

# EARTH AND ATMOSPHERIC SCIENCES (EAS)

## EAS 1030 - Earth's Dynamic Environment II

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:** International Studies, Natural Science Req (A&S), UUC:Natural & Applied Science

## EAS 1070 - Understanding the Weather

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

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.

**Attributes:** CVNG Science Elec w/ Lab, International Studies, International Studies-Health, Natural Science Req (A&S)

## EAS 1081 - Introduction to Environmental Science Laboratory

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:** CVNG Science Elec w/ Lab, Natural Science Req (A&S)

## EAS 1090 - Climate Change

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.

**Attributes:** Global Citizenship (CAS), International Studies, International Studies-Health, Natural Science Req (A&S), UUC:Natural & Applied Science

## EAS 1170 - Physical Geography

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.

**Attributes:** International Studies, International Studies-Health, Natural Science Req (A&S), UUC:Natural & Applied Science

## EAS 1310 - Water-Our Precious Resource

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:** International Studies, International Studies-Health, Natural Science Req (A&S)

## EAS 1340 - Is Earth Unique

3 Credits

**Attributes:** Natural Science Req (A&S)

## EAS 1350 - Real Meteorology

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 1420 - Introduction to Atmospheric Science

3 Credits

This course is one of three courses that can be taken independently and that cover the interactions between land, water, air, and life with special emphasis on humans and the environment. EAS 1430 focuses on the solid earth and surface environments; EAS 1450 focuses on the oceans, and EAS 1420 focuses on the atmosphere. All satisfy the Science Core requirement.

**Attributes:** CVNG Science Elec w/ Lab, Natural Science Req (A&S), UUC:Natural & Applied Science

## EAS 1425 - Introduction to Atmospheric Science Lab

1 Credit

This course introduces students to the data and analysis techniques in atmospheric science. Topics include the analysis of surface and upper-air data, the analysis of atmospheric stability through vertical profiles of temperature and moisture, and the horizontal and vertical analysis of winds. (Offered in Fall)

**Corequisite(s):** EAS 1420

**Attributes:** CVNG Science Elec w/ Lab, Natural Science Req (A&S)

**EAS 1430 - Introduction to the Solid Earth**

3 Credits

This course is one of three courses that can be taken independently and that cover the interactions between land, water, air, and life with special emphasis on humans and the environment. EAS 1430 focuses on the solid earth and surface environments; EAS 1450 focuses on the oceans, and EAS 1420 focuses on the atmosphere. All satisfy the Science Core requirement.

**Attributes:** CVNG Science Elec w/ Lab, Natural Science Req (A&S), UUC:Natural & Applied Science

**EAS 1435 - Introduction to the Solid Earth Lab**

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.

**Corequisite(s):** EAS 1430

**Attributes:** Natural Science Req (A&S)

**EAS 1450 - Introduction to Oceanography**

3 Credits

This course is one of three courses that can be taken independently and that cover the interactions between land, water, air, and life with special emphasis on humans and the environment. EAS 1430 focuses on the solid earth and surface environments; EAS 1450 focuses on the oceans, and EAS 1420 focuses on the atmosphere. All satisfy the Science Core requirement.

**Attributes:** CVNG Science Elec w/ Lab, Natural Science Req (A&S), UUC:Natural & Applied Science

**EAS 1455 - Intro to Oceanography Lab**

1 Credit

Laboratory meets for two hours per week and is designed to complement EAS-1450, Introduction to Oceanography. The lab is intended primarily for science majors with a strong interest in oceanography and earth systems. Course is designed to illustrate topics covered in lecture, including: plate tectonics, ocean sediments, physical and chemical properties of water, ocean currents, waves, tides, ocean environments and chart reading and navigation. (Offered in Spring)

**Corequisite(s):** EAS 1450

**Attributes:** CVNG Science Elec w/ Lab, Natural Science Req (A&S)

**EAS 1600 - Sustainable Energy**

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 1700 - Weather Briefing**

1 Credit

This course introduces students to the skills and techniques of delivering a summary of current and future weather conditions (i.e., weather briefing). (Offered in Spring)

**Attributes:** Natural Science Req (A&S)

**EAS 1800 - Introduction to Earthquakes**

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**

1-3 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)

**EAS 1980 - Independent Study**

1-3 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)

**EAS 2200 - Mineralogy**

3 Credits

Lecture three hours per week. Crystallography, physical, chemical, and descriptive mineralogy.

