOS 1304. (0-3) Y

GEOS 1303 (GEOL 1303) Physical Geology (3 semester credit hours) Introduction to Earth as a unique planet. Rock-forming minerals and rock-forming processes are discussed. The structure of the Earth, in the context of rock types, and dynamics of its internal mechanisms are explored. Plate tectonics and surface processes that sculpt the Earth are the topics of the second half of the course. Other planets and celestial bodies within the solar system are contrasted with Earth. (3-0) S

GEOS 1304 (GEOL 1304) History of Earth and Life (3 semester credit hours) Introduction to the history of the Earth. The history of life and an introduction to the principles of paleontology, stratigraphy and global change will be discussed. All topics will be discussed in the context of the tectonic evolution of North America. Field trip. Prerequisites: GEOS 1303 and GEOS 1103. (3-0) Y

GEOS 2302 (GEOL 1305) The Global Environment (3 semester credit hours) An introduction to the physical aspects of the world's geography emphasizing the interrelationships between the earth and its climate, vegetations, soils, and landforms. Provides a global perspective on the physical environment and the interactions between global systems to produce regional differences. (Same as ENVR 2302 and GEOG 2302) (3-0) Y

GEOS 2305 Spatial Thinking and Data Analytics (3 semester credit hours) This course explores the role that Spatial Thinking plays across a variety of subject areas in science, engineering, mathematics, arts and humanities. We will introduce rich resources of geospatial data from government agencies, social media, and semantic web. Students will be exposed to introductory methods in Spatial Data Analytics afforded by Global Positioning Systems (GPS), Remote Sensing (RS), Geographic Information Systems (GIS), Spatial Analysis, and Mapping technologies and learn how to bring spatial considerations into research and applications. The course is intended to empower students with spatial intelligence (one of the nine intelligences on Howard Gardner's Theory of Multiple Intelligences) and with experiences of applying spatial thinking and data analytics to problem solving. (Same as EPPS 2305 or GISC 2305) (3-0) Y

GEOS 2306 Essentials of Field Geologic Methods (3 semester credit hours) Introduction to fundamental methods of field geologic investigations, including topographic, air photo, and geologic map interpretation and preparation and use of common field geologic tools (Brunton compass, hand-held GPS, and a field notebook). Applications of field methods in the Earth Sciences

will be presented. There will be a mandatory field trip over part of spring break with a fee, which covers the cost of transportation and camping fees for the spring break field trip. Prerequisites: GEOS 1103 and GEOS 1303. (3-0) Y

GEOS 2310 Environmental Geology (3 semester credit hours) A course examining the interactions of people and our physical environment. Natural hazards, including landslides, flooding, tsunamis, volcanoes, earthquakes, erosion, and sea-level change. Air, soil, fresh and ocean water pollution problems and solutions including greenhouse gases, ozone depletion, acid rain, aquifer depletion, toxic wastes, and contamination. Energy supplies and the environment, including radioactive waste problems, and human impacts on climate. (3-0) Y

GEOS 2321 Geology, Resources, and Environment of Latin America (3 semester credit hours) An overview of the physical environment of Mexico, Central America, and South America. Topics include evolution of Latin American crust and continent; location and formation of major geologic resources and physiographic features; resource exploitation and present environmental problems with an historic perspective. (3-0) R

GEOS 2324 Energy, the Environment and Human Health (3 semester credit hours) This course will focus on the environmental and human health impacts of geologic materials and geologic processes with particular emphasis on fossil fuels. A balanced, fact-based discussion will be provided on both positive and negative effects of various energy sources on the natural environment and human health. Old and new myths about the environmental and health consequences of fossil fuels, especially coal, will be debunked. The course will cultivate an awareness of both the positive and negative aspects of energy production and use and enable informed decision making with respect to societal issues associated with energy and mineral resources. (3-0) Y

GEOS 2328 Geologic Time: An Historical Perspective (3 semester credit hours) Notions of immortality and concepts of eternity--the struggle to understand human existence and the physical world. The geocentric universe--a Graeco-Christian compromise. The Hexaemeron and the 6000 year-old earth. The Renaissance and the slow acceptance of the Copernican universe. Seventeeth century attempts to explain the earth in biblical terms. Steno's laws and the demonstration that the Earth had a history. James Hutton's Earth machine and William Smith's strata--the progeny of the Enlightenment and the Industrial Revolution. Biostratigraphy, the great stratigraphers, and Darwin. Victorian reaction to the realization of Earth's antiquity, as expressed in literature. Lord Kelvin's arguments for a young Earth. Discovery of radioactivity and the refutation of Kelvin. Patterson and the age of the solar system. Modern rock dating techniques. A walk through geologic time. Current concepts of the origin of the universe and the solar system. (3-0) Y

GEOS 2332 Age of Dinosaurs (3 semester credit hours) Introductory survey of the origin, evolution, anatomy, physiology, life-styles, population dynamics, and extinction of dinosaurs and marine and flying reptiles, as well as Mesozoic climates and basic Earth history of the "Age of Dinosaurs." Extensive use of fossils is a component of this course that is taught in a Problem Based Learning format. (3-0) Y

