Tulane University

EARTH & ENVIRONMENTAL SCIENCES (EENS)

EENS 1050 Dinosaurs (3 Credit Hours)
An introduction to dinosaurs, their relatives, and the Mesozoic world. Students will examine the fossil record of dinosaurs to explore dinosaur anatomy, physiology, systematics, ecology, biogeography, behavior, and macroevolution. Course also includes overviews of plate tectonics, sedimentary environments, fossil preservation, geologic time, and biotic evolution.

EENS 1110 Planet Earth (3 Credit Hours)
The origin, nature and evolution of the Earth-Moon system and their constituent materials; development of Earth's surface features through interaction of physical, chemical, and biological processes over geologic time; considerations of interactions between Earth processes and present day human activity.

Corequisite(s): EENS 1115.

EENS 1115 Planet Earth Lab (1 Credit Hour)
A hands-on study of rocks, minerals, landforms and geologic structures using topographic maps, aerial photographs, physical models, field examination and independent research projects. One laboratory per week; field trips.

Corequisite(s): EENS 1110.

EENS 1120 Earth & Life Through Time (3 Credit Hours)
The evolution of earth and life over the past 4.54 billion years.

Corequisite(s): EENS 1125.

EENS 1125 Earth & Life Through Time Lab (1 Credit Hour)
A hands-on exploration of the rock and fossil record of planet earth.

Corequisite(s): EENS 1120.

EENS 1300 Earth as a Living Planet (3 Credit Hours)
An introduction to the interaction of earth systems and man; anthropogenic impacts of population growth and economic development; renewable and non-renewable resources, air, water and soil pollution and mitigation; ecosystems and biological diversity; and environmental problem solving using the scientific method. Students develop a holistic understanding of environmental science using class discussions and laboratories to reinforce basic scientific principles.

Corequisite(s): EENS 1305.

EENS 1305 Earth as a Living Planet Lab (1 Credit Hour)
Lab section for EENS 1300

Corequisite(s): EENS 1300.

EENS 1400 Global Climate Change (3 Credit Hours)
This course provides a broad overview of the causes of climate change and its impacts on Earth and its inhabitants. The first part of the course focuses on the climate system and its components, the second part zeroes in on climate impacts (including those in coastal Louisiana) as well as policy aspects.

EENS 1890 Service Learning: EENS 1300 (0-1 Credit Hours)
Service learning component to Earth and Environmental Sciences courses. See Schedule of Classes each semester for offerings. 20 or 40 hours of public service with a CPS approved community partner.

EENS 1940 Transfer Coursework (3 Credit Hours)

EENS 2020 Environmental Geology (3 Credit Hours)
The interaction of humans and their geologic environment. A study of Earth processes and their action on rocks, soil, fluids, and life in ways that either affect or control the human environment. The effect of humans on their environment with consideration of the feedback between Earth processes and human activities. Lectures and field trips.

EENS 2060 Introductory Geography (3 Credit Hours)
An introduction to the basic facts concerning the physical environment: landforms, climates, vegetation and soils, followed by a comprehensive survey of the relationship between the physical environment and human activity in the major geographic regions of the world. The geography of Louisiana is considered in relation to the region. Recommended to students working toward Louisiana certification in elementary education.

EENS 2070 Weather and Climate (3 Credit Hours)
An introduction to the Earth's atmosphere with particular emphasis on weather and climate. Topics covered include: heating and cooling of the atmosphere; atmospheric circulation and wind; air masses and cyclonic storms; tropical weather and hurricanes; and global climates and climatic change.

EENS 2080 Extreme Weather (3 Credit Hours)
This course is designed to give students a fundamental understanding of severe weather and its impact on man and the environment. Students focus on life cycles of thunderstorms, tornadoes, hurricanes, blizzards, and ice storms, as well as the impacts of temperature and precipitation extremes.

EENS 2090 Surface Water Hydrology (3 Credit Hours)
This course focuses on the movement of water in and among surface water systems and exchanges between the surface, atmospheric and ground water components of the hydrologic cycle. A grade of C- or better is required for the Environmental Earth Science Major.

Prerequisite(s): (MATH 1210, 1210, 1210, 1210, 1310, 1310, 1310 or 1310) and EENS 1300.

EENS 2110 Mineralogy (4 Credit Hours)
Crystallography, mineralogy, and the identification of minerals in hand specimen and using the petrographic microscope.

