

EARTH, ENVIRONMENTAL, AND PLANETARY SCIENCES (EEPS)

EEPS 101. The Earth and Planets. 3 Units.

An examination of the geological processes that have shaped the planets and moons of the inner solar system, focusing on those with relevance to our own planet Earth. Following an introduction to the fundamentals of planetary geology, lectures and exercises will explore how the inner planets (the asteroids, Mercury, Venus, Earth, the Moon, and Mars) exhibit the effects of planetary differentiation, impact cratering, volcanic activity, tectonics, climate, and interactions with life.

EEPS 110. Physical Geology. 3 Units.

Introduction to geologic processes and materials that shape the world we live in. Hydrologic cycle and evolution of landscapes. Earthquakes, volcanoes, plate tectonics, and geologic resources. Students desiring laboratory experience should enroll in EEPS 119 concurrently.

EEPS 115. Introduction to Oceanography. 3 Units.

The sciences of oceanography. Physical, chemical, biologic, and geologic features and processes of the oceans. Differences and similarities between the oceans and large lakes including the Great Lakes. Required: Sunday field trip.

EEPS 117. Weather and Climate. 3 Units.

Introduction to the study of weather and climate. Covers the basics of meteorology, climate zones, the hydrologic cycle, and weather prediction. Lectures address timely topics including greenhouse warming, past global climates, and recent advances in meteorology.

EEPS 119. Geology Laboratory. 1 Unit.

Principles and techniques common to the geological sciences including rock and mineral identification, map interpretation, land form analysis, application of geological information to engineering works, and more. One three-hour laboratory or field trip weekly. Recommended preparation: EEPS 110.

EEPS 121. Environmental Science. 3 Units.

An introduction to the Earth's environmental systems and human interactions with those systems. In this course, students will be introduced to the earth's life-supporting ecological systems, environmental pollutants, natural resources, and how humans interact with, and sometimes threaten, those systems. Students will explore the Earth's major natural systems (climate, water, land, ecosystems, etc.) and how they are impacted by human activity, the sustainability/unsustainability of societal activities such as energy and mineral (oil, gas, coal, etc.) use, and interactions with natural hazards (tsunami, flooding, earthquakes, volcanic activities, freezing ice / rain, snow, etc.).

EEPS 202. Global Environmental Problems. 3 Units.

Global Environmental Problems is a course designed to provide students with an understanding of, and an appreciation for, human-influenced environmental changes that are global in scope. Accordingly, much of the material will focus on the nature and structure of natural global systems, how and where in those systems human influences occur, and will delve deeply into a few particular problems and solutions of current interest, such as population growth, climate change, ozone depletion, and fisheries, from a variety of viewpoints. Offered as ESTD 202 and EEPS 202.

EEPS 205. Climate Change Science and Society. 3 Units.

This course provides a synoptic, multi-disciplinary understanding of the past, present, and future of anthropogenic climate change by integrating three distinct fields: the earth and environmental sciences, biology and ecology, and history. What is changing in the global climate? Why? How do we know? What should we expect in the future? What can be done? No single discipline can answer these questions fully, and by organizing the course around these big questions, we will demonstrate how different disciplines each contribute essential answers. Course covers diverse sources of evidence for climate change in the past and present, the core mechanisms of climate change at different timescales and their consequences, the impact of climate change on human history and history of the discovery of climate change, climate models and ecological forecasts, the modern politics and diplomacy of climate, climate communication, and multiple paths forward for the earth's physical, ecological, and social systems. Offered as BIOL 205, EEPS 205, and HSTY 205.

EEPS 210. Earth History: Time, Tectonics, Climate, and Life. 3 Units.

The discovery and measurement of deep time, tectonic cycles, and geochemical cycles. The origin of life, major fossil groups and their evolution over time. Earth systems history: Major tectonic, ecologic, and climatic events in the last 4.5 billion years.

EEPS 220. Environmental Geology. 3 Units.

Geological attributes of environmental settings. Analysis of geologic conditions pertinent to engineering works. Site development, resource availability, urban planning, recognition and assessment of geologic hazards. Recommended preparation: EEPS 110 and EEPS 119.

EEPS 225. Evolution. 3 Units.

Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macro-evolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophic issues in evolutionary theory. Offered as ANTH 225, BIOL 225, EEPS 225, HSTY 225, and PHIL 225.

EEPS 260. Introduction to Climate Change: Physics, Forecasts, and Strategies. 3 Units.

