Earth and Environmental Sciences Courses (EES)

This is a list of all earth and environmental sciences courses. For more information, see Earth and Environmental Sciences.

**EES:1000 First-Year Seminar** 1-2 s.h.
Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities). Requirements: first- or second-semester standing.

**EES:1021 Spring Break Service Learning Trip** 1 s.h.
Special topics, directed research.

**EES:1030 Introduction to Earth Science** 3-4 s.h.
Relationships between plate tectonics, geologic time, and the rock cycle with volcanoes and igneous, sedimentary, metamorphic rocks; fossils; radioactive isotopes; landscape evolution; mountain building; natural resources; their impacts on civilization. GE: Natural Sciences with Lab; Natural Sciences without Lab. Same as CEE:1030.

**EES:1031 Introduction to Earth Science Laboratory** 1 s.h.
Laboratory component of EES:1030. Requirements: completion of 3 s.h. in EES:1030 or CEE:1030. GE: Natural Sciences Lab only. Same as CEE:1031.

**EES:1040 Evolution and the History of Life** 3-4 s.h.
Fossils over the past 3.5 billion years, origin and evolution of life, evolutionary radiations and mass extinctions, the invasion of land, dinosaurs, the age of mammals, relationship between biological systems and environmental change in earth history. Offered spring semesters. GE: Natural Sciences with Lab; Natural Sciences without Lab. Offered fall semesters. GE: Natural Sciences with Lab; Natural Sciences without Lab. Same as ENVS:1080.

**EES:1081 Introduction to Environmental Sciences Laboratory** 1 s.h.
Laboratory component of EES:1080. Requirements: completion of 3 s.h. in EES:1080 or ENVS:1080; or 3 s.h. of transfer equivalent. GE: Natural Sciences Lab only. Same as ENVS:1081.

**EES:1085 Fundamentals of Environmental Science** 4 s.h.
Interdisciplinary study of how Earth’s natural systems interact, how these systems affect society, and how they respond to human activity; how environmental problems can be solved and avoided by drawing upon knowledge in disciplines as diverse as ecology, anthropology, economics, chemistry, and political science; blend traditional and inquiry-based instructional environment, including traditional lectures, discussions in TILE classrooms, laboratory, online learning, peer-reviewed writing exercises, and service learning. Offered fall semesters. GE: Natural Sciences with Lab. Same as ENVS:1085.

**EES:1086 Fundamentals of Environmental Science Lab** 1 s.h.
Laboratory component of EES:1085. Prerequisites: EES:1085 or ENVS:1085.

**EES:1115 The History and Science of Oil** 3 s.h.
Historical perspective on business, science, geology, technology, politics, environment, and culture of the global oil industry; the rise of oil as the most influential international business of the last 150 years, the material foundation of economies, a major force in world politics, a shaper of daily life, and a guide to understanding Earth’s deep history. Offered fall semesters. GE: Historical Perspectives. Same as ENVS:1115, GEOG:1115, HIST:1115.

**EES:1170 Geology of the U.S. National Parks** 2 s.h.
Geologic features, geologic history, important biological and archaeological characteristics, with emphasis on features that caused certain areas to be included in national park system.
EES:1180 Geology Field Trip: Selected National Parks 2 s.h.
Observation, interpretation of prominent geologic, geomorphic, biological features; semester-break or semester-end visits to different parks or groups of parks each year. Offered spring semesters.

EES:1290 Energy and the Environment 3 s.h.
Scientific concepts related to potentially significant energy sources of the 21st century; environmental impacts, positive and negative, of each energy source as well as geologic and geographical distributions and applications. GE: Natural Sciences without Lab.

EES:1400 Natural Disasters 3 s.h.
How earth-atmosphere-hydrosphere-space systems produce events catastrophic to humans on the scale of individual lives to civilizations; root causes of earthquakes, landslides, volcanic eruptions, floods, hurricanes, tsunamis, tornadoes, and asteroid impact, and their local, national, and global impact; spatial and temporal occurrences of these hazards; methods and processes for hazard preparedness, response, and recovery; social, economic, and policy aspects that affect and compound the magnitude of disasters associated with natural phenomena; case studies drawn from contemporary and ancient societies. GE: Natural Sciences without Lab.