GEOS 2333 Introduction to Fossils (3 semester credit hours) Introduction to the study of invertebrate fossils occurring in Cretaceous sedimentary strata in North Texas. Hands on approach to the study of invertebrate macrofossils and microfossils includes learning how to (1) collect fossils at selected outcrops in the field; (2) process fossils (3) illustration of fossils and identification using the available paleontological literature. Lectures and exercises will focus on the invertebrate phyla occurring in selected North Texas Cretaceous outcrops. (3-0) Y

GEOS 2409 Rocks and Minerals (4 semester credit hours) Introduction to crystallography, mineralogy, and petrography. Laboratory course. Prerequisites or Corequisites: GEOS 1103 and GEOS 1303. (3-1) Y

GEOS 2V08 Special Topics in Geology or Geophysics I (1-4 semester credit hours) Subject matter will vary from semester to semester. Instructor consent required. May be repeated for credit as topics vary (9 semester credit hours maximum). Instructor consent required. ([1-4]-0) R

GEOS 3122 Coal in Our Society (1 semester credit hour) Coal plays an important role in the U.S. energy mix and a critical role in Texas society. Yet it may be the most misunderstood natural resource. It is the objective of this course to familiarize the students with the origin, properties, and uses of coal and examine how coal use may impact the environment and human health. This will be accomplished by exploring the facts and fallacies surrounding coal in our society. There will be a field trip to a coal mine and/or a coal-burning power plant. The course will last approximately 1 month during a semester. (1-0) Y

GEOS 3124 Energy, the Environment and Human Health (1 semester credit hour) This course will focus on the environmental and human health impacts of geologic materials and geologic processes with particular emphasis on fossil fuels. A balanced, fact-based discussion will be provided on both positive and negative effects of various energy sources on the natural environment and human health. Old and new myths about the environmental and health consequences of fossil fuels, especially coal, will be debunked. The course will cultivate an awareness of both the positive and negative aspects of energy production and use and enable informed decision making with respect to societal issues associated with energy and mineral resources. (1-0) Y

GEOS 3300 Field Geology I (Summer Field Camp I) (3 semester credit hours) A three-week, early summer field based course designed to provide practical introductory field geological experience. Course emphasizes mapping in sedimentary and igneous terrains and will also cover techniques for mapping geomorphic features. Reports on each project in professional form are required. NOTE: A field trip fee, which covers the cost of food, lodging, and transportation, is charged for this course. Students are responsible for any other personal expenses related to camp. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2306. (3-0) Y

GEOS 3304 Principles of Geospatial Information Sciences (3 semester credit hours) An introduction to the primary Geospatial Information Sciences (GIS) methods for manipulating, querying, analyzing, and visualizing spatial-based data. Topics include spatial data models, data acquisition and editing, cartography, and spatial analysis. This course is designed to provide a foundation for all other upper level GISC courses. (Same as GEOG 3304 and GISC 3304) (3-0) Y

GEOS 3331 Paleoecology (3 semester credit hours) Introduction to the characteristics, distribution, and relationships of individual organisms, communities, and ecosystems at selected intervals in time. The course objective is to use all available data to interpret extensive collections of both fossil and recent organisms. With a primary focus of paleoecology, the course ranges through geography, biology, botany, archaeology, paleontology, and other disciplines. (3-0) Y

GEOS 3421 Stratigraphy and Sedimentology (4 semester credit hours) Principles and evolution of modern stratigraphic nomenclature; concepts of space and time in the rock record and methods of stratigraphic correlation; factors controlling stratigraphic architecture of sedimentary basins; integrated stratigraphic techniques. Origin, transportation, and deposition of carbonate and siliciclastic sediments; weathering, textural analysis, and depositional environments. Laboratory course. Field trips. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-3) Y

GEOS 3434 Paleobiology (4 semester credit hours) History of life as documented by the fossil record. Basic concepts of paleontology and biostratigraphy followed by a review of major fossil groups and major events in the evolution of life, speciation, mass extinction, evolution of communities and ecosystems through geologic time. Paleontological methods to paleoenvironmental reconstruction. Field trip. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-1) Y

GEOS 3464 Igneous and Metamorphic Petrology (4 semester credit hours) Introduction to the petrographic microscope and its use for study of igneous and metamorphic minerals and rocks. Identification and classification of volcanic and plutonic igneous rocks and metamorphic rocks and their identification in thin sections. Introduction to major element chemical analyses of igneous and metamorphic rocks. Introduction to igneous and metamorphic petrogenesis. Prerequisites: CHEM 1111 and CHEM 1112 and CHEM 1311 and CHEM 1312 and GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-1) Y

GEOS 3470 Structural Geology (4 semester credit hours) Modern tectonic concepts, survey of major structural provinces, examination of material behavior, stress-strain concepts, failure criteria, soil mechanics, fault analysis, rheology, fold analysis and applications of structural concepts to neotectonics and environmental problems. Training in graphical techniques, use of stereographic projections, and geological map interpretation. Integrated lecture and laboratory course. Prerequisites: GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409 and PHYS 2125 and PHYS 2126 and PHYS 2325 and PHYS 2326. (3-3) Y