This is a one-semester introduction to the physical processes that determine Earth's past, present, and future climate. The course focuses on quantitatively understanding the human impact on climate, including the historical development of steadily more sophisticated physical models, and ever more complete data. Particular emphasis will be placed on understanding climate change projections, as well as the ethical, political, economic, and communications challenges associated with various strategies going forward. The course is appropriate for all majors. Offered as EEPS 260 and PHYS 260.

EEPS 301. Stratigraphy and Sedimentation. 3 Units.

Formation, distribution, and composition of sediments and sedimentary rocks. Modern depositional environments and their ancient analogues; principles of stratigraphic and biostratigraphic correlation. Two lectures and one laboratory per week. Offered as EEPS 301 and EEPS 401.

EEPS 303. Environmental Law. 3 Units.

Introduction to treatment of environmental issues in legal proceedings. Sources of environmental law, legal procedure, common law remedies (toxic torts and human health, nuisance, contract law), statutes and regulations, endangered species, public lands, toxics regulation, nuclear power, coal. The course employs the case method of reading and recitation of appellate judicial opinions. We read both classic cases in environmental law as well as current controversies. Offered as ESTD 303 and EEPS 303.

EEPS 305. Geomorphology and Remote Sensing. 3 Units.

Recognition and interpretation of land forms and their significance in revealing present and past geologic processes. Introduction to acquisition and analysis of data through aerial photography and satellite imagery. Two lectures and one laboratory weekly. Recommended preparation: EEPS 110 and EEPS 119. Offered as EEPS 305 and EEPS 405.

EEPS 315. Structural Geology and Geodynamics. 3 Units.

Theoretical analysis of deformation in earth materials, with illustrations of deformational styles in various tectonic settings and the dynamics of the Earth's interior. Recommended preparation: EEPS 110. Offered as EEPS 315 and EEPS 415.

EEPS 317. Introduction to Field Methods. 3 Units.

Practice in field procedures, recognition and testing of hypotheses in the field, field mapping and analysis of sedimentary, igneous, and metamorphic rocks in deformed and tectonically active settings. Weekly meeting plus spring break field trip. Students required to pay partial cost of meals, lodging, and travel. Offered as EEPS 317 and EEPS 417. Prereq: EEPS 119.

EEPS 321. Hydrogeology. 3 Units.

Basic and applied concepts pertaining to the occurrence and movement of groundwater. Definitions, basic equations, applications to a variety of geologic settings, wells. Requires one Saturday field trip to make field measurements, collect and analyze data, and prepare a report. Offered as EEPS 321 and EEPS 421.

EEPS 340. Earth and Planetary Interiors. 3 Units.

Quantitative introduction to the composition, structure, dynamics, and evolution of Earth and other planets using principles of geophysics and geochemistry. Planetary formation and differentiation, composition and structure of Earth and planets, heat generation and heat flow, mantle convection and plate tectonics, planetary magnetism and core dynamics, chemical evolution of Earth and planets, extrasolar planets and super Earths. This course will be offered to both undergraduate students and graduates. In addition to the requirements for undergraduate students, graduate students will be asked to work on a small course project relevant to the subject of the course and submit a term paper based on this project by the end of semester. Offered as EEPS 340 and EEPS 440. Prereq: MATH 122 or MATH 126.

EEPS 341. Mineralogy. 4 Units.

Crystallography, hand specimen mineralogy and petrology, principles of crystal structure and crystal chemistry, elementary geochemistry and phase diagrams, and an introduction to the petrographic microscope. Three lectures and one three-hour laboratory weekly. Prereq: EEPS 119.

EEPS 344. Igneous and Metamorphic Petrology. 4 Units.

Composition, classification, and genesis of igneous and metamorphic rocks, emphasizing physical and chemical principles governing their origin. Laboratory study of rocks in thin section. Two lectures and two three-hour laboratories weekly. Prereq: EEPS 341.

EEPS 345. Planetary Materials. 3 Units.

An inquiry-driven, lab-based exploration of the materials that make up the solid matter of the solar system. Each class period consists of a microscopy-based laboratory exercise examining a unique aspect of planetary materials such as meteorites, cosmic dust, lunar samples and ancient terrestrial rocks, and their relationship to modern natural materials and solar system processes. Offered as EEPS 345 and EEPS 445. Prereq: EEPS 119 or BIOL 214L or BIOL 215L or CHEM 113 or PHYS 115 or PHYS 121.

EEPS 349. Geological Problems. 1 - 3 Units.

Special work arranged according to the qualifications of the student.

EEPS 350. Geochemistry. 3 Units.