EES:2001 Second-Year Field Trip for Earth and Environmental Sciences 1 s.h.
Opportunity for students to begin developing an appreciation of earth system and earth history scales; application of classroom learning to field-based inquiry; real-world examples of introductory course material in an outdoor classroom setting. Prerequisites: EES:1030 or EES:1050 or EES:1080 or ENVS:1080. Requirements: geoscience or environmental sciences major. Same as ENVS:2001.

EES:2190 Directed Study arr.
Special topics, independent research.

EES:2200 Historical Geology 4 s.h.
Framework of earth history that is essential to understand how the earth system works; investigation of physical, biological, atmospheric, oceanographic, and chemical history of the earth to prepare for further earth and environmental science courses. Prerequisites: EES:1030 or EES:1050 or EES:1080 or ENVS:1080 or EES:1085 or ENVS:1085. Same as ENVS:2200.

EES:2310 Introduction to Climatology 3 s.h.
Introduction to atmospheric processes that determine weather and climate; flow of energy through the atmosphere, distribution and movement of moisture and air, and atmospheric disturbances such as cyclones, hurricanes and tornadoes, and climate change. Recommendations: GEOG:1020 or similar earth systems science course. Same as GEOG:2310.

EES:2410 Mineralogy 4 s.h.
Physical, chemical, and optical properties of minerals; phase relations; structures; associations; diagnostic features for identification. Offered fall semesters. Prerequisites: (CHEM:1110 or CHEM:1070) and (EES:1050 or EES:1030).

EES:2831 Geologic Field Methods 3 s.h.
Introduction to basic methods of geologic fieldwork in southwest Montana using topographic maps and GPS to locate oneself, identifying geologic map units (including superficial deposits), recognizing geologic contacts, constructing stratigraphic sections, measuring planar structures, and making geologic maps complete with a legend and cross-section. Offered summer session. Prerequisites: EES:1400 or EES:1080 or EES:1030 or EES:1050.

EES:3000 Geologic Training Assignment 1-3 s.h.
Practical experience.

EES:3001 Third-Year Field Trip for Earth and Environmental Sciences 1 s.h.
Opportunity for students to apply their major course work to real-world problems; field trip to visit parks, mines, and/or quarries in Missouri and Arkansas that illustrate many of the lessons learned in EES:2410 and EES:3500. Prerequisites: EES:1030 or EES:1050 or EES:1080 or ENVS:1080 or EES:2410. Requirements: geoscience or environmental sciences major, and junior standing. Same as ENVS:3001.

EES:3003 Natural History Research Collections 3 s.h.
Techniques, methods, and issues specific to natural history research collections; practice in preparing and cleaning specimens; role of natural history specimens in modern scientific research. Recommendations: basic understanding of the diversity of plants and animals and natural history museum collections, MUSM:3001 or MUSM:3200, and BIOL:1411 or BIOL:1412; other experience. Same as MUSM:3003.

EES:3020 Earth Surface Processes 3 s.h.
Basic geomorphic and environmental processes that shape the earth's surface; emphasis on erosion, transport, deposition by land mass movement (creep, landslides, earth flow), fluid agents (wind, water, ice); methods used to study these processes. Prerequisites: EES:1050 or EES:1080 or ENVS:1080 or GEOG:1020 or EES:1085 or ENVS:1085. Same as ENVS:3020, GEOG:3020.

EES:3030 Conservation Paleobiology 4 s.h.
Exploration of how near- and deep-time geologic record pertains to conservation; restoration targets; best practices for conservation of ecosystems; human impacts. Same as ENV:3030.

EES:3040 Writing for the Earth and Environmental Sciences 1-3 s.h.
Practical methods of content creation across curriculum; effective communication to lay and academic audiences; methods of planning, drafting, revising, and editing everything from general articles of interest to scientific papers. Same as WRIT:3200.