Corequisite(s): EENS 2111.

EENS 2111 Mineralogy Lab (0 Credit Hours)
Lab section for EENS 2110

Corequisite(s): EENS 2110.

EENS 2120 Petrology (4 Credit Hours)
The study of igneous and metamorphic rocks including their nature and origin in both hand specimen and using the petrographic microscope.

Corequisite(s): EENS 2121.

EENS 2121 Petrology Lab (0 Credit Hours)
Lab section for EENS 2120

Corequisite(s): EENS 2120.

EENS 2230 Oceanography (3 Credit Hours)
A broad survey of chemical, physical, and geological oceanography with a brief historical overview and a consideration of current concepts.

EENS 2880 Writing Practicum (1 Credit Hour)

EENS 2890 Service Learning: EENS 2090 (0-1 Credit Hours)

EENS 2940 Transfer Coursework (3 Credit Hours)

EENS 3050 Natural Hazards & Mitigation (3 Credit Hours)
The broad aim of this course is to introduce students to the processes causing volcanic eruptions, earthquakes, landslides, tsunamis, and tropical storms, and to outline the steps to their mitigation. These dynamic Earth process are placed within the general context of plate tectonics, as well as the financial, social, and political implications of these catastrophic events. All of these processes are moderated by climate change and rising sea level, which are also considered in group discussions and scenerios. In lieu of a final exam, students prepare and present a hazard case study emphasizing geologic, economic, health, or sociological implications.

EENS 3060 Earth Materials (4 Credit Hours)
In this course you will investigate the materials that comprise the Earth and how they are made. You will learn about mineral structure and chemistry and be able to relate these parameters to the physical properties of minerals. An analysis of phase stability will follow that will build towards interpreting phase diagrams. These new skills will be applied to understanding the formation of igneous and metamorphic rocks of Earth as organized by tectonic setting.

Prerequisite(s): (CHEM 1070, 1070, 1070 or 1070) and (CHEM 1075, 1075, 1075 or 1075) and (EENS 1110 or 1110) and (EENS 1115 or 1115).
Corequisite(s): CHEM 1080.

EENS 3090 Invertebrate Paleontology (3 Credit Hours)
Principles of invertebrate paleontology; a systematic treatment of the fossil invertebrates and their living relatives. Emphasis on functional morphology, ontogeny, and paleoecology. Lectures, laboratory, field trips.

Prerequisite(s): EENS 1120.

EENS 3091 Invertebrate Paleontology Lab (0 Credit Hours)
Lab section for EENS 3090

EENS 3150 Intro to GIS (3 Credit Hours)
This course is designed to give students a general understanding of geographic information systems (GIS) and the Environmental Systems Research Institute (ESRI) ArcGIS software. The approach taken is detailed instruction in utilizing ArcGIS to solve problems in the earth and environmental sciences.

Corequisite(s): EENS 3151.

EENS 3151 Intro to GIS lab (0 Credit Hours)
Co-requisite lab for Intro to GIS

Corequisite(s): EENS 3150.

EENS 3170 Geomorphology (3 Credit Hours)
The study of processes leading to landform creation and development in response to climate and tectonics. Overview of fundamental and applied activities undertaken by geomorphologists.

Prerequisite(s): (EENS 1110, 1110, 1110 or 1110) or (EENS 1300, 1300, 1300 or 1300) and (MATH 1210*, 1210, 1210, 1210 or 1210).
* May be taken concurrently.

EENS 3171 Geomorphology Discussion (0 Credit Hours)
A discussion section to accompany EENS 3170/6170, Geomorphology.

EENS 3180 Making Landscapes (3 Credit Hours)
In this course, we will explore how different "iconic" landscapes were formed such as Niagara Falls and Mount Everest. Iconic landscapes can still be awe inspiring for those who can't see them if we are creative about how we share these landscapes. We will also learn about best practices for teaching students with disabilities and different abilities. As part of the class, we will teach K-12 who are visually impaired or have autism spectrum disorder about awe-inspiring landscapes using the 3D models. Mandatory Service Learning component.

EENS 3270 Sedimentation and Strat (3 Credit Hours)
Composition, primary textures, and structures of sediments in major sedimentary environments. Environmental interpretation of ancient sedimentary sequences. The basic principles utilized in interpretation of the stratigraphic column. The associated laboratory focuses primarily on methods of sedimentary analysis. Mandatory field trip to Ouachita Mountains, Arkansas.