**Prerequisite(s):** EAS 1430; CHEM 1110\*

\* Concurrent enrollment allowed.

**Corequisite(s):** EAS 2205

**Attributes:** CVNG Science Elec w/ Lab, Natural Science Req (A&S)

**EAS 2205 - Mineralogy Lab**

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:** CVNG Science Elec w/ Lab, Natural Science Req (A&S)

**EAS 2400 - Field Techniques in the Geosciences**

3 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.

**Prerequisite(s):** EAS 1430; EAS 1435

**Attributes:** Natural Science Req (A&S)

**EAS 2420 - Computer Applications in Earth Science**

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**

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):** EAS 1420; PHYS 1610\*

\* Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 2450 - Communicating in Science**

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.

**Prerequisite(s):** (EAS 1420, EAS 1430, or EAS 1450)

**Attributes:** Natural Science Req (A&S)

**EAS 2480 - Foundations of Environmental Science**

3 Credits

This course provides a foundation 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. This course will prepare students for an undergraduate major in Environmental Science. (Offered in Spring)

**Prerequisite(s):** (BIOL 1240 and BIOL 1245); (CHEM 1110 and CHEM 1115); (EAS 1420, EAS 1430, or EAS 1450)

**Corequisite(s):** EAS 2485

**Attributes:** Natural Science Req (A&S)

**EAS 2485 - Foundations of Environmental Science Lab**

1 Credit

This is the lab course that accompanies EAS-2480. (Offered in Spring)

**Prerequisite(s):** (BIOL 1240 and BIOL 1245); (CHEM 1110 and CHEM 1115); (EAS 1420, EAS 1430, or EAS 1450)

**Corequisite(s):** EAS 2480

**Attributes:** Natural Science Req (A&S)

**EAS 2530 - Climate and Climate Change**

3 Credits

Introduction to the fundamental processes which effect 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; (MATH 1510 or SLUMP with a minimum score of 1520); (PHYS 1310 or PHYS 1610)

**Attributes:** International Studies, International Studies-Health, Natural Science Req (A&S)

**EAS 2700 - Sustainable Development in Latin America**

3 Credits

Provides an introduction to the analysis of Latin American environmental problems linked to the sustainable development possibilities of the region.

**Attributes:** IAS-Latin American Studies, International Studies, International Studies-Latin Am, Urban-Cities Society & Justice, UUC:Natural & Applied Science

**EAS 2800 - Radar Meteorology**

3 Credits

This course introduces students to the principles of weather radars and the interpretation of radar information of meteorological phenomena. Topics include the principles of radar reflectivity, Doppler velocity, and dual polarization radar. The course will also examine radar signatures of various meteorological phenomena. (Offered every other year in Fall)

**Prerequisite(s):** EAS 1420

**Attributes:** Natural Science Req (A&S)

**EAS 2820 - Satellite Remote Sensing**

3 Credits

This course introduces students to the principles of satellite meteorology. Topics include the principles of remote sensing, satellite orbits, and satellite image analysis of various meteorological phenomena. (Offered every other year in Fall)

**Attributes:** Natural Science Req (A&S)

**EAS 2930 - Special Topics**

3 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)

**EAS 2980 - Independent Study**

1-3 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)

**EAS 3100 - Environmental Issues**

3 Credits

An examination of current and historical environmental issues from scientific, economic, social, and political perspectives, with an emphasis on energy, food, water, public health, land use, and climate change.

**Prerequisite(s):** EAS 2480; EAS 2485

**Attributes:** International Studies, International Studies-Health, Natural Science Req (A&S), Sustainability Focused

**EAS 3150 - Broadcast Meteorology**

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 2440

**Attributes:** Natural Science Req (A&S)

**EAS 3200 - Earth Materials**

3 Credits

This course looks at the properties of solid Earth materials: minerals, mineraloids, and rocks. In addition, it explores the various origins of these Earth materials and their relevance to environmental science.