EES:3050 Geology of Iowa 2 s.h.
Exploration of geologic history responsible for landscape, soil, rocks, fossils, water, and natural resources of Iowa; background of Iowa's natural history; preparation for K-12 educators to deliver earth and environmental science content in their own classrooms, utilizing natural landscapes in Iowa. Same as ENV:3050.

EES:3051 Geology of Iowa Field Trip 1 s.h.
Exploration of the geologic history responsible for landscape, soil, rocks, fossils, water, and natural resources of Iowa; field-based examples of Iowa's natural history; preparation for K-12 educators to deliver earth and environmental science content in their own classrooms utilizing the natural landscapes in Iowa. Recommendations: EES:3050. Same as ENV:3051.
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<td>Introduction to Oceanography</td>
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<td>EES:3110</td>
<td>Chemical Evolution of the Oceans</td>
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EES:3410 Analytical Methods 2-3 s.h.
Theory and practice of analyzing chemical, isotopic, and mineralogical compositions of rocks, organic materials, and waters; use of modern analytical instruments. Offered spring semesters. Prerequisites: EES:3500 and (PHYS:1512 or PHYS:1702) and CHEM:1070.

EES:3500 Igneous and Metamorphic Petrology 4 s.h.
Nature, origin, and petrography of igneous and metamorphic rocks in hand specimen and thin-section. Offered spring semesters. Prerequisites: (MATH:1010 or MATH:0300 or MATH:0100) and (EES:1050 or EES:1030) and (CHEM:1110 or CHEM:1070) and EES:2410.

EES:3770 Global Stratigraphy 3 s.h.
Types of stratigraphy (e.g., biostratigraphy, lithostratigraphy, sequence stratigraphy, chronostratigraphy, chronostratigraphy) that share a number of procedures and practices and how differences cloud understanding of Earth history; central role of stratigraphy in modern geoscience pursuits; issue of time in stratigraphic record as an organizing theme for investigation of comparative stratigraphy.

EES:3840 Structural Geology 4 s.h.
Rock deformation; description, classification of geologic structures such as faults and folds; processes that generate geologic structures; solution of structural problems; interpretation of geologic maps. Prerequisites: EES:1030 or EES:1050.

EES:4001 Fourth-Year Field Trip for Earth and Environmental Sciences 2 s.h.
Application of core course learning to real-world examples; students develop a broader understanding of interrelated aspects of earth and environmental sciences as truly integrated scientific endeavors; field trip to Big Bend National Park to highlight a wide range of geoscience and environmental science studies and provide students an opportunity to apply all aspects of their training to the amazing geologic landscape of southwest Texas; capstone field experience for students heading into their senior year. Prerequisites: EES:2831. Requirements: geoscience or environmental sciences major, and senior standing. Same as ENVS:4001.

EES:4156 Scanning Electron Microscopy and X-Ray Microanalysis 3 s.h.
Microscopy methods for research; all aspects of research, from sample preparation to imaging to data analysis; when to use a particular microscopy procedure; theory, operation, and application of scanning electron microscopy, scanning probe microscopy, laser scanning microscopy, X-ray microanalysis. Requirements: a physical science course. Same as ACB:4156, CBE:4156.

EES:4200 Advanced Collection Care 3 s.h.
Builds on MUSM:3200; types and materials of museum objects and their care; storage and preservation of paper, books, photographs, works of art, electronic media, textiles, furniture, archaeological artifacts, and natural history specimens; collections project and hands-on practice in preservation techniques, enclosures, and supports; for students planning museum careers or professions that require care of collections. Same as MUSM:4200.

EES:4230 Special Topics 1-3 s.h.
Contemporary issues in earth sciences.
EES:4660 Groundwater Modeling 3 s.h.
Groundwater flow and contaminant transport modeling; numerical methods, applications of groundwater modeling to water supply, groundwater resources evaluation, remediation design using software: GMS (MODFLOW, MODPATH, and MT3D). Prerequisites: MATH:1860 and (EES:4630 or CEE:4103). Same as CEE:4104.

