EARTH AND ATMOSPHERIC SCIENCES (EAS)

EAS 1010 - Earth Systems I-The Solid Earth  
Credit(s): 3 Credits  
This course covers the interactions between land, water, air, and life with special emphasis on humans and the environment. EAS 1010 focuses on the solid earth and surface environments; EAS 1030 focuses on the oceans and atmosphere. Either course can be taken independently. Satisfies Science Core requirement.  
Attributes: Natural Science Req (A&S)

EAS 1020 - Earth's Environment I Lab  
Credit(s): 1 Credit  
This course covers the interactions between land, water, air, and life with special emphasis on humans and the environment. EAS 1010 focuses on the solid earth and surface environments; EAS 1030 focuses on the oceans and atmosphere. Either course can be taken independently. Satisfies Science Core requirement.  
Attributes: Natural Science Req (A&S)

EAS 1030 - Earth's Dynamic Environment II  
Credit(s): 3 Credits  
This course covers the interactions between land, water, air, and life with special emphasis on humans and the environment. EAS 1010 focuses on the solid earth and surface environments; EAS 1030 focuses on the oceans and atmosphere. Either course can be taken independently. Satisfies Science Core requirement.  
Attributes: Natural Science Req (A&S)

EAS 1040 - Earth's Environment II Lab  
Credit(s): 1 Credit  
Two hour laboratory per week. Illustrates and supplements the material covered in lectures of EAS 1030 Earth's Dynamic Environment II. Several short field trips are taken during the semester.  
Prerequisite(s): EAS 1030  
*Concurrent enrollment allowed.  
Attributes: Natural Science Req (A&S)

EAS 1050 - Introduction to Oceanography  
Credit(s): 1 or 3 Credits  
Lecture three hours per week. Provides an introduction to ocean basin formation, chemical and physical properties of sea water, waves, currents, tidal forces and tides, interaction of land and ocean in coastal environments, marine biology and ocean resources. Fulfills three hours of science requirement. Spring semester, alternate years.  
Attributes: Natural Science Req (A&S)

EAS 1060 - Understanding the Weather  
Credit(s): 3 Credits  
Lecture three hours per week. A nonmathematical description of the processes that effect the weather are provided. Topics include solar radiation, horizontal and vertical structure of the atmosphere, atmospheric motions, and climate. Fulfills three hours of science requirement. Fall and Spring semesters.  
Attributes: Natural Science Req (A&S)

EAS 1070 - Understanding the Weather  
Credit(s): 3 Credits  
Lecture three hours per week. A nonmathematical description of the processes that effect the weather are provided. Topics include solar radiation, horizontal and vertical structure of the atmosphere, atmospheric motions, and climate. Fulfills three hours of science requirement. Fall and Spring semesters.  
Attributes: Natural Science Req (A&S)

EAS 1080 - Introduction to Environmental Science  
Credit(s): 3 Credits  
This course is a first introduction to the main topics of environmental science, with emphasis on human interactions with the environment. Sustainability is a unifying theme throughout the course. The knowledge and skills learned in this course will inform and guide students’ life-decisions and their impacts on the environment. Topics covered include the scientific process and critical thinking, matter and energy, ecosystem ecology and biomes, evolution, biodiversity, community ecology, human population growth, geologic processes, land resources and agriculture, nonrenewable and renewable energy, water resources and water pollution, air pollution, solid waste generation and disposal, human health risk, conservation of biodiversity, climate alteration and global warming.  

EAS 1081 - Introduction to Environmental Science Laboratory  
Credit(s): 1 Credit  
This is a laboratory to complement EAS 1080, Introduction to Environmental Science. The lab is intended primarily for science, engineering, and other majors with a strong interest in Environmental Science. Topics covered include: matter and energy, evolution, biodiversity, community ecology, human population growth, geologic processes, land resources, agriculture, energy, water, air, solid waste, human health, and climate change.  
Attributes: Natural Science Req (A&S)

EAS 1090 - Climate Change  
Credit(s): 3 Credits  
Introduction to climate change. Understand what is happening to the climate system, what evidence there is and what has happened in the past. We will study the reasons for the societal debate and evaluate proposals for international action on climate change. Lecture course, satisfies 3 hours of Science requirement and 3 hours of Global Citizenship requirement.  

EAS 1130 - Earth and Human Systems  
Credit(s): 3 Credits  
Provides an introduction to the concept of Earth Systems and how the interrelationships between land, water, air, and life with special emphasis on humans and the environment. Topics include functions of the solid earth and surface environments; EAS 1030 focuses on the oceans and atmosphere. Either course can be taken independently. Satisfies Science Core requirement.  
Attributes: Natural Science Req (A&S)

EAS 1140 - Earth History  
Credit(s): 3 Credits  
Lecture three hours per week. Provides an introduction to the geologic origin and development of the earth; plant and animal inhabitants. Fulfills three hours of science requirement. Spring semester, alternate years.  
Attributes: International Studies, Natural Science Req (A&S)

EAS 1170 - Physical Geography  
Credit(s): 3 Credits  
Lecture three hours per week. Provides an introduction to the origin of land forms, earth resources, climate and weather, implications of human use of natural resources. (Satisfies Missouri Teaching Certification Requirement.) Fulfills three hours of science requirement. Fall semester.  

EAS 1180 - Physical Geography Lab  
Credit(s): 1 Credit  
Two hour laboratory per week. Provides experience in using planimetric maps, topographic maps and nautical charts and an introduction to the underlying principles of map making and map reading. Fulfills 1 hour of science requirement. Usually offered in the Fall semester.  
Attributes: Natural Science Req (A&S)
EAS 1300 - Seismology of Nuclear Explosions  
Credit(s): 3 Credits  
This inquiry-based course will emphasize the scientific questions involved in the detection of underground nuclear explosions using seismology. Many other related issues will also be raised and discussed, e.g. the interplay of science and public policy, how political decisions are made, the ratification of Test Ban Treaties, and the difference between explosions and earthquakes. Class limit 19. Two lectures and a 2-hour lab per week. Offered once per year.  
Attributes: Natural Science Req (A&S)

EAS 1310 - Water-Our Precious Resource  
Credit(s): 3 Credits  
This course is focused on freshwater, which is one of most important and vulnerable resources on Earth. Availability of freshwater for human consumption, animal husbandry, and crop irrigation will become a major focus of national and international relations in the years to come. In this course, we will be learning the basics about freshwater resources, drinking-water and waste-water treatments, water-borne disease, water pollution, river dynamics and flooding, land use in flood plains, and national and international conflicts related to water resources. Each class session will be comprised of lecture (~2hours), water laboratory simulation (~2hours), and field trip (~3hours). Transportation is provided for the field trips.  
Attributes: Natural Science Req (A&S)

EAS 1320 - Natural Disasters  
Credit(s): 3 Credits  
This inquiry-based course examines geologic processes that are sometimes hazardous to humans, including earthquakes, volcanic eruptions, and landslides. Each section of the course will include and analysis of the geologic processes, and end by discussing specific examples of where, when and how each type of geologic process has proven hazardous, or resulted in a natural disaster. Lecture and discussion, 3 hours per week.  
Attributes: Natural Science Req (A&S)

EAS 1330 - Drifting Continents  
Credit(s): 3 Credits  
This inquiry-based course introduces students to the theory of continental drift and plate tectonics, covers the general character of science, the history behind plate tectonics, how the theory explains the gross features and phenomena near the Earth's surface, and current debates around plate tectonics. Lectures and discussion, 3 hours per week.  
Attributes: Natural Science Req (A&S)