GEOS 4300 Field Geology II (Summer Field Camp II) (3 semester credit hours) A three-week, early summer field based course designed to provide practical advanced field geological experience. Course emphasizes mapping in sedimentary, metamorphic, and igneous terranes and will also cover techniques used in imaging and analyzing geomorphic features. Reports on each project in professional form are required. NOTE: A field trip fee, which covers the cost of food, lodging, and transportation, is charged for this course. Students are responsible for all personal expenses related to camp. Prerequisites: GEOS 3300 and GEOS 3421 and GEOS 3464 and GEOS 3470. (0-3) Y

GEOS 4320 The Physics and Chemistry of the Solid Earth (3 semester credit hours) The study of the

structure and evolution of the Earth through petrology, geochemistry and geophysics. Plate tectonics will be emphasized as a framework for crust and mantle dynamics. The roles of gravity, thermal processes and the mechanical behavior of rocks are investigated. Tectonic settings of igneous and metamorphic rocks will be explored. Prerequisites: CHEM 1111 and CHEM 1112 and CHEM 1311 and CHEM 1312 and GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409 and PHYS 2125 and PHYS 2126 and PHYS 2325 and PHYS 2326. (3-0) Y

GEOS 4322 The Earth System (3 semester credit hours) Planet Earth comprises a system of interacting spheres: atmosphere, hydrosphere, lithosphere and biosphere, all of which have played an important role in Earth processes and Earth history. This course examines these Earth systems and how their interactions over time have affected their evolving compositions, the evolution of life and Earth's climate. The short-term and long-term parts of the carbon cycle provide the underlying theme for the study of the Earth System. Prerequisites: CHEM 1111 and CHEM 1112 and CHEM 1311 and CHEM 1312 and GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (3-0) Y

GEOS 4325 Introduction to Remote Sensing (3 semester credit hours) Topics include principles of remote sensing and sensors, image visualization and statistics, radiometric and geometric correction, enhancement, classification, change detection, and innovative image processing approaches. (Same as GISC 4325) (3-0) Y

GEOS 4369 Volcanic Successions (3 semester credit hours) Terrestrial volcanism is considered from the perspective of volcanic processes, and the properties, products and deposits of volcanic eruptions, all in the context of definable facies models. The effects of subsequent sedimentological processes are also considered. Volcanic settings are explored in detail as they are related to their plate tectonic settings. Recognition of volcanically derived deposits are emphasized using the facies model concepts, and are considered with respect to their geological and economic significance. (3-0) T

GEOS 4390 Communication in the Geosciences (3 semester credit hours) For all Geoscience students. Independent research and all forms of scientific communication in the Geosciences are emphasized. Subject and scope of material presented is determined on an individual basis. Satisfies the Advanced Writing Requirement for Geoscience majors. Prerequisites: Instructor consent required and senior level standing in Geosciences. (3-0) S

GEOS 4391 Geoscience Animations and Video (3 semester credit hours) Geoscientific concepts are supremely amenable to being taught with animations, particularly as compared with other sciences. In this class, students will learn how to generate simple videos and animations of geoscientific processes. The course grade is based on 5 projects, spaced throughout the semester (research paper, storyboard, narration, video, and animation). All 5 projects are related to developing a hybrid video/animation presentation of approximately 3 minute length. The presentation will explain some geologic process. Instructor consent required. (3-0) Y

GEOS 4399 Senior Honors in Geosciences (3 semester credit hours) For students conducting independent research for honors theses or projects. Satisfies the School of Natural Sciences and Mathematics' advanced writing requirement. Instructor consent required. (3-0) R

GEOS 4430 Hydrogeology and Aqueous Geochemistry (4 semester credit hours) An introduction to the principles of physical and chemical hydrogeology. Physical topics include the nature and quantification of the components of the hydrologic cycle, fundamentals of water supply and quality, overview of aquifer testing and environmental assessment. Chemical topics include behavior of low-temperature aqueous solutions, water-rock interaction and applications of chemistry to understand the Earth and its geochemical cycles. Prerequisites: CHEM 1111 and CHEM 1112 and CHEM 1311 and CHEM 1312 and GEOS 1103 and GEOS 1104 and GEOS 1303 and GEOS 1304 and GEOS 2409. (4-0) Y

GEOS 4V08 Special Topics in Geology or Geophysics II (1-4 semester credit hours) Subject matter will vary from semester to semester. Instructor consent required. May be repeated for credit as topics vary (9 semester credit hours maximum). Instructor consent required. ([1-4]-0) R

GEOS 4V09 Senior Research in Geology (1-6 semester credit hours) Topics may vary. No more than 3 semester credit hours of senior research may be used to satisfy the upper-division course work requirement in the major unless approved in advance by the undergraduate advisor. May be repeated for credit. Instructor consent required. ([1-6]-0) S

GEOS 4V80 Senior Research in Geophysics (1-6 semester credit hours) Topics may vary. No more than 3 semester credit hours of senior research may be used to satisfy the upper-division course work requirement in the major unless approved in advance by the undergraduate advisor. May be repeated for credit. Instructor consent required. ([1-6]-0) S