Corequisite(s): EENS 3271.

EENS 3271 Sedimentation & Strat Lab (0 Credit Hours)
Lab section for EENS 3270

Corequisite(s): EENS 3270.

EENS 3410 Structural Geology (3 Credit Hours)
Principles and mechanics of rock deformation, the evolution of geological structures, and the relations between structures and plate tectonics. Laboratory section focuses on geological problem solving. Field trip to the Southern Appalachian Mountains.

EENS 3411 Structural Geology Lab (0 Credit Hours)
Lab section for EENS 3410

EENS 3550 Shark Paleobiology (3 Credit Hours)
This course examines the processes and patterns of shark speciation, diversification, macroevolution, and extinction within the framework of developing a problem-based learning activity using shark teeth for a K-12 classroom. Particular emphasis is placed on the systematics and functional morphology of shark teeth.

EENS 3551 Shark Paleobiology Lab (0 Credit Hours)
Lab section for EBIO 3550

EENS 3650 Marine Environmental Geology (3 Credit Hours)
This course is an introduction to the aspects of coastal and marine geology and oceanography that are societally linked through environmental issues and marine resource availability. This will provide a basic science introduction to topics that include estuarine oceanography and sedimentation, eutrophication of coastal waters, primary productivity and deep sea sedimentation, waves and tides, sea level history and the evolution of coastlines, and the geology of the Gulf coastal region. However, the larger goal of the course will be to focus on a series of societally relevant environmental issues with a marine geological connection either in causation or in mitigation/adaptation/solution strategies. These issues are divided broadly into topics relevant to land-ocean connectivity, natural hazards, global climate change, and local/regional anthropogenic effects. In addition to a critical analysis of global (marine) environmental issues, another goal will be to improve presentation skills, both oral and written.

EENS 3660 Special Topics (1-3 Credit Hours)
Special Topics.

EENS 3880 Writing Practicum (1 Credit Hour)

EENS 3890 Service Learning: EENS 3730 (0-1 Credit Hours)
Service learning component to Earth and Environmental Sciences' courses. See Schedule of Classes each semester for offerings. 20 or 40 hours of public service with a CPS approved community partner.

EENS 3892 Service Learning: EENS 3150 (0-1 Credit Hours)

EENS 3940 Transfer Coursework (1-4 Credit Hours)
Transfer Coursework.

EENS 3990 Field Geology (3-8 Credit Hours)
The application of basic field methods to practical problems in field geology, including the construction of geological maps. Students typically complete this course at an approved summer field camp offered by another college or university.

EENS 4030 Advanced GIS (3 Credit Hours)
GISThis course is designed to advance 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 Introduction to Geographic Information Systems (GIS) course (EENS 3150/6150) 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 analysis. 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 application..

EENS 4040 Coastal Marine Geology (3 Credit Hours)
Geomorphic features of estuarine, coastal, and continental shelf environments: erosional, depositional, and geochemical processes; field and laboratory methods; emphasis on dynamic coastal environments of the northern Gulf of Mexico.

Prerequisite(s): EENS 1110 and 1115.

EENS 4060 Tectonic Geomorphology (3 Credit Hours)
The interplay between tectonic processes and the development and modification of landforms, from the scale of earthquake ruptures to mountain building. The course will also include an overview of techniques for analyzing tectonic and geomorphic data, and an introduction to geochronology and thermochronology. Lecture and seminar format; field trip; optional service learning component.

EENS 4160 3D Stratigraphy (3 Credit Hours)
Introduction to Remote Sensing From Earth surface to subsurface, this course uses three-dimensional volumes of basin-filling stratigraphy to explore how depositional landscapes are preserved in the sedimentary record and how sedimentary deposits can be analyzed to produce quantitative reconstructions of past environmental states.

Prerequisite(s): EENS 3270.

EENS 4180 Intro Remote Sensing (3 Credit Hours)
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 the 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 consists of two components: lectures and labs. In the lectures, the above topics will be reviewed and explained. The laboratory part of this course will cover digital image processing and analysis techniques using ENVI software.

EENS 4230 Tectonics (3 Credit Hours)
Tectonics encompasses the processes of large-scale deformation and the formation of structures that define, or are association with, Earth's tectonic plate boundaries. The course will include the historical development and testing of plate tectonic hypotheses, as well as a detailed overview of plate tectonics as a current unifying theory. Lecture format, but will include a limited number of discussions of published papers; field trip component is not graded, but participation is expected.