EES:4680 Field Methods in Hydrologic Science 3 s.h.
Collection and interpretation of physical hydrology and hydraulics field measurements; basic data quality assurance and quality control; hands-on experience with field equipment and data collection. Prerequisites: EES:4720 or EES:2831 or EES:3020 or EES:3360 or EES:3300 or EES:3380 or ENGR:2510 or EES:4800 or EES:4630 or CEE:3371 or EES:4790 or EES:3390 or EES:3020.

EES:4700 Evolution of Ecosystems 3 s.h.
Evolutionary history of terrestrial and marine ecosystems; ecological processes from population to ecosystem levels; community assembly, trophic levels, networks, biodiversity dynamics; practical aspects of paleoecological data collection, statistical analysis, modeling. Requirements: two courses in geoscience, biology, environmental sciences, anthropology, or geography. Same as ENV:4700.

EES:4710 Evolution of Plants 3 s.h.
Evolutionary history of plants over geologic time: relationships, morphology, and fossil record of major plant lineages; patterns and processes in evolution of plant morphology and diversity; ecological innovations and evolution of terrestrial ecosystems; relationships between biotic and environmental change; paleobotanical tools in stratigraphy, paleoecology, sedimentology; practical aspects of paleobotanical data collection, statistical analysis, modeling; field trip. Requirements: two courses in geoscience, anthropology, biology, environmental science, or geography.

EES:4720 Glacial and Pleistocene Geology 3 s.h.
Introduction to glaciers and glacial and interglacial Earth systems; linkages among glacial, oceanic, and atmospheric systems and their effects on landscapes and biota over the past two million years; how oceans, atmosphere, and glaciers interact and landscape effects of past glacial and interglacial cycles. Requirements: physical geology or physical geography or anthropology.

EES:4750 Mineral and Petroleum Exploration Geology 3 s.h.
Fundamentals of resource exploration philosophy and methods, with project-based presentation of techniques and strategies for mineral exploration and petroleum exploration; integration and evaluation of geological, geochemical, and geophysical techniques for mineral exploration; hydrocarbon systems and seismic interpretation for petroleum exploration. Corequisites: EES:3500 and EES:3840.

EES:4790 Engineering Geology 3 s.h.
Application of geology, water, and earth processes to civil and environmental engineering practice; physical properties of rock and soil, geologic mapping and surveying, groundwater supplies and wells, stream engineering, watershed management, site investigations for environmental assessment, and geologic hazards. Prerequisites: EES:1030 or EES:1080 or EES:1050.

EES:4800 Solid Earth Geophysics 3 s.h.
Geophysics is the broad geoscience field interested in discovering the unseen characteristics of the Earth and other planets, including the internal structure of the Earth, the current motions of tectonic plates, the sources and causes of geological disasters, and the locations of economic resources; methods to accomplish these goals include seismology, gravity and magnetic studies, geodesy, and measurements of heat; course offers a broad introduction to these topics that is rooted in current and growing fields of active research. Requirements: introductory geology or physics.

EES:4820 Tectonics and Basin Analysis 3 s.h.
Dynamic processes responsible for crustal genesis, plate movements, mountain building; plate boundary zones; sedimentologic, structural, petrologic, geophysical characteristics of major tectonic settings; multidisciplinary approach; week-long field trip. Corequisites: EES:3840.

EES:4832 Geologic Field Analysis 3 s.h.
Structural, stratigraphic, and regional analysis of geology in the Rocky Mountains of Montana; emphasis on making reasonable geologic interpretations from field relationships; mapping projects in vicinity of Dillon, Montana that build on experience gained in EES:2831; capstone experience dedicated to synthesizing the geology of a fold-and-thrust belt near Glacier National Park. Offered summer session. Prerequisites: EES:2831 and EES:3840.

EES:4870 Applied Geostatistics 3 s.h.
Applications of geostatistical methods to geology, geography, hydrology, environmental sciences, and engineering; variogram, Kriging, analysis of spatial-varied data with varied computer software in participants' specialties. Same as GEOG:4870.