**Prerequisite(s):** EAS 1430

**EAS 3330 - Atmospheric Thermodynamics**

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<sup>\*</sup>; (MATH 1520 or SLUMP with a minimum score of 2530)

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 3340 - Physical Meteorology**

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<sup>\*</sup>; MATH 2530

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 3500 - Numerical Modeling Applications**

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**Attributes:** Natural Science Req (A&S)**EAS 3700 - Mesoanalysis and Severe Storms**

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 3780 - COMET Modules**

1-3 Credits (Repeatable up to 3 credits)

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 2440**Attributes:** Natural Science Req (A&S)**EAS 3910 - Internship**

1-6 Credits (Repeatable for credit)

**Prerequisite(s):** (CORE 1000 or UIS with a minimum score of S); CORE 1500\*

\* Concurrent enrollment allowed.

**Attributes:** UUC:Reflection-in-Action**EAS 3930 - Special Topics**

3 Credits (Repeatable for credit)

**EAS 3980 - Independent Study**

1-3 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)**EAS 4010 - Earth Critical Resources**

3 Credits

This course explores the types, distribution, and origins of critical Earth resources that provide the essential material ingredients of a modern society such as various metallic and non-metallic resources as well as energy resources. The course also looks at the environmental issues related to extraction (mining) and processing of those resources.

**Prerequisite(s):** EAS 1430**EAS 4030 - Elements of Air Pollution**

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 2530**Attributes:** Natural Science Req (A&S)**EAS 4050 - Petrology**

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**

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 4100 - Surface Processes**

3 Credits

Overview of physical and chemical processes and landform development in modern and ancient surface environments. Field trip required.

**Prerequisite(s):** EAS 1430**Corequisite(s):** EAS 4105**Attributes:** Natural Science Req (A&S)**EAS 4105 - Surface Processes Laboratory**

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 4110\*; EAS 2400

\* Concurrent enrollment allowed.

**Corequisite(s):** EAS 4100**Attributes:** Natural Science Req (A&S)**EAS 4140 - Soil Science**

3 Credits

This course is an introduction to soil formation and the fundamental properties of soils. The class examines the basic chemical, physical, and biological properties of soils and how they interact to affect important processes such as soil-water-plant relations, nutrient cycling, and erosion. The class explores how soil management affects important environmental concerns including water quality, global greenhouse gasses, and ecosystem services. (Offered even years in Fall)

**Prerequisite(s):** CHEM 1110; EAS 1430**Attributes:** Natural Science Req (A&S)**EAS 4160 - Exploration Seismology**

0 or 3 Credits

The objective of this course is to introduce students the basics of seismology as a tool for exploring the inner structure of the earth. Students will also learn and apply elementary seismic data analysis techniques. Students who have taken EAS 4510/4520 will not be able to earn credit for EAS 4160. The material is the same between the courses.



**EAS 4200 - Synoptic Meteorology I**

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 3330; PHYS 1630<sup>\*</sup>; MATH 2530<sup>\*</sup>

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 4210 - Divergent & Convergent Margins**

3 Credits

The objective of this course is to introduce students to modern plate tectonics, the characteristics of various plate settings, and the evidence supporting the theory. Students should become familiar with classic instructive plate tectonic settings on Earth. Knowledge of terms associated with plate tectonics and the ability and skill to read and interpret scientific papers, maps, figures, and data associated with plate tectonics is also expected. (Offered every other year in Fall)

**Attributes:** Natural Science Req (A&S)

**EAS 4220 - Synoptic Meteorology II**

3 Credits

Continuation of the laboratory study began 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

**Attributes:** Natural Science Req (A&S)

**EAS 4280 - Environmental Geochemistry**

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):** EAS 1430; EAS 1450; CHEM 1110; CHEM 1120

**Attributes:** Natural Science Req (A&S)

**EAS 4300 - Structural Geology**

3 Credits

Lecture three hours per week. Description 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 2400; (PHYS 1310 or PHYS 1610)

**Attributes:** Natural Science Req (A&S)

**EAS 4305 - Structural Geology Lab**

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.