EAS 1340 - Is Earth Unique  
Credit(s): 3 Credits  
Attributes: Natural Science Req (A&S)

EAS 1350 - Real Meteorology  
Credit(s): 3 Credits  
Real observation-based meteorology will give non-science majors an appreciation of how meteorologists collect and use weather data to make forecasts. Students are expected to actively participate by analyzing meteorological data and by making and verifying at least one forecast.  
Attributes: Natural Science Req (A&S)

EAS 1360 - Beauty of Atmosphere  
Credit(s): 3 Credits  
The student understands the physical processes responsible for severe local storms, hurricanes, and winter storms. In addition to understanding the power behind these phenomena, the student marvels at the beauty of optical phenomena such as rainbows, halos, mirages, coronas and sundogs and inquires about the mechanism.  
Attributes: Natural Science Req (A&S)

EAS 1370 - Meteorological Aspects of Emergency Response  
Credit(s): 3 Credits  
Two 75 minute periods per week. The first period and 25 minutes of the second period will be devoted to lecture topics. The last 50 minutes of the second period will involve a case study. Field trips to the St. Louis Forecast Office of the National Weather Service and to an Emergency Operations Center are required. 75% of situations involving federal, state and local emergency responders and agencies are directly caused by weather phenomena. Some of these are obvious, such as tornadoes, hurricanes and flooding; while others, like a heat wave or extreme winter weather may not be obvious. In addition, conflagrations, chemical spills and releases, and air pollution incidents require weather information and forecasts.  
Attributes: Natural Science Req (A&S)

EAS 1380 - Missouri Climate  
Credit(s): 3 Credits  
This course is focused on Missouri. Students working in teams will use actual observations to examine the possible relationships between climate phenomena (i.e. El Nino, La Nina, Pacific Decadal Oscillation, teleconnections, and global warming) and the weather patterns over Missouri.  
Attributes: Natural Science Req (A&S)

EAS 1390 - Hurricanes and Typhoons  
Credit(s): 3 Credits  
Attributes: Natural Science Req (A&S)

EAS 1400 - Energy Resources for a Sustainable Future  
Credit(s): 3 Credits  
Analysis of the emerging crisis in fossil fuels as the cheap energy source for the future. Is limitless petroleum, gas, or coal available, accessible, and at what cost? Are there miracle cures from fundamental physics, biology? How much energy can be supplied by solar, wind, and other sources?  
Attributes: Natural Science Req (A&S)

EAS 1420 - Foundations of Atmospheric Science  
Credit(s): 3 Credits  
This course provides an overview of atmospheric science for students majoring in meteorology. Topics include: atmospheric composition and structure, temperature, heat, moisture, air masses, fronts, mid-latitude cyclones, thunderstorms, and hurricanes. Education and career opportunities will also be discussed.  
Prerequisite(s): (1 Course from MATH 141-4999 or Math Waiver per Advisor with a minimum score of 1400)  
Attributes: Natural Science Req (A&S)
EAS 1530 - Aviation Meteorology  
Credit(s): 3 Credits  
This course will present the fundamentals of meteorological theory with a specific application to aviation and flight. The course will examine standard meteorological fields along with their roles in generating sensible weather. In addition, the course will study weather hazards specific to aviation including wind shear, turbulence, icing, visibility and fog.  
Attributes: Natural Science Req (A&S)  

EAS 1600 - Sustainable Energy  
Credit(s): 3 Credits  
Scientific and economic impacts of the crisis in waning fossil fuels as the world's cheap energy source. Future petroleum, gas, and coal recovery will likely be either environmentally unacceptable or too costly. The challenges of supplying energy from solar, wind, and other renewable sources will be highlighted.  
Attributes: Natural Science Req (A&S)  

EAS 1800 - Introduction to Earthquakes  
Credit(s): 1 or 3 Credits  
Lecture three hours per week. Provides an introduction to the science of earthquakes. Discussions include the general character of science, plate tectonics, geologic time, seismic hazards, faults and faulting, earthquake prediction, seismic waves, and Earth structure and composition.  
Attributes: Natural Science Req (A&S)  

EAS 1930 - Special Topics  
Credit(s): 1-3 Credits (Repeatable for credit)  
Attributes: Natural Science Req (A&S)  

EAS 1980 - Independent Study  
Credit(s): 1-3 Credits (Repeatable for credit)  
Attributes: Natural Science Req (A&S)  

EAS 2110 - Meteorological Analysis  
Credit(s): 3 Credits  
The analysis procedures and tools of meteorology are studied. Types and formats of meteorological data from both observations and models are examined. The analysis and display of data by hand and with computers are introduced.  
Prerequisite(s): EAS 2530; (1 Course from MATH 142-4999 or Math Waiver per Advisor with a minimum score of 1510)  
Corequisite(s): EAS 2440  
Attributes: Natural Science Req (A&S)  

EAS 2170 - Geographic Information System in Civil Engineering  
Credit(s): 3 Credits  
This course discusses the fundamental concepts of GIS, the methods and software used to solve civil engineering problems. The course also covers skills to deal with remote sensing data, basic and differential GPS surveying to prepare students for today's growing business needs in civil engineering companies and government agencies. Students may only apply credits towards their graduation requirements from one of the following courses: EAS 2170, BIOL 4170, EAS 4170, or SOC 4650.  
Attributes: Natural Science Req (A&S)  

EAS 2200 - Mineralogy  
Credit(s): 3 Credits  
Lecture three hours per week. Crystallography, physical, chemical, and descriptive mineralogy.  
Prerequisite(s): EAS 1010, EAS 1020, and CHEM 1110  
* Concurrent enrollment allowed.  
Corequisite(s): EAS 2210  
Attributes: Natural Science Req (A&S)  

EAS 2210 - Mineralogy Lab  
Credit(s): 1 Credit  
Identification of rock-forming and ore minerals through physical and optical properties. will include field trips. Meets 3 hours once a week.  
Corequisite(s): EAS 2200  
Attributes: Natural Science Req (A&S)  

EAS 2300 - Geology for Engineers  
Credit(s): 3 Credits  
Engineering projects deal with surface materials and landforms on a daily basis. A proper understand of material properties and processes that lead to their formation is critical to understand their behavior. This course introduces students to the basic principles of earth science, the composition of earth materials and processes that shape the Earth and how these relate to human modifications.  
Attributes: Natural Science Req (A&S)  

EAS 2400 - Field Techniques in the Geosciences  
Credit(s): 2 Credits  
Instruction in the fundamental methods of field work in the geosciences and environmental sciences. Students will learn to use compasses, maps, and other important geological and environmental field equipment, describe and map basic geologic features and structures, and maintain a field notebook. Most of the course will be conducted in the field. (Offered every Spring)  
Prerequisite(s): EAS 1010; EAS 1020  
Attributes: Natural Science Req (A&S)  

EAS 2420 - Computer Applications in Earth Science  
Credit(s): 1 Credit  
Laboratory two hours per week. Students gain experience in the use of word processors, spreadsheets and graphing packages for tabulating, analyzing and reporting scientific data in the geosciences. Spring semester.  
Restrictions: Enrollment is limited to students with a major in Environmental Science, Geophysics, Geology or Meteorology.  
Attributes: Natural Science Req (A&S)  