EENS 4250 Isotopes in The Environm (3 Credit Hours)
The use of stable and radioactive isotopes as tools to trace the movement of air, water, and sediments through the atmosphere, hydrosphere, biosphere, and lithosphere.

EENS 4300 Groundwater Hydrology (3 Credit Hours)
Occurrence of water in the near-surface environment. Topics include saturated and unsaturated flow in aquifers, aquifer characterization, well hydraulics, and groundwater chemistry.

EENS 4320 Subsurface Geology (3 Credit Hours)
Principles of subsurface mapping with emphasis on 3-dimensional seismic reflection data. Utilization of geophysical data to construct subsurface maps. Students gain hands on experience with Seismic Micro-Technology's state-of-the-art software, The Kingdom Suite, in work-station based laboratory sessions. Lectures and laboratory.

Prerequisite(s): EENS 3270*.
* May be taken concurrently.

EENS 4350 Geologic Dating Methods (3 Credit Hours)
IN this course the student will explore the development of methods used to date and establish rates of Earth and planetary processes via radiogenic isotopic methods. Students will come away with deeper understanding of age of the Universe, Solar system, and Earth and understand how radiogenic isotopic techniques can be used to study, for example, differentiation of the earth into its major components (crust, mantle, core).

EENS 4360 Environmental Geochemstr (3 Credit Hours)
Quantitative examination of the fundamental processes that control the chemistry of natural waters. Topics will include equilibrium thermodynamics, kinetics, oxidation-reduction reactions , solution and surface complexation (adsorption), chemical weathering and biogeochemical cycling of chemical elements in the environment.

Prerequisite(s): CHEM 1070, 1080, MATH 1210, 1220 and EENS 2110.

EENS 4370 GIS Research Project (3 Credit Hours)
This course is designed to advance student's knowledge to design, manage, and complete a research project that emphasizes the use of geographic information systems (GIS). This course will focus on the project's methodological and organizational design, the application of appropriate GIS techniques, and proper reporting of the results. The GIS component is accomplished through independent work. The graduate student/undergraduate group has the freedom to choose their own project topic. The instructor may suggest some project ideas, but students are welcome to develop their own. If you have an idea of a project, you are encouraged to discuss it with the instructor as soon as possible to see if it is feasible and to start the process of data acquisition. Ideas may come from a variety of sources, such as a current or previous employer, work done as a volunteer, or work done in another course or on a field trip.

Prerequisite(s): (EENS 3150, 3150, 6150 or 6150) and (EENS 4030, 4030, 6030 or 6030).

EENS 4380 Remote Sensing for Env Anlys (3 Credit Hours)
Continued advancements in remote sensing technologies have resulted in an extraordinary increase in the availability of remotely sensed data of Earth. Remote sensing data are now used in geology, hydrology, meteorology, environmental sciences, geography, urban planning, anthropology, civil engineering, and environmental monitoring. This course is built on the techniques learned in the introduction to Remote Sensing course (EENS 4180/6180) by exposing the student to more image processing and analysis for different environmental applications. Students will use the multispectral, hyperspectral, thermal, Radar, and LiDAR data for watersheds, wetlands, water quality, coastal changes, vegetation analysis, mineral resources, land use and land cover changes. Students will develop technical skills of digial image processing, analysis, and interpretation using the ENVI software.

Prerequisite(s): EENS 4180 or 6180.

EENS 4390 Geospatial Data Analysis (4 Credit Hours)
Satellites probe Earth's ionosphere, atmosphere, oceans, and subsurface over periods of days to weeks, building large 4D data sets. Earth based data from the internet of things to sophisticated monitoring provide even denser 4D data sets. The broad aims of this course are to learn theory and application of the following broad topics, and to use open source command line software (GMT, Google Earth, QGIS), or commercial (ArcGIS), and Matlab or python programming to solve geospatial data analyses problems. Prerequisites: MATH1220 and EENS1110 or equivalents, or instructor permission.

EENS 4440 Introduction to Geophysics (3 Credit Hours)
Introduction to Geophysics This course provides an introduction to applied geophysical methods, with a focus on the application of these techniques in environmental and engineering studies. The material will provide the technical foundation needed to understand the commonly used geophysical methods: gravity, magnetics, electrical resistivity, seismic, electromagnetics, and ground penetrating radar.