**Attributes:** Natural Science Req (A&S)

**EAS 4310 - Structural Geology Laboratory**

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<sup>\*</sup>

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 4370 - Earth Dynamics**

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 1430; EAS 4300; (PHYS 1310 or PHYS 1610); (MATH 1510 or SLUMP with a minimum score of 1520)

**Attributes:** Natural Science Req (A&S)

**EAS 4410 - Hydrology**

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 1420; EAS 1430; EAS 1450; (MATH 1510 or SLUMP with a minimum score of 1520)

**Corequisite(s):** EAS 4415

**Attributes:** Natural Science Req (A&S)

**EAS 4415 - Hydrology Lab**

1 Credit

This laboratory course focuses on the collection and interpretation of hydrologic data. Students will learn both field and laboratory methods for surface water and groundwater resources.

**Corequisite(s):** EAS 4410

**Attributes:** Natural Science Req (A&S)

**EAS 4420 - Environment and Conservation in Africa**

3 Credits

This is an experiential mix of classroom and in-the-field or practical project course that will provide a view of the unique environment and conservation issues of continental Africa. It will help the student to come closer to comprehending this continent's reality. Students will develop a practical and realistic understanding of these complex issues through visits or research work related to some of Africa's environmental issues, Africa's protected areas, endangered species, and conservation projects. Key to the course is understanding the main environments and the interactions with the environmental issues related to Conservation.

**Prerequisite(s):** (EAS 1480<sup>\*</sup>, EAS 1080<sup>\*</sup>, BIOL 1340<sup>\*</sup>, EAS 3100<sup>\*</sup>, or BIOL 1200<sup>\*</sup>)

<sup>\*</sup> Concurrent enrollment allowed.

**EAS 4440 - Principles of Dynamic Meteorology I**

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.

**Prerequisite(s):** EAS 3330; PHYS 1630<sup>\*</sup>; MATH 2530<sup>\*</sup>

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 4450 - Principles of Dynamic Meteorology II**

3 Credits

Analytical investigation of atmospheric motions. Topics include: wave dynamics, sound waves, gravity waves, Rossby waves, geostrophic adjustment, baroclinic instability and isentropic potential vorticity.

**Prerequisite(s):** EAS 4440; MATH 3550<sup>\*</sup>

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 4470 - Elementary Tropical Meteorology**

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 4570 - Advanced Petrology**

3 Credits

The objective of this course is to introduce students to modern petrological techniques used in current research related to igneous/metamorphic rocks and tectonics/geodynamics. (Offered every other year in Fall)

**Prerequisite(s):** EAS 4410; EAS 4415

**Attributes:** Natural Science Req (A&S)

**EAS 4580 - Karst Hydrology**

3 Credits

This course is an introduction to karst landscapes and the principles that govern water flow through these systems. Course topics include karst landforms and processes, karst hydrologic principles, and sediment and solute transport in karst systems. (Offered every other year in Spring)

**Prerequisite(s):** EAS 4410; EAS 4415

**Attributes:** Natural Science Req (A&S)

**EAS 4590 - Environmental Geophysics**

3 Credits

The course introduces exploration of shallow subsurface using various geophysical methods of seismology, electrical resistivity, gravity, magnetic surveying, and ground-penetrating radar. Geologic, engineering, and environmental applications are emphasized throughout. Students will also get hands-on experiences of using different field instruments and processing data.

**Prerequisite(s):** MATH 1510; ((PHYS 1310 and PHYS 1320) or (PHYS 1610 and PHYS 1620))

**EAS 4620 - Introduction to Earthquake Seismology**

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.