EAS 2440 - Atmospheric Processes and Systems  
Credit(s): 3 Credits  
Introduction to theoretical aspects of dynamic and synoptic meteorology and numerical weather prediction. The kinematic quantities of vorticity and divergence, as well as the analysis of weather systems will be emphasized.  
Prerequisite(s): PHYS 1610; (1 Course from MATH 142-4999 or Math Waiver per Advisor with a minimum score of 1510)  
* Concurrent enrollment allowed.  
Corequisite(s): EAS 2110  
Attributes: Natural Science Req (A&S)  

EAS 2450 - Communicating in Science  
Credit(s): 3 Credits  
Lecture three hours per week. Critical reading of and oral and written presentations about scientific articles. Emphasis will be on the examination of different types of sources and the synthesis of the content for different audiences. Spring Semester.  
Attributes: Natural Science Req (A&S)
EAS 2530 - Fundamentals of Climate Systems  
Credit(s): 3 Credits  
Introduction to the fundamental processes which affect climate and influence climate change. Topics include: earth’s radiation budget, oceanic and atmospheric general circulations, ocean, atmosphere and land interactions, climate classifications, and the hydrologic cycle.  
Prerequisite(s): EAS 1420  

EAS 2600 - Environmental Science Seminar Series  
Credit(s): 1 Credit (Repeatable for credit)  
The seminar series is comprised of two components. Environmental scientists and professionals will be invited to give four seminars on important environmental issues. Three seminars will also be given to prepare students for their future careers. Must be declared environmental science / studies major or in the process of declaring to enroll in seminar.  
Restrictions:  
Enrollment is limited to students with a program in Environmental Science or Environmental Studies.  
Attributes: International Studies, Natural Science Req (A&S)

EAS 2700 - Sustainable Development in Latin America  
Credit(s): 3 Credits  
Provides an introduction to the analysis of Latin American environmental problems linked to the sustainable development possibilities of the region.  
Attributes: Natural Science Req (A&S)

EAS 2930 - Special Topics  
Credit(s): 3 Credits (Repeatable for credit)  
Attributes: Natural Science Req (A&S)

EAS 2980 - Independent Study  
Credit(s): 1-3 Credits (Repeatable for credit)  
Attributes: Natural Science Req (A&S)

EAS 3050 - Geomorphology  
Credit(s): 3 Credits  
Introduction to landforms and surficial deposits, and to the erosional and depositional processes responsible for landform genesis. Long-term landscape development and aspects of larger scale geomorphology. Lecture three hours per week, occasional field trips. Spring or Fall semester.  
Prerequisite(s): EAS 1010; EAS 1020  
Attributes: Natural Science Req (A&S)

EAS 3100 - Environmental Issues  
Credit(s): 3 Credits  
An examination of current and historical environmental issues from scientific, economic, social, and political perspectives, with an emphasis on energy, public health, land use, and global change.  
Prerequisite(s): ((EAS 1010 and EAS 1020) or (EAS 1030 and EAS 1040)); (BIOL 1040 and BIOL 1060); CHEM 1110  
Attributes: International Studies, Natural Science Req (A&S)

EAS 3150 - Broadcast Meteorology I  
Credit(s): 3 Credits  
The principles of broadcast meteorology will be introduced combining lectures and hands-on experience. Students will develop the skills necessary to communicate scientific information, with emphasis on weather forecasts. The campus radio station will be used by the students to present weather forecasts on a daily basis .  
Prerequisite(s): EAS 2110; EAS 2440  
Attributes: Natural Science Req (A&S)

EAS 3160 - Broadcast Meteorology II  
Credit(s): 3 Credits  
Production will be explored, including the concepts behind the presentation and practical applications. The goal is to achieve the knowledge and experience necessary to obtain a position in broadcasting and the understanding on how to advance one’s career.  
Prerequisite(s): EAS 3150  
Attributes: Natural Science Req (A&S)

EAS 3250 - Global Change  
Credit(s): 3 Credits  
Fundamentals of climate physics, global and regional scale average solar and terrestrial radiation regimes and respective radiation balances; radiation instruments of roof station; hydrologic cycle and water balance; energy balance for atmosphere, ground and total earth system; heat transfer in ocean and ground; paleoclimatology; climatic change. Fulfills three hours of science requirement. Spring semester.  
Prerequisite(s): (MATH 1200, 0 Course from MATH 1320-4999, and Math Waiver per Advisor with a minimum score of 1200)  
Attributes: International Studies, Natural Science Req (A&S)

EAS 3310 - Paleontology  
Credit(s): 3 Credits  
Lecture three hours, laboratory two hours per week. Classification, anatomical structure and geological history of invertebrate fossils.  
Attributes: Natural Science Req (A&S)

EAS 3330 - Physical Meteorology I  
Credit(s): 3 Credits  
The study of the physical principles underlying atmospheric processes of dry and moist air. Additional topics include the analysis of atmospheric stability and thermodynamic diagrams.  
Prerequisite(s): EAS 2440; PHYS 1610; (1 Course from MATH 143-4999 or Math Waiver per Advisor with a minimum score of 1520); PHYS 1620  
Attributes: Natural Science Req (A&S)

EAS 3340 - Physical Meteorology II  
Credit(s): 3 Credits  
The study of cloud microphysics and radiative transfer in the atmosphere. Topics include absorption and emission of radiation, solar and terrestrial radiation, cloud formation, heat and energy transfer, and optical phenomena.  
Prerequisite(s): EAS 3330, PHYS 1630, PHYS 1640, and MATH 2530  
* Concurrent enrollment allowed.  
Attributes: Natural Science Req (A&S)

EAS 3400 - Soils- Formation, Properties, Identification, and Current Issues  
Credit(s): 3 Credits  
This course covers the physical-, chemical-, and biologically related properties of soils and the environmental issues surrounding soils and society. Lecture 3 hours per week plus several field trips and field exercises.  
Attributes: Natural Science Req (A&S)

EAS 3500 - Numerical Modeling Applications  
Credit(s): 3 Credits  
The input data and procedures for running numerical weather prediction models as well as the analysis of model output. Topics include: Numerical model components, model input requirements, cluster computing, analysis procedures, numerical model data formats, and analysis and display software.  
Prerequisite(s): EAS 3330; PHYS 1630  
Attributes: Natural Science Req (A&S)
EAS 3600 - A Future Based on Sustainable Energy
Credit(s): 3 Credits
Assuming available fossil fuels will soon be exhausted, we examine alternative renewable resources and nuclear energy to sustain current US consumption. Mid-Western States will be highlighted for their wind, solar, and geothermal potential. Implications for new transportation systems, power generation, and community development will be quantitatively examined.
Prerequisite(s): EAS 1400; (1 Course from MATH 141-4999 or Math Waiver per Advisor with a minimum score of 1400)
Attributes: Natural Science Req (A&S)

EAS 3700 - Mesosanalysis and Severe Storms
Credit(s): 3 Credits
The study of the structure, dynamics and climatology of severe local storms. Topics include: severe local storm climatology, the severe storm environment, mesoscale convective systems, supercells, tornados and tropical cyclones. Forecasting techniques for assessing the severe weather morphology and potential will also be covered.
Prerequisite(s): EAS 3330
Attributes: Natural Science Req (A&S)

EAS 3900 - SLU TV Practicum
Credit(s): 1-3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

EAS 3910 - Internship
Credit(s): 1-6 Credits (Repeatable for credit)

EAS 3930 - Special Topics
Credit(s): 3 Credits (Repeatable for credit)

EAS 3980 - Independent Study
Credit(s): 1-3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