Prerequisite(s): (MATH 1220, 1220, 1220, 1220 or 1220) and EENS 1110.

EENS 4560 Public Service Internship (0-4 Credit Hours)
Open to sophomores, juniors and seniors having min. GPA 3.0, or 2.7 with recommendation letter. A public service learning experience provided through an internship. May fulfill the 2nd tier service learning requirement; refer to the Center for Public Service website for information on how to apply. Notes: Only one internship may be completed per semester. A maximum of six credits may be earned in two internships. Pre-requistites: Approval of department and approval of CPS if used to fulfill the 2nd tier requirement. Co-registration in SRVC 4890 if fulfilling 2nd tier service requirement. credit hours: 0-4

EENS 4570 Internship (0-4 Credit Hours)
Open to sophomores, juniors and seniors having min. GPA 3.0, or 2.7 with a recommendation letter. An experiential learning opportunity provided through an internship. Application is typically through a government agency, business or industry, or non-profit. Appropriate supervision must be provided and communication is required between the department and the internship provider in order for credit hours to be accrued. Notes: Only one internship may be completed per semester. A maximum of six credits may be earned in two internships. Pre-requisites: Approval of the department. credit hours: 0-4

EENS 4660 Special Topics (1-3 Credit Hours)
Special Topics.

EENS 4665 Special Topics Lab (0-4 Credit Hours)
Special Topics Lab.

EENS 4700 Earth & Env Sci. Field Studies (3 Credit Hours)
This course will take students into the field and provide them with their first in depth experience with earth and environmental science. Students will spend the first part of the course in a seminar type course discussing fundamental papers. The course will then culminate with an approximately week long field outing. Course location will rotate. The course will not supllant the field geology camp requirement for geology majors.

EENS 4840 Planetary Geophysics` (3 Credit Hours)
The interior structure, composition, and dynamics of Earth and the terrestrial planets can be deduced from a number of different physical, chemical, and thermodynamic observations and models. Topics include: Early bombardment and formation of proto-planetary discs, core formation, Earth's composition and age from radioactivity and thermal considerations, thermal and density structure, geomagnetic dynamo, mantle convection, and plate tectonics, and their absence on other terrestrial planets. Special topics for in-class seminars will explore the methodologies used to determine the internal structure (e.g., seismology, gravity), and the dynamics of systems (e.g., geomagnetism, plate tectonics, the water and carbon cycle). Assessment: 2 in-class quizzes, 5 problem sets, 2 class presentations, and a final critical review of 2 linked research papers on a special topic to be assigned in class.

EENS 4910 Independent Study (1-3 Credit Hours)
Laboratory or library research under direction of a faculty member.

EENS 4930 Lumcom Summer Special Topics (1-3 Credit Hours)

EENS 4990 Honors Thesis (3 Credit Hours)
Honors thesis research, first semester. Register in department.

EENS 5000 Honors Thesis (4 Credit Hours)
Honors thesis research, second semester. Register in department.

EENS 5380 Study Abroad (1-20 Credit Hours)
Courses taught abroad by non-Tulane faculty. Does not count toward Tulane GPA.

EENS 5390 Study Abroad (1-20 Credit Hours)
Courses taught abroad by non-Tulane faculty. Does not count toward Tulane GPA.

EENS 6030 Advanced GIS (3 Credit Hours)
An introduction to the art and science of mapmaking with the aid of state-of-the-art Geographic Information Systems (GIS), specifically Environmental Sciences Research Institute (ESRI), ArcGIS and Golden Software Surfer. An introduction to geodetic models, map projections, geographic coordinate systems, global position systems, geographic information systems, satellite photogrammetry, and database design. Practical skills will be developed through mapping projects designed to illustrate the use of contouring algorithms and other spatial analysis tools.

EENS 6040 Coastal Marine Geology (3 Credit Hours)
Geomorphic features of estuarine, coastal, and continental shelf environments: erosional, depositional, and geochemical processes; field and laboratory methods; emphasis on dynamic coastal environments of the northern Gulf of Mexico.