EES:4990 Senior Thesis in Geoscience arr.
Independent research resulting in a senior thesis. Requirements: senior standing.

EES:4999 Honors Thesis in Geoscience arr.
Independent research resulting in an honors thesis. Requirements: honors standing.

EES:5010 Geoscience Seminar Series 1 s.h.
Scholarly work and research in geoscience.

EES:5015 American Association of Petroleum Geologists Fall Field Trip 1 s.h.
Resource-related topics in mineral and hydrocarbon exploration; joint field trip with Iowa State University. Requirements: AAPG student chapter member or graduate standing, and basic understanding of mineralogy, petrology, and structural geology.

EES:5070 Geologic Orientation arr.
Department degree requirements, programs; field survey of local geology; tips for TAs; introduction to specialized facilities; for new graduate students.

EES:5250 Environmental Seminar 1 s.h.
Environmental topics selected by student and instructor.

EES:5330 Carbonate Petrology 2 s.h.
Identification of constituents and interpretation of genesis, structures, environments of formation, and patterns and processes of diagenesis in limestones; laboratory-based. Requirements: familiarity with optical microscope and sedimentation principles.
**EES:5350 Depositional Environments**  3-4 s.h.
Modern patterns of sedimentation; emphasis on interpreting depositional environments of ancient sedimentary rocks and deciphering resulting stratigraphic patterns. Requirements: knowledge of basic sedimentary geology and paleontology.

**EES:5380 Process Geomorphology Seminar**  1-3 s.h.
Topics in process geomorphology ranging from fluvial dynamics to mass movement to sediment transport and related environmental processes.

**EES:5530 Geochronology**  3 s.h.
How to evaluate published ages, and assumptions/errors involved; how to select and sample suitable materials for dating, and choose a suitable dating method and analytical technique; opportunity to develop skills for research and professional careers. Prerequisites: EES:4490 or EES:4520.

**EES:5550 Metamorphic Petrology**  3 s.h.
Interpretation of metamorphic rocks using hand specimens, thin sections, field relationships, mineralogical composition, texture, geochronology, isotope geochemistry, thermodynamics, kinetics, and tectonic setting; phase equilibria in pelitic, mafic, and carbonate rocks; thermobarometry, petrogenetic grids, P-T-X relationships, and psedosections; kinetic models of metamorphic textures, heat-flow modeling, P-T-t paths, and tectonic evolution of metamorphic rocks. Prerequisites: EES:3500.

**EES:6250 Paleontology Seminar**  1-3 s.h.

**EES:6390 Advanced Watershed Analysis Seminar**  1-3 s.h.
Integration of existing knowledge of physical, hydrological, and environmental processes with management issues and challenges in water resources and environmental management; aspects of water quantity and quality, water use and treatment, and basin management issues related to forestry, agriculture, urbanization, floods, droughts.

**EES:6570 Tectonics and Petrology Seminar**  1-2 s.h.
Topics in tectonics, structural geology, petrology.

**EES:6920 Advanced Structural Geology**  3 s.h.
Kinematic and dynamic analysis of deformed rocks; microstructural analysis; strain analysis, field investigations of highly deformed rocks. Prerequisites: EES:3840.

**EES:7270 Geologic Orientation, Scholarly Integrity, and Responsible Conduct of Research**  1 s.h.
Department degree requirements, programs; field survey of local geology; scholarly integrity; responsible conduct of research; tips for TAs; introduction to specialized facilities; for new graduate students.

**EES:7604 Principles of Scholarly Integrity**  0 s.h.
Training in responsible conduct of research and scholarly activities; student/mentor responsibilities, authorship, plagiarism/falsification/fabrication of data, intellectual property, conflict of interest; fiscal, institutional, and societal; data handling. Requirements: postdoctoral standing in geoscience.

**EES:7990 Research: Geoscience**  arr.
Independent research related to theses or dissertations in geoscience.