EAS 4030 - Elements of Air Pollution
Credit(s): 3 Credits
Meteorological aspects of air pollution. Topics include atmospheric transport, turbulence models, geochemical cycles, stratospheric ozone, oxidation, ozone, aerosols, and acid rain. Current topics in air pollution along with health effects and policy implications will also be addressed.
Prerequisite(s): EAS 1030 or EAS 2530; (1 Course from MATH 142-4999 or Math Waiver per Advisor with a minimum score of 1510)
Attributes: Natural Science Req (A&S)

EAS 4050 - Petrology
Credit(s): 3 Credits
Origin, occurrence, classification and characteristics of igneous and metamorphic rocks. Lecture three hours per week. Spring or Fall semester.
Corequisite(s): EAS 4060
Attributes: Natural Science Req (A&S)

EAS 4060 - Petrology Lab
Credit(s): 1 Credit
Three hours laboratory per week. An introduction to the description, classification and analysis of igneous and metamorphic rocks in hand specimens and under the microscope. A brief introduction to optical mineralogy is included. Spring or Fall semester.
Attributes: Natural Science Req (A&S)

EAS 4070 - Coastal Processes & Morphology
Credit(s): 3 Credits
The origin/evolution of coastal landforms and the physical processes responsible for their creation and modification, including the following topics: geomorphic classification of coasts, sediment characteristics, sea level, tides, waves, nearshore currents, longshore and cross-shore sediment transport, beach and nearshore morphology, barrier island systems, salt marshes, cliffsed coastes, and the effects of climate change on coastal environments.
Attributes: Natural Science Req (A&S)

EAS 4100 - Surface Processes
Credit(s): 3 Credits
Overview of physical and chemical processes and landform development in modern and ancient surface environments. Field trip required.
Prerequisite(s): EAS 1010, EAS 1020, and EAS 4110
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4110 - Surface Processes Laboratory
Credit(s): 1 Credit
This laboratory illustrates and supplements the material covered in lectures of EAS 4100. Several field trips are taken during the semester.
Prerequisite(s): EAS 2400 and EAS 4100
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4130 - Geotechnics
Credit(s): 3 Credits
Geologists and Environmental Scientists are faced with slope stability, rock and soil loss problems at one point or another in the professional work. These issues directly affect population and infrastructure, as well impacts negatively household, state and federal budgets. It is of paramount importance to understand not only the behavior natural material under critical equilibrium or unstable conditions, and how they will react to induced disturbances, but also, the mechanisms to improve and resolve such conditions. This course presents the properties of geologic materials and general principles that govern the stability of rock and soil masses. In addition, it provides students with tools to characterize, assess and analyze unstable masses, and to provide solutions for their improvement, containment and stabilization.
Attributes: Natural Science Req (A&S)

EAS 4150 - Instrumentation and Remote Sensing
Credit(s): 3 Credits
Meteorological instruments will be studied from the viewpoint of geologic materials and general principles that govern the stability of rock and soil masses. In addition, it provides students with tools to characterize, assess and analyze unstable masses, and to provide solutions for their improvement, containment and stabilization.
Attributes: Natural Science Req (A&S)

EAS 4170 - Introduction to GIS
Credit(s): 3 Credits
This class introduces concepts, science and theory of GIS with hands-on experiences. After successful completion of the course, students will be able to demonstrate fundamental techniques of geospatial analysis and mapping. Students may only apply credits towards their graduation requirements from one of the following courses: EAS 4170, BIOL 4170, or SOC 4650.
Attributes: Natural Science Req (A&S)
EAS 4180 - Intermediate GIS
Credit(s): 3 Credits
This course covers intermediate and advanced topics in GIS including remote sensing for GIS, geospatial statistics and GIS in biogeography. Students may only apply credits towards their graduation requirements from one of the following courses: EAS 4180, BIOL 4180, or SOC 4660.
Prerequisite(s): (EAS 4170, BIOL 4170, or SOC 4650)
Attributes: Natural Science Req (A&S)

EAS 4190 - Geospatial Methods in Environmental Studies
Credit(s): 1 or 3 Credits
For students and professionals in Environmental Sciences, this course explores an integrated GIS and remote sensing approach to solve real-world environmental problems. Through hands-on projects, the course will also prepare students for today’s growing business needs in innovative server-based GIS solutions, relational databases and web mapping in an enterprise environment.
Attributes: Natural Science Req (A&S)

EAS 4200 - Synoptic Meteorology I
Credit(s): 3 Credits
Extratropical cyclones, polar and tropical jet streams, synoptic climatology, teleconnections and quasi-geostrophic theory as it applies to weather forecasting.
Prerequisite(s): EAS 3340 and EAS 4440
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4200 - Synoptic Meteorology II
Credit(s): 3 Credits
Continuation of the laboratory study begun in EAS 4220. Topics include thermodynamic diagrams, sounding analysis, stability indices, isentropic analysis, severe local storms and numerical weather prediction as a forecasting tool.
Prerequisite(s): EAS 4200 and EAS 4450
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4230 - Micrometeorology
Credit(s): 3 Credits
Physical relations between profiles of temperature, moisture and wind in the atmospheric boundary layer, influence of low-level atmospheric turbulence, diffusion, and heat transfer processes on the boundary layer. Spring semester.
Prerequisite(s): (1 Course from MATH 244-4999 or Math Waiver per Advisor with a minimum score of 2530)
Attributes: Natural Science Req (A&S)

EAS 4250 - Project in Environmental Science
Credit(s): 1-6 Credits
This course will be lecture, field and laboratory based. The goal will be to discuss local and global environmental issues important to society and allow students to acquire first-hand knowledge of such issues in the laboratory and in the field. Lectures will emphasize the methods of scientific analysis, data collection, library research, identification of environmental problems and possible solutions, report writing, and presentation of results. Several case studies will be reviewed in detail as needed.
Attributes: Natural Science Req (A&S)

EAS 4260 - Environmental Geophysics
Credit(s): 3 Credits
Lecture three hours per week. Geophysical techniques for exploration and characterization of shallow structure and media in the geosciences. Includes gravity, magnetic, seismic, electrical, borehole and ground-penetrating radar methods. Alternate Spring semesters.
Prerequisite(s): EAS 240; EAS 242; (0 Course from MATH 142-499 or Math Waiver per Advisor with a minimum score of 1510); 0 Course from PHYS 131-161
Attributes: Natural Science Req (A&S)

EAS 4280 - Environmental Geochemistry
Credit(s): 3 Credits
Introduction to the geochemistry of natural waters and the processes that alter their composition. Key principles of aqueous geochemistry are introduced and then used to describe the main controls on pristine and polluted soil, surface water, and groundwater environments. Topics include acids and bases, mineral solubility, carbonate chemistry, chemical speciation, redox reactions, adsorption and ion exchange, and global geochemical cycles. (Offered every Spring)
Prerequisite(s): CHEM 1110; EAS 1010; EAS 1030; CHEM 1120
Attributes: Natural Science Req (A&S)

EAS 4300 - Structural Geology
Credit(s): 3 Credits
Continued study of structures in sedimentary, igneous and metamorphic rocks at scales ranging from atomic to continental. Introduction to stress, strain, deformation mechanisms, and techniques of kinematic and dynamic analyses. Alternate Spring semesters.
Prerequisite(s): EAS 2200; EAS 2210; EAS 2400; EAS 2420; (1 Course from MATH 142-499 or Math Waiver per Advisor with a minimum score of 1510); (PHYS 1310 or PHYS 1610)
Attributes: Natural Science Req (A&S)