EENS 6050 Natural Hazards & Mitigation (3 Credit Hours)
The broad aim of this course is to introduce students to the processes causing volcanic eruptions, earthquakes, landslides, tsunamis, and tropical storms, and to outline the steps to their mitigation. These dynamic Earth process are placed within the general context of plate tectonics, as well as the financial, social, and political implications of these catastrophic events. All of these processes are moderated by climate change and rising sea level, which are also considered in group discussions and scenerios. In lieu of a final exam, students prepare and present a hazard case study emphasizing geologic, economic, health, or sociological implications.

EENS 6060 Tectonic Geomorphology (3 Credit Hours)
The interplay between tectonic processes and the development and modification of landforms, from scale of earthquake ruptures to mountain building. The course will also include an overview of techniques for analyzing tectonic and geomorphic data, and an introduction to geochronology and thermochronology. Lecture and seminar format; mandatory field trip; optional service learning component.

EENS 6070 Independent Research (1-3 Credit Hours)
Topical and timely course, typically in a seminar format in which students lead discussions based on current scientific literature. The topics will be listed on a semester-by-semester basis in the Schedule of Classes.

EENS 6080 Special Topics (3 Credit Hours)
Special course taught by Tulane faculty or visiting faculty. The topics will be listed in the Schedule of Classes.

EENS 6081 Special Topics (1-4 Credit Hours)

EENS 6082 Special Topics (3 Credit Hours)

EENS 6090 Invertebrate Paleontology (3 Credit Hours)
Principles of invertebrate paleontology; a systematic treatment of the fossil invertebrates and their living relatives. Emphasis on functional morphology, ontogeny, and paleoecology. Lectures, laboratory, field trip.

Corequisite(s): EENS 6091.

EENS 6091 Invertebrate Paleontology Lab (0 Credit Hours)
Lab section for EENS 6090

Corequisite(s): EENS 6090.

EENS 6110 Mineralogy (3 Credit Hours)

EENS 6140 Igneous Petrology (3 Credit Hours)
An in-depth study of the origins of igneous rocks from the standpoint of experimental investigations, thermodynamics, trace elements, radiogenic isotopes, and field investigations. Includes a laboratory.

EENS 6150 Intro to GIS (4 Credit Hours)
This course is designed to give students a general understanding of geographic information systems (GIS) and the Environmental Systems Research Institute (ESRI) ArcGIS software. The approach taken is detailed instruction in utilizing ArcGIS to solve probl

Corequisite(s): EENS 6151.

EENS 6151 Intro to GIS lab (0 Credit Hours)
Co-requisite lab for Intro to GIS

Corequisite(s): EENS 6150.

EENS 6160 3D Stratigraphy (3 Credit Hours)
Study of the geomorphological, sedimentological, and stratigraphic responses of rivers to tectonics, climate, and sea-level changes. Discussion of recent scientific literature on river changes and associated stratigraphic records over time scales of 1 to millions of years. Formerly Fluvial Responses to Allogenic Controls.

EENS 6170 Geomorphology (3 Credit Hours)
The study of processes leading to landform creation and development in response to climate and tectonics. Overview of fundamental and applied activities undertaken by geomorphologists.

EENS 6171 Geomorphology Discussion (0 Credit Hours)
A discussion section to accompany EENS 3170/6170, Geomorphology.

EENS 6180 Intro Remote Sensing (3 Credit Hours)
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 for

EENS 6230 Tectonics (3 Credit Hours)
Tectonics encompasses the processes of large-scale deformation and the formation of structures that define, or are association with, Earth's tectonic plate boundaries. The course will include the historical development and testing of plate tectonic hypotheses, as well as a detailed overview of plate tectonics as a current unifying theory. Lecture format, but will include a limited number of discussions of published papers; field trip component is not graded, but participation is expected.

EENS 6250 Isotopes In The Environm (3 Credit Hours)
The use of stable and radioactive isotopes as tools to trace the movement of air, water, and sediments through the atmosphere, hydrosphere, biosphere, and lithosphere.

EENS 6260 Paleoclimatology (3 Credit Hours)
Understanding past climate change is necessary to effectively predict the future of our planet, which is currently in a state of rapid transition. The main focus of the course is on the reconstruction and modeling of climates of the Quaternary, the past two million years of Earth's history.

EENS 6300 Groundwater Hydrology (3 Credit Hours)
Occurrence of water in the near-surface environment. Topics include saturated and unsaturated flow in aquifers, aquifer characterization, well hydraulics, and groundwater chemistry.