Introduction to geochemistry. Properties of the elements, elemental and isotopic fractionation, element transport, geochemical systems, geochronology, mineral reactions, the solid Earth, Earth in the solar system. A quantitative approach to modeling geochemical processes will be emphasized throughout. Offered as EEPS 350 and EEPS 450.

EEPS 352. Biogeochemistry. 3 Units.

This course is intended for upper-level undergraduate and graduate students and will focus on global environmental changes and the intersections between biology, geology, chemistry and environmental sciences. Throughout the semester students will explore the cycling of biologically important elements (carbon, nitrogen, phosphorus) in order to understand their role in shaping ecosystem processes and in the development of life on Earth. In the first half of the class, students will explore the biological/chemical processes that shape the past, present and future Earth System. In the second half of the course, students will investigate inter-related nature of these processes/reactions in regulating global biogeochemical cycles. Topics to be covered in this class include the origin of the Earth, elements and life; the Gaia Hypothesis; Geochemical tools to study Earth processes; biological and chemical processes occurring on Earth's surface; Global Climate/Environmental Change. Recommended Preparation: (CHEM 105 or CHEM 111) and (CHEM 106 or ENGR 145). Offered as EEPS 352 and EEPS 452.

EEPS 360. Summer Field Camp. 6 Units.

Six-week course in geologic field methods and mapping. Not offered at CWRU; must be taken at another college or university. Credits will be transferred.

EEPS 367. Topics in Evolutionary Biology. 3 Units.

The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. The graduate level offerings of this course will require a longer, more sophisticated term paper, and additional class presentation. Offered as ANTH 367, BIOL 368, EEPS 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, EEPS 467, PHIL 467 and PHOL 467. Prereq: EEPS 225 or equivalent.

EEPS 390. Introduction to Geological Research. 3 Units.

Examination of factors in the selection, design, and conduct of research projects and in the analysis and interpretation of research results. Consideration of ethical issues in scientific research. Development of a written research proposal and oral presentation of proposed research. Consultations with department faculty in development of research proposal. Research initiation. Offered as EEPS 390 and EEPS 490. Counts as a SAGES Departmental Seminar course.

EEPS 391. Senior Project. 2 Units.

Research project required of all department majors, based on formal project proposals presented to department faculty. Proposals may be submitted prior to the semester in which EEPS 391 is taken. Grading based on project progress presentation that will include a statement of the problem, a literature review, a description of their field/lab work and presentation of their data collected to date. This course is the first of a 2 semester Senior Capstone (EEPS 391, 392) sequence. Recommended preparation: EEPS 390. Counts as a SAGES Senior Capstone course.

EEPS 392. Professional Presentation. 2 Units.

Preparation and presentation of final written and oral reports on individual Senior Projects. Class meetings focus on group discussion of problem areas in analysis and interpretation of project results, and in styles of writing poster and oral presentation as demonstrated by practice examples. This course is the second in a two-course (EEPS 391, 392) Senior Capstone sequence. Counts as a SAGES Senior Capstone course. Prereq: EEPS 390 and EEPS 391. Or Coreq: EEPS 390.

EEPS 396. Undergraduate Research in Evolutionary Biology. 3 Units.

Students propose and conduct guided research on an aspect of evolutionary biology. The research will be sponsored and supervised by a member of the CASE faculty or other qualified professional. A written report must be submitted to the Evolutionary Biology Steering Committee before credit is granted. Offered as ANTH 396, BIOL 396, EEPS 396, and PHIL 396.

EEPS 401. Stratigraphy and Sedimentation. 3 Units.

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EEPS 490. Introduction to Geological Research. 3 Units.

Examination of factors in the selection, design, and conduct of research projects and in the analysis and interpretation of research results. Consideration of ethical issues in scientific research. Development of a written research proposal and oral presentation of proposed research. Consultations with department faculty in development of research proposal. Research initiation. Offered as EEPS 390 and EEPS 490. Counts as a SAGES Departmental Seminar course.

EEPS 509. Seminar: Graduate Research. 1 Unit.

EEPS 511. Special Readings in Geology. 1 - 6 Units.

Detailed study of a selected topic in geology under the guidance of a faculty member.

EEPS 512. Special Readings in Geology. 1 - 6 Units.

Detailed study of a selected topic in geology under the guidance of a faculty member.

EEPS 601. Special Problems and Research. 1 - 18 Units.

(Credit as arranged.)

EEPS 651. Thesis M.S.. 1 - 18 Units.

(Credit as arranged.)

EEPS 701. Dissertation Ph.D.. 1 - 9 Units.

(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.