EAS 4310 - Structural Geology Laboratory
Credit(s): 1 Credit
Laboratory focuses on map interpretation, collection of structural data, and geometrical techniques for solving structural problems. Half-day and weekend field trips are an integral part of the laboratory.
Prerequisite(s): EAS 4300
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4320 - Climate Change and Variability
Credit(s): 3 Credits
The analysis of the fundamental principles and techniques used for climate change detection, attribution, and projection. Topics include: climate system interplay, natural variability and likely anthropogenic influences of the climate system, and climate change scenarios and modeling.
Prerequisite(s): EAS 4440; MATH 3550
Attributes: Natural Science Req (A&S)

EAS 4370 - Earth Dynamics
Credit(s): 3 Credits
Lecture three hours per week. The relation between plate tectonics and properties of Earth's interior inferred from geological and geophysical observations. Emphasis will be on the relation of Earth's surface features to processes at depth. Alternate Fall semesters.
Prerequisite(s): EAS 1010; MATH 1510
Attributes: Natural Science Req (A&S)
EAS 4400 - Environmental Science Capstone Project
Credit(s): 3 Credits
This team project is the final integrative experience in the environmental science/studies programs. Each team focuses on one local, regional, or global environmental issue. The results of each team's investigation of the problem(s) and formulation of potential solutions will be presented and defended before faculty and students. Senior standing required.

Restrictions:
Enrollment limited to students with a classification of Senior.

Attributes: Natural Science Req (A&S)

EAS 4410 - Hydrology
Credit(s): 3 Credits
This course is an introduction to the principles that govern precipitation, evaporation, infiltration, runoff generation, flow, and geochemistry in freshwater environments. The course focuses on the characteristics of surface water and groundwater, with an emphasis on the connection between these systems as well as their temporal and spatial variability. Basic equations of flow and transport will be covered. The course overviews anthropogenic impacts on freshwater environments and efforts to remediate damaged systems.

Prerequisite(s): EAS 1010; EAS 1020; EAS 1030; EAS 1040; MATH 1510
Attributes: Natural Science Req (A&S)

EAS 4440 - Principles of Dynamic Meteorology I
Credit(s): 3 Credits
Dynamic principles underlying large-scale atmospheric motion. Topics include the development of the primitive equations, horizontal wind approximations, thermal wind, vertical coordinate transformations, kinematics, circulation theorem and the flow in the planetary boundary layer. Must take EAS-4200 concurrently.

Prerequisite(s): EAS 3340; EAS 4200; (1 Course from MATH 244-4999 or Math Waiver per Advisor with a minimum score of 2530)
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4450 - Principles of Dynamic Meteorology II
Credit(s): 3 Credits
Analytical investigation of atmospheric motions. Topics include: wave dynamics, sound waves, gravity waves, Rossby waves, geostrophic adjustment, baroclinic instability and isotropic potential vorticity.

Prerequisite(s): EAS 4220; EAS 4440, and MATH 3550
* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4470 - Elementary Tropical Meteorology
Credit(s): 3 Credits
The study of the structure, dynamics and climatology of tropical weather. Topics include: the trade winds, intertropical convergence zone, Hadley and Walker circulations, El-Nino/Southern Oscillation, the Madden-Julian oscillation, and tropical cyclones.

Prerequisite(s): EAS 3330; EAS 4440
Attributes: Natural Science Req (A&S)

EAS 4480 - Introduction to Remote Sensing
Credit(s): 3 Credits
Fundamental knowledge on the physics of remote sensing, photography, multispectral, hyperspectral, thermal imaging and RADAR and LIDAR principles are reviewed in lectures while lab assignments cover image processing, environmental modeling & analysis. Course objective is to demonstrate present applications of RS in environmental sciences with software training in ENVI+IDL, SARscape.

Attributes: Natural Science Req (A&S)

EAS 4490 - Microwave Remote Sensing: SAR Principles, Data Processing and Applications
Credit(s): 3 Credits
This course introduces SAR principles, data sources, data processing chain, and SAR applications in measuring earthquake deformation, land subsidence and building sinking, and tree height estimation, DEM generation, and monitoring environmental issues. These different topics will be covered through a series of stepwise exercises involving different kinds of SAR data.

Attributes: Natural Science Req (A&S)

EAS 4500 - Scientific Communications
Credit(s): 3 Credits
Lecture two hours per week. Principles of effective writing for a scientific audience; the structure of reports, papers and communications; techniques for the organization and delivery of results for oral, written and poster presentations. Spring or Fall semester.

Restrictions:
Enrollment is limited to students with a major in Environmental Science, Geophysics, Geology or Meteorology.

Attributes: Natural Science Req (A&S)

EAS 4510 - Principles of Seismic Exploration
Credit(s): 2 Credits
It is also recommended that EAS-4520 be taken concurrently. Exploration for natural resources using seismic waves; refraction and reflection methods and interpretation; elementary seismic data processing. Spring or Fall semester.

Attributes: Natural Science Req (A&S)

EAS 4530 - Principles of Electrical Exploration
Credit(s): 3 Credits
Electrical properties of earth materials, natural electrical fields, electrical fields in layered media, electrical methods of exploration. Spring or Fall semester.

Attributes: Natural Science Req (A&S)

EAS 4550 - Principles of Gravity and Magnetic Exploration
Credit(s): 3 Credits
Earth's gravity and magnetic fields, density and magnetic properties of rocks, gravity and magnetic methods of exploration. Spring or Fall semester.

Prerequisite(s): MATH 3230; PHYS 4210
Attributes: Natural Science Req (A&S)

EAS 4560 - Interferometric Synthetic Aperture Radar
Credit(s): 3 Credits
This course focuses on providing application oriented forum on InSAR for geoscientists. Principles of InSAR, DInSAR, timeSAR are introduced through hands-on lab work on measuring earthquake deformation, volcanic unrest, land subsidence due to extraction of groundwater, oil, gas, and coal mining using both commercial and open-source software tools.

Attributes: Natural Science Req (A&S)
EAS 4600 - Introduction to the Physics of the Solid Earth
Credit(s): 3 Credits
Physical properties and processes in the earth's interior structure, composition, heat flow, rheological processes, and evolution. Spring or Fall semester.
Prerequisite(s): (1 Course from MATH 244-4999 or Math Waiver per Advisor with a minimum score of 25%) (PHYS 1310 or PHYS 1610)
Attributes: Natural Science Req (A&S)

EAS 4620 - Introduction to Earthquake Seismology
Credit(s): 3 Credits
Lecture two hours, laboratory two hours per week. Causes and effects of earthquakes; parameters of seismic foci determinable from seismographic records; seismic geography and structure of the earth inferred from seismic data. Laboratory exercises with problems of record interpretation. Spring or Fall semester.
Attributes: Natural Science Req (A&S)

EAS 4650 - Weather Forecasting
Credit(s): 3 Credits
The development of skills to assess the current and future states of the atmosphere. Efforts are focused on proper weather briefing techniques and on producing forecasts for short term, extended, fire, and aviation weather. There will also be post-evaluation of forecasts.
Prerequisite(s): EAS 4220* and EAS 4440* * Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4680 - Mesoscale Meteorology
Credit(s): 3 Credits
Theoretical examination of the dynamical and thermodynamical processes associated with mesoscale meteorological phenomena. Topics include vorticity and divergence tendencies, supercell thunderstorms, quasi-linear convective systems, mesoscale convective vortexes, and downbursts.
Prerequisite(s): EAS 4450
Attributes: Natural Science Req (A&S)