EENS 6310 Depositional Mechanics (3 Credit Hours)
This course emphasizes a quantitative description of the mechanics of sediment transport in steady and unsteady flows based on hydrodynamic principles. Aspects of flow and sediment-transport mechanics that are relevant to understanding the construction of landscapes and depositional systems including modes of particle entrainment and motion in turbulent shear flows will be considered. The course includes consideration of the equations of motion for particles in a turbulent flow, entrainment, bedload, and suspended load in addition to the mechanics of bedforms, ripples, and dunes, parameters responsible for channelization, erosion, and deposition of cohesive and non-cohesive sediments, and the mechanics of sediment gravity flows. Finally, quantitative methods relating properties of stratigraphy to paleo-environmental conditions are considered.

EENS 6320 Subsurface Geology (3 Credit Hours)
Principles of subsurface mapping with emphasis on 3-dimensional seismic reflection data. Utilization of geophysical data to construct subsurface maps. Students gain hands on experience with Seismic Micro-Technology's state-of-the-art software, The Kingdom Suite, in work-station based laboratory sessions. Lectures and laboratory.

EENS 6350 Geologic Dating Methods (3 Credit Hours)
Geologic Dating Methods IN this course the student will explore the development of methods used to date and establish rates of Earth and planetary processes via radiogenic isotopic methods. Students will come away with deeper understanding of age of the Universe, Solar system, and Earth and understand how radiogenic isotopic techniques can be used to study, for example, differentiation of the earth into its major components (crust, mantle, core).

EENS 6360 Environmental Geochemstr (3 Credit Hours)
Quantitative examination of the fundamental processes that control the chemistry of natural waters. Topics will include equilibrium thermodynamics, kinetics, oxidation-reduction reactions, solution and surface complexation (adsorption), chemical weathering and biogeochemical cycling of chemical elements in the environment.

EENS 6370 GIS Research Project (3 Credit Hours)
This course is designed to advance student's knowledge to design, manage, and complete a research project that emphasizes the use of geographic information systems (GIS). This course will focus on the project's methodological and organizational design, the application of appropriate GIS techniques, and proper reporting of the results. The GIS component is accomplished through independent work. The graduate student/undergraduate group has the freedom to choose their own project topic. The instructor may suggest some project ideas, but students are welcome to develop their own. If you have an idea of a project, you are encouraged to discuss it with the instructor as soon as possible to see if it is feasible and to start the process of data acquisition. Ideas may come from a variety of sources, such as a current or previous employer, work done as a volunteer, or work done in another course or on a field trip.

Prerequisite(s): (EENS 3150, 3150, 6150 or 6150) and (EENS 4030, 4030, 6030 or 6030).

EENS 6380 Remote Sensing for Env Anlys (3 Credit Hours)
Continued advancements in remote sensing technologies have resulted in an extraordinary increase in the availability of remotely sensed data of Earth. Remote sensing data are now used in geology, hydrology, meteorology, environmental sciences, geography, urban planning, anthropology, civil engineering, and environmental monitoring. This course is built on the techniques learned in the introduction to Remote Sensing course (EENS 4180/6180) by exposing the student to more image processing and analysis for different environmental applications. Students will use the multispectral, hyperspectral, thermal, Radar, and LiDAR data for watersheds, wetlands, water quality, coastal changes, vegetation analysis, mineral resources, land use and land cover changes. Students will develop technical skills of digial image processing, analysis, and interpretation using the ENVI software.

EENS 6390 Geospatial Data Analysis (4 Credit Hours)
Satellites probe Earth's ionosphere, atmosphere, oceans, and subsurface over periods of days to weeks, building large 4D data sets. Earth based data from the internet of things to sophisticated monitoring provide even denser 4D data sets. The broad aims of this course are to learn theory and application of the following broad topics, and to use open source command line software (GMT, Google Earth, QGIS), or commercial (ArcGIS), and Matlab or python programming to solve geospatial data analyses problems. Prerequisites: MATH1220 and EENS1110 or equivalents, or instructor permission.

EENS 6400 The Scientifc Enterprise (3 Credit Hours)
Scientific research has evolved into a complex activity that requires numerous skills which are typically not captured by traditional curricula. This course covers such topics as science funding, publishing, misconduct, media, and politics, and is specifically intended for (aspiring) graduate students.