**Prerequisite(s):** MATH 3550; PHYS 1610

**Attributes:** Natural Science Req (A&S)

**EAS 4650 - Weather Forecasting**

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<sup>\*</sup> and EAS 4440<sup>\*</sup>

<sup>\*</sup> Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S)

**EAS 4720 - Seismological Instrumentation**

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; PHYS 1610

**Attributes:** Natural Science Req (A&S)

**EAS 4810 - Sustainability and the Built Environment**

3 Credits

In 1983 the World Commission on Environment and Development (aka the Bruntland Commission) was convened to address the growing concerns about environmental degradation in response to escalating human development. From that came the call to switch the world policy focus toward a more sustainable future. Sustainable development is commonly described as efforts to meet the needs of our present generation while taking the needs of the future generation into consideration. The concept appears simple. Yet, the challenge lies in how we get there. What does it mean to meet the needs of our present generation without compromising the future? How do we define those needs? In this course we will wrestle with some challenging issues (e.g. the growing climate crisis, increasing global inequality) in the context of sustainability with the intent to guide student thinking about what a sustainable future might look like for individuals, communities, and the world.

**EAS 4880 - Senior Inquiry Research Project**

3 Credits (Repeatable for credit)

This course is a combination of independent study and class meetings. The student will integrate material learned throughout their degree program to examine a problem in their discipline.

**Restrictions:**

Enrollment limited to students in the Earth, Env, and Geospatial Sci department.

**Attributes:** Natural Science Req (A&S)

**EAS 4910 - Internship**

1-6 Credits (Repeatable for credit)

**Prerequisite(s):** (CORE 1000 or UIS with a minimum score of S); CORE 1500\*

\* Concurrent enrollment allowed.

**Attributes:** Natural Science Req (A&S), UUC:Reflection-in-Action**EAS 4930 - Special Topics**

1-4 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)**EAS 4939 - Collaborative Inquiry**

1-3 Credits (Repeatable for credit)

Collaborative Inquiry Special Topics.

**Prerequisite(s):** Minimum Earned Credits of 60; CORE 1500\* ; (CORE 1000 or UIS with a minimum score of S)

\* Concurrent enrollment allowed.

**Attributes:** UUC:Collaborative Inquiry**EAS 4980 - Advanced Independent Study**

1-6 Credits (Repeatable for credit)

**Attributes:** Natural Science Req (A&S)**EAS 5040 - Potential Theory**

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**

3 Credits

Structure and processes in the earth's interior; composition, heat flow, rheology, and geomagnetism. Offer as needed.

**Prerequisite(s):** MATH 2530**EAS 5080 - Dynamics of the Atmosphere**

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**

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**

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**

3 Credits

Fourier transform, Fourier series, discrete Fourier transform, fast Fourier transform, digital filtering. Applications to Geophysics. Offered occasionally.

**EAS 5140 - Soil Science**

3 Credits

This course is an introduction to soil formation and the fundamental properties of soils. The class examines the basic chemical, physical, and biological properties of soils and how they interact to affect important processes such as soil-water-plant relations, nutrient cycling, and erosion. The class explores how soil management affects important environmental concerns including water quality, global greenhouse gasses, and ecosystem services.

**Attributes:** Natural Science Req (A&S)**EAS 5170 - Divergent & Convergent Margins**

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.

**Prerequisite(s):** EAS 4370**EAS 5180 - Trans Margins & Plate Interior**

3 Credits

This course in an in-depth, integrative examination into the geology and geophysics of transform margins and plate interiors. Subject matter includes the physiography, petrology, geochemistry, sedimentology, seismic surveys, and seismology of margins and plate interiors. Laboratory exercises, take-home assignments, classroom presentations and paper are an integral part of the course. Offered every other year.

**EAS 5190 - Seminar in Geoscience**

2 Credits (Repeatable for credit)

In-depth study of recent research developments in geophysics.

**EAS 5270 - Meteorology of Severe Storms**

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**

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 5300 - Seminar in Atmospheric Science**

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 5330 - Communicating in Research**

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**

3 Credits

Microphysics of warm and cold clouds, including diffusion, collision-coalescence, riming and aggregate processes. Offered occasionally.

**EAS 5360 - Principles of Radiative Transference**

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 - Statistical Methods in Meteorology**

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**

2 Credits

In depth study of recent research developments or specific topics not covered in formal courses.