EAS 4700 - Theory of Vibrating Systems
Credit(s): 3 Credits
Single and multiple degree of freedom oscillators. Theoretical and practical study of ground vibrations caused by earthquakes, machinery, quarry blasts, and other disturbances; effects of these vibrations on buildings and other structures. Offered Spring or Fall semester.
Prerequisite(s): MATH 3550
Attributes: Natural Science Req (A&S)

EAS 4720 - Seismological Instrumentation
Credit(s): 3 Credits
Lecture two hours, laboratory one hour per week. Physical principles underlying design and operation of the seismograph. Selection of the seismograph for specific problems; calibration and response characteristics. Laboratory practice in assembly, installation, and calibration of modern seismographs. Offered Spring or Fall semester.
Prerequisite(s): MATH 3550
Attributes: Natural Science Req (A&S)

EAS 4780 - COMET Modules
Credit(s): 1-3 Credits (Repeatable for credit)
This is a self study, self-paced course which utilizes the computer-based learning (CBL) modules on the laser video disk and CD-ROM, purchased from the Cooperative Program for Operational Meteorology, Education, and Training (COMET). Credits earned are based upon the number of modules chosen. The modules vary in length and include frequent quizzes and lab exercises which are computer evaluated. The student will contract to finish a certain number of modules during the term, and complete them on the department PC which runs the modules. The completion of the modules will be monitored by the student's advisor. Offered Fall or Spring semester.
Prerequisite(s): (EAS 4200*, EAS 4220*, and EAS 4440*) * Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

EAS 4880 - Senior Inquiry Research Project
Credit(s): 3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

EAS 4910 - Internship
Credit(s): 1-6 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

EAS 4930 - Special Topics
Credit(s): 1-4 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

EAS 4980 - Advanced Independent Study
Credit(s): 1-6 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

EAS 5010 - Introduction to GIS
Credit(s): 3 Credits
This class introduces concepts, science and theory of GIS with hands-on experiences. After successful completion of the course, students will be able to demonstrate fundamental techniques of geospatial analysis and mapping. Students may only apply credits towards their graduation requirements from one of the following courses: EAS 5010, BIOL 5170, IAS 5170 or SOC 5650.

EAS 5020 - Intermediate GIS
Credit(s): 3 Credits
This course covers intermediate and advanced topics in GIS including remote sensing for GIS, geospatial statistics and GIS biogeography. Each part is instructed by a professor specialized in the particular area. Students may only apply credits towards their graduation requirements from one of the following courses: EAS 5020, BIOL 5170, IAS 5180 or SOC 5660.

EAS 5030 - Geospatial Methods in Environmental Studies
Credit(s): 3 Credits
For students and professionals in Environmental Sciences, this course explores an integrated GIS and remote sensing approach to solve real-world environmental problems. Through hands-on projects, the course will also prepare students for today's growing business needs in innovative server-based GIS solutions, relational databases and web mapping in an enterprise environment.

EAS 5040 - Potential Theory
Credit(s): 3 Credits
Laplace's equation and the Dirichlet, Neumann and mixed boundary value problems. Methods of solution studied include separation of variables, conformal mapping, and integral transforms. Offered every Fall semester.
EAS 5060 - Physics of Solid Earth
Credit(s): 3 Credits
Structure and processes in the earth's interior; composition, heat flow, rheology, and geomagnetism. Offer as needed.
Prerequisite(s): MATH 2530

EAS 5070 - Advanced Coastal Processes
Credit(s): 3 Credits
Origin and evolution of coastal landforms and the physical processes responsible for their creation and modification, including: geomorphic classification of coasts, sediment characteristics, sea level, tides, waves, nearshore currents, longshore and cross-shore sediment transport, beach and nearshore morphology, barrier island systems, salt marshes, cliffed coasts, and effects of climate change on coastal environments.

EAS 5080 - Dynamics of the Atmosphere
Credit(s): 3 Credits
Dynamic core course of the graduate program. Comprehensive treatments of dynamic processes of the atmosphere on all spatial-temporal scales. Integrates dynamic aspects of atmosphere ranging from storm movement to general circulation. Topics include cloud-storm dynamics, mesoscale processes, large-scale dynamics, and global circulation.

EAS 5090 - Physics of the Atmosphere
Credit(s): 3 Credits
Physics core course of the graduate program. Comprehensive treatment of physical processes of the atmosphere on all spatial-temporal scales. Covers atmospheric processes ranging from eddy turbulence to general circulation. Topics include boundary layer turbulence, atmospheric radiation, cloud physics, numerical modeling.

EAS 5110 - Computing in Atmospheric Science
Credit(s): 2 or 3 Credits
This course includes practical experience carrying out numerical weather prediction and re-analysis; pre-processing of meteorological data to run computer models; and post-processing of model output for data visualization and analysis. During the course, students will develop skills with different computer languages and software packages for accomplishing these tasks.

EAS 5120 - Time Series Analysis in Geophysics
Credit(s): 3 Credits

EAS 5130 - Geotechnics
Credit(s): 3 Credits
Geologists and Environmental Scientists are faced with slope stability, rock and soil loss problems at one point or another in the professional work. These issues directly affect population and infrastructure, as well impacts negatively household, state and federal budgets. It is of paramount importance to understand not only the behavior natural material under critical equilibrium or unstable conditions, and how they will react to induced disturbances, but also, the mechanisms to improve and resolve such conditions. This course presents the properties of geologic materials and general principles that govern the stability of rock and soil masses. In addition, it provides students with tools to characterize, assess and analyze unstable masses, and to provide solutions for their improvement, containment and stabilization.

EAS 5150 - Properties of Earth Materials
Credit(s): 3 Credits
This course gives a survey of the physical and chemical properties of geological materials. The course covers: physical properties of minerals and rocks; chemical properties of minerals and rocks; seismic and thermal parameters of the lithosphere and mantle; properties of surface fluids and loose aggregate materials. Normally offered every year.

EAS 5170 - Divergent & Convergent Margins
Credit(s): 3 Credits
This course in an in-depth, integrative examination into the geology and geophysics of divergent and convergent margins. Subject matter includes the physiography, petrology, geochemistry, sedimentology, seismic surveys, and seismology of margins. Laboratory exercises, take-home assignments, classroom presentations and paper are an integral part of the course. Offered every other year.

EAS 5180 - Seminar in Geoscience
Credit(s): 2 Credits (Repeatable for credit)
In-depth study of recent research developments in geophysics.

EAS 5190 - Numerical Method of Prediction
Credit(s): 3 Credits
Study of the concepts of dynamic meteorology underlying numerical weather prediction models, the development of the single and multi-level models and their applications. Climate modeling. Offered during the summer session.

EAS 5200 - Geophysical Data Processing
Credit(s): 3 Credits
Modern digital data processing methods used in geophysics, based on Fourier and Z transforms. Topics include correlation, spectral analysis, and digital filters, with application to earthquake seismology, seismic, gravity, and magnetic exploration. Offered occasionally.
Prerequisite(s): EAS 4510

EAS 5220 - Boundary Layer Meteorology
Credit(s): 3 Credits
Comprehensive treatment of the Navier Stokes equations - development and solutions. Discussions of the three-dimensional modeling of the planetary boundary layer, the accompanying turbulence theory, and marine boundary layers. Offered every other Fall semester.