EENS 6410 Structural Geology (3 Credit Hours)
Principles and mechanics of rock deformation, the evolution of geological structures, and the relations between structures and plate tectonics. Laboratory section focuses on geological problem solving. Field trip to the Southern Appalachian Mountains.

EENS 6411 Structural Geology Lab (0 Credit Hours)
Lab section for EENS 6410

EENS 6420 Applied Basin Analysis (3 Credit Hours)
This course focuses on practical applications of stratigraphy, structural geology and petroleum geology. It is designed around a dataset for an individual hydrocarbon basin that will typically include seismic reflection data and well data. Datasets will vary from year to year, as the course will be coordinated with AAPG's Imperial Barrel award program. Students work as a team, however each student has a clear role and responsibility to the ultimate goal, which is a geologically valid interpretation of the basin that makes predictions about the hydrocarbon prospectively of the study area. Emphasis is on teamwork, participation, oral and written communication of results. Practicum format (non-lecture).

EENS 6440 Introduction to Geophysics (3 Credit Hours)
Introduction to Geophysics This course provides an introduction to applied geophysical methods, with a focus on the application of these techniques in environmental and engineering studies. The material will provide the technical foundation needed to understand the commonly used geophysical methods: gravity, magnetics, electrical resistivity, seismic, electromagnetics, and ground penetrating radar.

EENS 6550 Shark Paleobiology (4 Credit Hours)
This course examines the processes and patterns of shark speciation, diversification, macroevolution, and extinction within the framework of developing a problem-based learning activity using shark teeth for a K-12 classroom. Particular emphasis is placed on the systematics and functional morphology of shark teeth.

EENS 6551 Shark Paleobiology Lab (0 Credit Hours)

EENS 6660 Special Topics (1-3 Credit Hours)
Special Topics.

EENS 6700 Earth & Env Sci.Field Studies (3 Credit Hours)
This course will take students into the field and provide them with their first in depth experience with earth and environmental science. Students will spend the first part of the course in a seminar type course discussing fundamental papers. The course will then culminate with an approximately week long field outing. Course location will rotate. The course will not supllant the field geology camp requirement for geology majors.

EENS 6840 Planetary Geophysics (3 Credit Hours)
The interior structure, composition, and dynamics of Earth and the terrestrial planets can be deduced from a number of different physical, chemical, and thermodynamic observations and models. Topics include: Early bombardment and formation of proto-planetary discs, core formation, Earth's composition and age from radioactivity and thermal considerations, thermal and density structure, geomagnetic dynamo, mantle convection, and plate tectonics, and their absence on other terrestrial planets. Special topics for in-class seminars will explore the methodologies used to determine the internal structure (e.g., seismology, gravity), and the dynamics of systems (e.g., geomagnetism, plate tectonics, the water and carbon cycle). Assessment: 2 in-class quizzes, 5 problem sets, 2 class presentations, and a final critical review of 2 linked research papers on a special topic to be assigned in class.

EENS 6930 Lumcom Summer Special Topics (1-3 Credit Hours)

EENS 6931 Lumcom Summer Special Topics (1-3 Credit Hours)

EENS 6932 Lumcon Summer Special Topics (1-3 Credit Hours)

EENS 6940 Transfer Coursework (1-4 Credit Hours)
Transfer Coursework.

EENS 7010 Techniques Geoscience Writing (3 Credit Hours)
This graduate-level course will introduce students to methods and best practices for writing scientific paper and as scientific proposal. General practices for clear and concise writing will also be discussed. Students will be required to write and rewrite either a scientific proposal (PhD students) or a thesis prospectus (MS students). Students will be required to critique classmates' writing and provide constructive feedback. Best practices for reviewing scientific writing will also be discussed. This course should be taken in a graduate student's third or fourth semester, so that the student will have some of their own research completed.

EENS 7100 EENS Seminar (1-3 Credit Hours)

EENS 7101 EENS Seminar (1-3 Credit Hours)

EENS 7150 Adv Top Sedimentary Geol (3 Credit Hours)

EENS 7660 Special Topics (0-4 Credit Hours)
Special Topics.

EENS 7940 Transfer Credit-Grad (1-12 Credit Hours)

EENS 7990 Research In Geosciences (1-9 Credit Hours)
Individual research supervised by faculty.

EENS 9980 Masters Research (3 Credit Hours)
Research toward completion of a masters degree.

EENS 9990 Dissertation Research (3 Credit Hours)
Research toward completion of a doctoral degree.