

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: International Studies, 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 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.

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

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.

Attributes: Global Citizenship (A&S), International Studies, International Studies-Health, 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.

Attributes: International Studies, International Studies-Health, 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 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 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.

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 2200 - Mineralogy**Credit(s): 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 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 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 1430; EAS 1435

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): EAS 1420; PHYS 1610*

* 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 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; (PHYS 1310 or PHYS 1610)

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

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 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 2480; EAS 2485

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 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 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*; MATH 1520

* Concurrent enrollment allowed.

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*; MATH 2530

* Concurrent enrollment allowed.

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

Attributes: Natural Science Req (A&S)

EAS 3700 - Mesoanalysis 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 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 2530**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 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 1430**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 4140 - Soil Science****Credit(s): 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 4150 - Instrumentation and Remote Sensing****Credit(s): 3 Credits**

Meteorological instruments will be studied from the viewpoint of performance characteristics, sensitivity, dynamical error, and response to sinusoidal and step impulses. Statistical treatment of output data; digital systems; computerized processing and retrieval as it applies to meteorology.

Prerequisite(s): PHYS 1630**Corequisite(s):** EAS 3340**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 3330; PHYS 1630*; MATH 2530*

* Concurrent enrollment allowed.

Attributes: Natural Science Req (A&S)**EAS 4220 - Synoptic Meteorology II****Credit(s): 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****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): EAS 1430; EAS 1450; CHEM 1110; CHEM 1120**Attributes:** Natural Science Req (A&S)**EAS 4300 - Structural Geology****Credit(s): 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 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 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 1430; EAS 4300; (PHYS 1310 or PHYS 1610);

MATH 1510

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 1420; EAS 1430; EAS 1450; 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.

Prerequisite(s): EAS 3330; PHYS 1630^{*}; MATH 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 isentropic potential vorticity.

Prerequisite(s): EAS 4440; 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 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 4520 - Seismic Exploration Lab**Credit(s): 1 Credit**

Laboratory and field problems, two hours per week. Collection and interpretation of seismic data; applications of the computer to data interpretation. Fall or Spring semester.

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 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; PHYS 1610

Attributes: Natural Science Req (A&S)

EAS 4780 - COMET Modules**Credit(s): 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 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 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 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**

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

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.

Prerequisite(s): EAS 4370**EAS 5180 - Trans Margins & Plate Interior****Credit(s): 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**Credit(s): 2 Credits** (Repeatable for credit)

In-depth study of recent research developments in geophysics.

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 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 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.

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 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 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 5650 - Radar Meteorology**Credit(s): 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**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 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 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

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

Credit(s): 1 Credit (Repeatable for credit)

Registration in Journal Club is required every semester.

EAS 6920 - Geoscience Journal Club

Credit(s): 1 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)