EAS 5230 - Tropical Meteorology
Credit(s): 3 Credits
Study of the fundamentals of circulation in the tropics, the importance of sea-air interaction, convection processes, monsoons, energy transfer and hurricanes. Offered every Spring semester.
EAS 5250 - Diagnosis & Prediction of Severe Storms
Credit(s): 3 Credits
Emphasis is placed on the development of short term (1-6 hours) forecasting techniques for severe storms. Topics include: instability mechanisms, severe storm structure and types, sounding analysis, low level jet inversion wind maxima, jet streak coupling, boundary layer thermal gradients, satellite/radar signatures of severe convection, flash flood forecasting and statistical guidance. Case studies of severe weather are discussed in class. Offered every other spring semester.

EAS 5260 - Synoptic & Dynamic Meteorology of the Jet Stream
Credit(s): 3 Credits
The dynamic concepts useful in jet stream meteorology; methods of measuring various parameters in the free atmosphere; discussion of laboratory and computing models as they relate to planetary jet streams. Offered occasionally.

EAS 5270 - Meteorology of Severe Storms
Credit(s): 3 Credits
Comprehensive treatment of the synoptic and mesoscale meteorological aspects and the mechanics of thunderstorms, tornadoes and downbursts. Offered every other Fall semester.

EAS 5280 - Environmental Geochemistry
Credit(s): 3 Credits
Introduction to the geochemistry of natural waters and the processes that alter their composition. Key principles of aqueous geochemistry are introduced and then used to describe the main controls on pristine and polluted soil, surface water, and groundwater environments. Topics include acids and bases, mineral solubility, carbonate chemistry, chemical speciation, redox reactions, adsorption and ion exchange, and global geochemical cycles. Offered in spring.

EAS 5290 - Mesometeorology
Credit(s): 3 Credits
Comprehensive synoptic and theoretical discussion of mesoscale meteorological events, thermally induced circulations and nonconsecutive circulations. Offered occasionally.

EAS 5300 - Seminar in Atmospheric Science
Credit(s): 0-1 Credits (Repeatable for credit)
Student will choose paper(s) from recent literature related to a topic assigned. After thorough study of the papers, students present their finding around the papers in the class. Peers students, instructor, and participating professor provide written critical comments. Presenting students response to the comments and indicate how he/she would improve their presentation based on the feedback.

EAS 5320 - Climate Change and Variability
Credit(s): 3 Credits
The analysis of the fundamental principles and techniques used for climate change detection, attribution, and projection. Topics include: climate system interplay, natural variability and likely anthropogenic influences of the climate system, and climate change scenarios and modeling. Offered occasionally.

EAS 5330 - Communicating in Research
Credit(s): 2 Credits
In common with EAS 5300, students and faculty will choose papers from recent literature relevant to research topics in the department. Individual students will be assigned to present the papers to the group and lead group discussions. "Computer Supported Peer Review in Education" will be used to collect feedback and grades from entire class. The presenters will evaluate the feedback received ("back-evaluations"). This will provide a mechanism for enhanced critical evaluation with a view to improving students’ communication and review skills. (Offered every Fall)

EAS 5340 - Cloud Physics
Credit(s): 3 Credits
Microphysics of warm and cold clouds, including diffusion, collision-coalescence, riming and aggregate processes. Offered occasionally.

EAS 5360 - Principles of Radiative Transference
Credit(s): 3 Credits
Concepts of transfer of solar and terrestrial radiation in the earth-atmosphere system studied on the basis of an introduction to precision radiometry. Topics include atmospheric turbidity, radiative transfer in cloudless and cloudy atmospheres, heat budget, role of radiative energy exchange in weather processes. Offered every other Fall semester.

EAS 5380 - Stat Methods in Meteorology
Credit(s): 3 Credits
This course will introduce the students to the statistical methods used in the analysis of observational and numerical model data. The topics include a review of standard statistical analysis of location and spread in data, as well as, hypothesis testing, field significance, simple stochastic models, and advanced data analysis techniques including principle component analysis. The students will also be introduced to Monte Carlo techniques as another way to access statistical significance.

EAS 5390 - Seminar in Seismology
Credit(s): 2 Credits
In depth study of recent research developments or specific topics not covered in formal courses.

EAS 5400 - Continuum Mechanics in Wave Propagation
Credit(s): 3 Credits
Concepts of continua, tensor analysis, stress deformation, and elasticity will be covered in detail. Other constitutive relations used to describe deformation in real materials such as plasticity, viscoelasticity, materials testing, thermoelasticity, and several classical boundary value problems relevant to the geosciences will be presented. Offered every Spring semester.

EAS 5410 - Hydrology
Credit(s): 3 Credits
This course is an introduction to the principles that govern precipitation, evaporation, infiltration, runoff generation, flow, and geochemistry in freshwater environments. The course focuses on the characteristics of surface water and groundwater, with an emphasis on the connection between these systems as well as their temporal and spatial variability. Basic equations of flow and transport will be covered. The course overviews anthropogenic impacts on freshwater environments and efforts to remediate damaged systems. Prerequisites: None.

EAS 5420 - Advanced Structural Geology
Credit(s): 2 Credits
This course gives a survey of microstructures and mesoscale structures that are important for understanding and deciphering the deformation history of deformed rocks. Offered every other year.

Prerequisite(s): EAS 4300

EAS 5430 - Isotope Geochemistry
Credit(s): 2 Credits
This course gives a survey of radiogenic and stable isotopic systems that are frequently used in the geosciences. The course covers: principles of isotopic decay; geochronology with emphasis on K/Ar, Rb/Sr, and U/Pb systems; thermochronology; and stable isotope geochemistry. Offered every other year.
EAS 5440 - Advanced Sedimentary Geology  
**Credit(s): 2 Credits**  
A survey of clastic depositional systems and their facies, ranging from terrestrial systems to marginal-marine and deep-marine systems. Topics will include the occurrence of depositional systems within a sequence stratigraphic framework, and the storage and migration of hydrocarbons and groundwater in these depositional systems. Offered every other year.

EAS 5450 - Advanced Petrology  
**Credit(s): 2 Credits**  
An introduction to modern geochemical theory and methods and their application to the igneous and metamorphic rocks. Emphasis will be on the major and trace element geochemistry of crust and mantle rocks, and the use of geothermometers and geobarometers in deciphering the pressure-temperature histories of rocks. Offered every other year.

EAS 5460 - Geodynamics  
**Credit(s): 3 Credits**  
Course focuses on the poorly understood, and hence controversial, large-scale processes and events that have affected the gross structure and chemistry of the Earth's mantle, crust, atmosphere, and biosphere. Offered occasionally.

EAS 5470 - Turbulence  
**Credit(s): 3 Credits**  
The main theoretical concepts of atmospheric turbulence, diffusion, evaporation and wind structure in the atmospheric boundary layer. Offered every other Spring semester.

EAS 5480 - Introduction to Remote Sensing  
**Credit(s): 3 Credits**  
EAS 5490 - Microwave Remote Sensing: SAR principles, data processing and Applications  
**Credit(s): 3 Credits**  
This course introduces SAR principles, data sources, data processing chain, and SAR applications in measuring earthquake deformation, land subsidence and building sinking, and tree height estimation, DEM generation, and monitoring environmental issues. These different topics will be covered through a series of stepwise exercises involving different kinds of SAR data.

EAS 5500 - Scientific Communication  
**Credit(s): 3 Credits**  
Principles of effective writing for a scientific audience; the structure of reports, papers and communications; techniques for the organization and delivery of results for written, oral, and poster presentations.