**EAS 5400 - Continuum Mechanics in Wave Propagation**

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**

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.

**EAS 5415 - Hydrology Lab**

1 Credit

This lab course focuses on the collection and interpretation of hydrologic data. Students will learn both field and laboratory methods for surface water and groundwater resource analysis.

**Corequisite(s):** EAS 5410

**EAS 5450 - Advanced Petrology**

3 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**

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 5500 - Scientific Communication**

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**

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**

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 5530 - Geophysics Inverse Theory**

3 Credits

This is an introductory course to geophysics inverse theory. It starts with a general background of inverse problems, data error, and solution uncertainties. The main part of the course is on discrete, linear inverse problem with Gaussian statistics, its solution, uncertainty, and resolution. Non-Gaussian, non-linear, and continuous inverse problems are also discussed. (Offered even years in Fall)

**EAS 5580 - Karst Hydrology**

3 Credits

This course is an introduction to karst landscapes and the principles that govern water flow through these systems. Course topics include karst landforms and processes, karst hydrologic principles, and sediment and solute transport in karst systems.

**EAS 5600 - Atmospheric Chemistry**

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 5620 - Introduction to Earthquake Seismology**

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 5630 - Principles of Dynamic Meteorology I**

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. (Offered odd years in Fall)

**Restrictions:**

Enrollment limited to students in the Earth Atmospheric Sciences department.

**EAS 5640 - Principles of Dynamic Meteorology II**

3 Credits

Analytical investigation of atmospheric motions. Topics include: wave dynamics, sound waves, gravity waves, Rossby waves, geostrophic adjustment, baroclinic instability and isentropic potential vorticity. (Offered even years in Spring)

**Prerequisite(s):** EAS 5630 with a grade of C or higher

**Restrictions:**

Enrollment limited to students in the Earth Atmospheric Sciences department.

**EAS 5650 - Radar Meteorology**

3 Credits

Fundamentals of a pulsed Doppler and non-Doppler radar. Velocity and range folding. Doppler radar display and signature interpretation. Characteristics of convective storms and severe weather signatures. Offered every other Spring semester.

**EAS 5700 - Convection in the Atmosphere**

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**

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**

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 5900 - Geoscience Journal Club**

0-1 Credits (Repeatable for credit)

Registration in Journal Club is required every semester.

**EAS 5920 - Geoscience Journal Club**

1 Credit (Repeatable for credit)

Registration in Journal Club is required every semester.

**EAS 5930 - Special Topics**

1-3 Credits (Repeatable for credit)

**EAS 5970 - Research Topics**

1-3 Credits

**EAS 5980 - Graduate Independent Study in Earth & Atmospheric Sciences**

1-3 Credits (Repeatable for credit)

A critical evaluation of literature concerning a specific problem.

**EAS 5981 - Graduate Independent Study in Earth & Atmospheric Sciences**

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**

0-6 Credits (Repeatable for credit)

**EAS 6100 - Advanced Topics in Solid Earth Geophysics**

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 6310 - Advanced Seismology I**

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**

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 with a grade of C or higher; EAS 5400 with a grade of C or higher

**EAS 6480 - Gen Circulation of Atmosphere**

3 Credits

The nature and theories of the atmospheric general circulation, the energy and momentum budget of the atmosphere and the numerical simulation of the atmospheric general circulation. Offered occasionally.

**EAS 6900 - Geoscience Journal Club**

0 or 1 Credits (Repeatable for credit)

Registration in Journal Club is required every semester.

**EAS 6920 - Geoscience Journal Club**

1 Credit

Registration in Journal Club is required every semester.

**EAS 6930 - Special Topics**

1-3 Credits

**EAS 6970 - Advanced Research Topics in Earth & Atmospheric Sciences**

1-3 Credits

**EAS 6980 - Graduate Independent Study in Earth & Atmospheric Sciences**

1-3 Credits (Repeatable for credit)

**EAS 6981 - Graduate Independent Study in Earth & Atmospheric Sciences**

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**

0-6 Credits (Repeatable for credit)