EAS 5510 - Seismic Exploration Methods  
**Credit(s): 2 Credits**  
Exploration for natural resources using seismic waves; refraction and reflection methods and interpretation; elementary seismic data processing. Offered alternate years.

EAS 5520 - Seismic Exploration Lab  
**Credit(s): 1 Credit**  
Laboratory and field problems two hours per week. Collection and interpretation of seismic data; application of the computer to data interpretation. Offered in alternate years.

EAS 5540 - Potential and Electrical Exploration Methods  
**Credit(s): 3 Credits**  
Earth's gravity, magnetic and natural electrical and electromagnetic fields; density and magnetic and electrical properties of rocks; gravity, magnetic and electrical methods of exploration. Offered occasionally.

**Prerequisite(s):** MATH 3230; PHYS 4210

EAS 5560 - Interferometric Synthetic Aperture Radar  
**Credit(s): 3 Credits**  
This course focuses on providing application oriented forum on InSAR for geoscientists. Principles of InSAR, DInSAR, timeSAR are introduced through hands-on lab work on measuring earthquake deformation, volcanic unrest, land subsidence due to extraction of groundwater, oil, gas, and coal mining using both commercial and open-source software tools.

EAS 5600 - Atmospheric Chemistry  
**Credit(s): 3 Credits**  
Focuses on chemical and physical processes that determine the composition of the troposphere and stratosphere. Emphasis is on regional and global-scale processes and the impact of global warming and climate change on these processes.

EAS 5610 - Satellite Meteorology  
**Credit(s): 3 Credits**  
Satellite instrumentation; rectification, analysis and interpretation of satellite radiation measurements and cloud photographs; use of these data in the solution of specific meteorological problems. Offered every other Fall semester.

EAS 5620 - Introduction to Earthquake Seismology  
**Credit(s): 3 Credits**  
Causes and effects of earthquakes; parameters of seismic foci determinable from seismographic records; seismic geography and structure of the earth inferred from seismic data. Students need trigonometry and calculus and ability to program in MATLAB.

EAS 5650 - Radar Meteorology  
**Credit(s): 3 Credits**  

EAS 5700 - Convection in the Atmosphere  
**Credit(s): 3 Credits**  
Derivation of consistent equations to study thermal convective phenomena in the atmosphere, the interaction between convective elements and their environments, simulation of thunderstorms and arrangement of convection. Offered every other Fall semester.

EAS 5720 - Seismological Instrumentation  
**Credit(s): 3 Credits**  
Lecture two hours, laboratory one hour per week. Physical principles underlying design and operation of the seismograph. Selection of the seismograph for specific problems; calibration and response characteristics. Laboratory practice in assembly, installation and calibration of modern seismographs. Offered in alternate years.

EAS 5750 - Land-Atmosphere Interaction  
**Credit(s): 3 Credits**  
Principal physical and dynamic processes governing exchanges of mass and energy among soil, vegetation, bodies of water, and overlying atmosphere: precipitation, evapotranspiration, infiltration, snowmelt, and surface-runoff. Parameterization of these processes in numerical models over large tempo-spatial scales.
EAS 5800 - Synoptic and Mesoscale Circulation  
Credit(s): 3 Credits  
This course will cover topics that are critical for understanding both large- and small-scale circulations in the atmosphere. Emphasis will be placed on developing a deep conceptual understanding and in-depth mathematical treatment of 'balanced' vertical motions, quasi-geostrophic theory, the Petterssen's development equation, the Sawyer-Eliassen ageostrophic circulation equations, jet streak dynamics, tropopause undulations, and isentropic potential vorticity concepts.

EAS 5890 - Research Seminar  
Credit(s): 1-3 Credits

EAS 5900 - Geoscience Journal Club  
Credit(s): 0-1 Credits (Repeatable for credit)  
Registration in Journal Club is required every semester.

EAS 5920 - Geoscience Journal Club  
Credit(s): 1 Credit (Repeatable for credit)  
Registration in Journal Club is required every semester.

EAS 5930 - Special Topics  
Credit(s): 3 Credits (Repeatable for credit)

EAS 5970 - Research Topics  
Credit(s): 1-3 Credits

EAS 5980 - Graduate Reading Course  
Credit(s): 1-3 Credits (Repeatable for credit)  
A critical evaluation of literature concerning a specific problem.

EAS 5981 - Independent Study  
Credit(s): 1-3 Credits (Repeatable for credit)  
The Master's student undertakes an independent study of a chosen topic with the approval of sponsoring professor and the Program Director.

EAS 5990 - Thesis Research  
Credit(s): 0-6 Credits (Repeatable for credit)

EAS 6100 - Advanced Topics in Solid Earth Geophysics  
Credit(s): 3 Credits  
Physics of the earth's interior; emphasis on current research problems. Topics from seismology, geology, heat flow, geomagnetism, and tectonophysics. Offered occasionally.

EAS 6190 - Advanced Seminar in Geophysics  
Credit(s): 2 Credits  
In-depth analysis of topics for Ph.D. students. Offered occasionally.

EAS 6200 - Advanced Geomagnetism  
Credit(s): 3 Credits  
Lecture course on spherical harmonic analysis of the main magnetic field of the earth and of transient magnetic variations. Processes in the ionosphere relating to geomagnetism; topics in paleomagnetism and magnetohydrodynamics included. Offered occasionally.

Prerequisite(s): EAS 4510

EAS 6310 - Advanced Seismology I  
Credit(s): 3 Credits  
In common with EAS 5300, students and faculty will choose papers from recent literature relevant to research topics in the department. Individual students will be assigned to present the papers to the group and lead group discussions. "Computer Supported Peer Review in Education" will be used to collect feedback and grades from entire class. The presenters will evaluate the feedback received ("back-evaluations"). This will provide a mechanism for enhanced critical evaluation with a view to improving student's communication and review skills.

EAS 6320 - Advanced Seismology II  
Credit(s): 3 Credits  
Wave propagation in a spherical earth is the focus of this course. Wave equation solutions using free oscillations, WKBJ ray theory and surface waves are developed. Modern techniques for wave propagation in an earth with laterally varying media will be addressed. Theory for the inversion of seismic observations, e.g. free oscillation frequencies, surface wave dispersion or body wave travel times, for earth structure will be developed. Offered every Spring semester.

Prerequisite(s): EAS 6310

EAS 6480 - Gen Circulation of Atmosphere  
Credit(s): 3 Credits

EAS 6590 - Numeric Methods of Atmospheric Sciences  
Credit(s): 3 Credits

EAS 6900 - Geoscience Journal Club  
Credit(s): 1 Credit (Repeatable for credit)  
Registration in Journal Club is required every semester.

EAS 6920 - Geoscience Journal Club  
Credit(s): 1 Credit (Repeatable for credit)  
Registration in Journal Club is required every semester.

EAS 6930 - Special Topics  
Credit(s): 1-3 Credits

EAS 6970 - Research Topics  
Credit(s): 1-3 Credits

EAS 6980 - Graduate Reading Course  
Credit(s): 1-3 Credits (Repeatable for credit)

EAS 6981 - Independent Study  
Credit(s): 1-3 Credits (Repeatable for credit)  
The student undertakes an independent study of a chosen topic with the approval of a sponsoring professor and the Program Director.

EAS 6990 - Dissertation Research  
Credit(s): 0-6 Credits (Repeatable for credit)