EARTH AND PLANETARY SCIENCES (EPS)

EPS 101a, Climate Change  Mary-Louise Timmermans and Noah Planavsky
An introductory course that explores the science of global climate change. We analyze processes that regulate the climate on Earth, assess the scientific evidence for global warming, and discuss consequences of climate change. We explore Earth’s climate history as it relates to the present climate as well as future climate projections. Uncertainty in the interpretation of climate observations and future projections are examined. SC

EPS 110a, Dynamic Earth  David Evans and Danny Rye
An introduction to the processes that shape Earth’s environment through the interactions of rocks, soils, the atmosphere, and the hydrosphere. Field trips and practical sessions in the properties of natural materials. Topics include evolution of landscapes; hydrologic and tectonic cycles; extreme geologic events such as earthquakes, floods, volcanism, and landslides; society’s economic dependence on natural materials such as soils, minerals, and fossil fuels; and human influences on the natural environment. SC

EPS 111b, Dynamic Earth Laboratory and Field Methods  Danny Rye and David Evans
Practical exercises in the laboratory and in the field to complement G&G 110 or 115. Identification of minerals and rocks; construction of geologic maps and cross sections to determine Earth-system processes and histories. Includes a field trip to the northern Appalachians during the October recess. After or concurrently with G&G 110, or after G&G 115. SC ½ Course cr

* EPS 125b / E&EB 125b, History of Life  Derek Briggs, Pincelli Hull, and Bhart-Anjan Bhullar
Examination of fossil and geologic evidence pertaining to the origin, evolution, and history of life on Earth. Emphasis on major events in the history of life, on what the fossil record reveals about the evolutionary process, on the diversity of ancient and living organisms, and on the evolutionary impact of Earth’s changing environment. SC

EPS 126lb, Laboratory for the History of Life  Derek Briggs, Pincelli Hull, and Bhart-Anjan Bhullar
A survey of the diversification of life using suites of fossils and related modern organisms drawn from critical evolutionary stages. Emphasis on direct observation and description of specimens, the solution of problems posed by the instructor, and the generation and testing of hypotheses by the students. To be taken concurrently with or following G&G 125. SC ½ Course cr

EPS 140b, Atmosphere, Ocean, and Climate Change  Juan Lora
Physical processes that control Earth’s atmosphere, ocean, and climate. Quantitative methods for constructing energy and water budgets. Topics include clouds, rain, severe storms, regional climate, the ozone layer, air pollution, ocean currents and productivity, the seasons, El Niño, the history of Earth’s climate, global warming, energy, and water resources. QR, SC

EPS 210b, The Geology of North America through its National Parks  Alan Rooney
The Geology of North America (a.k.a. Parks & Plates) serves as a bridge between the introductory level courses and the more focused upper-level classes taught in the G&G department. While drawing on a traditional tectonics curriculum this course also integrates geomorphology, landscape evolution, and current environmental issues to investigate how geologic processes have shaped and continue to alter the world around us. This course is for those students interested in pursuing their major in the Geology & Geophysics department. Furthermore, with the integrated geology and environmental focus we hope that this course provides a fundamental scientific knowledge to engage students interested in pursuing the intersection of environmental policy, science, and natural resources. In addition to providing an essential scientific background to students regardless of their path, this course aims to teach skills in scientific literacy and introduce students to different career paths within the Earth sciences via interactions with professionals working in the National Parks System, at national laboratories, and in environmental/conservation law. Prerequisites: G&G 100, 110, 115 and 232 (can be taken concurrently with 232) or permission of instructor. SC

EPS 211b / EVST 211b / HIST 416b / HSHM 211b, Global Catastrophe since 1750  Bill Rankin
A history of the geological, atmospheric, and environmental sciences, with a focus on predictions of global catastrophe. Topics range from headline catastrophes such as global warming, ozone depletion, and nuclear winter to historical debates about the age of the Earth, the nature of fossils, and the management of natural resources. Tensions between science and religion; the role of science in government; environmental economics; the politics of prediction, modeling, and incomplete evidence. HU

* EPS 212b, Global Tectonics  Mark Brandon
The architecture of continents and oceans; detailed geology of lithospheric plate margins and mountain chains. Examples of plate-interaction histories from the ancient geological record emphasize the interdisciplinary approaches used to determine interlinked Earth-system processes involving the mantle, crust, hydrosphere, atmosphere, and biosphere. The course features a field trip during spring break. Prerequisite: one course in G&G (preferably 100, 110, or 115), or permission of instructor. Enrollment limited to 15. SC

EPS 220b, Petrology and Mineralogy  Jay Ague
Study of the structures, chemistry, and physical properties of minerals, including common rock-forming minerals found in sedimentary, metamorphic, and igneous rocks, as well as rare and valuable minerals such as precious metals and gemstones. After one year of college-level chemistry; G&G 110 recommended. SC
EPS 232b, Earth Surface Processes  Lidya Tarhan
Introduction to sedimentary rocks as palaeoenvironmental archives. Reconstruction of depositional environments and palaeoclimatic conditions using geochemical and sedimentological tools. Topics include sedimentology, stratigraphy, basin analysis, diagenesis, and sedimentary geochemistry. Prerequisite: G&G 100, 110, or 115, or permission of instructor.  SC

* EPS 240b, Forensic Geoscience  Maureen Long
Approaches and technologies developed for geoscience that have been adapted and applied in criminal, environmental, historical, and archaeological investigations. Methods related to seismology, geophysics, geomorphology, geochemistry, and radiometric dating. Case studies include nuclear treaty verification, detection of unexploded ordnance and clandestine graves, military history, soil and groundwater contamination, archaeological controversies, art and antiquities fraud, and narcotics provenance.  SC

EPS 255b / EVST 265b, Environmental Geomicrobiology  Ruth Blake
Microbial diversity in natural geologic habitats and the role of microorganisms in major biogeochemical cycles. Introduction to prokaryote physiology and metabolic diversity; enrichment culture and molecular methods in geomicrobiology. Prerequisite: college-level chemistry.  SC

* EPS 261a / EVST 261a, Minerals and Human Health  Ruth Blake
Study of the interrelationships between Earth materials and processes and personal and public health. The transposition from the environment of the chemical elements essential for life. After one year of college-level chemistry or with permission of instructor; EPS 110 recommended.  SC

EPS 274a, Fossil Fuels and World Energy  Michael Oristaglio
The origins, geologic settings, exploration, distribution, and extraction of coal, oil, and natural gas as finite Earth resources. The role of fossil fuels in the world's energy systems; environmental impacts of fossil fuels, including climate change; the transition to low-carbon energy sources. Prerequisites: high school chemistry, mathematics, and Earth science. Recommended preparation: G&G 110 or 205.  SC

* EPS 275b, Renewable Energy  Michael Oristaglio
Introduction to renewable energy, including physical principles, existing and emerging technologies, and interaction with the environment. Energy demand; transmission and storage; generation by hydroelectric, wind, solar, biofuel, and geothermal sources, as well as waves and tidal generation. Includes field trips to conventional, hydroelectric, and wind power facilities in Connecticut. Prerequisites: high school physics, chemistry, and mathematics; college-level science, engineering, and mathematics recommended.  SC

* EPS 281b, Introduction to Geochemistry  Danny Rye and Ruth Blake
Basic principles of geochemistry and their use in geological science. Thermodynamics of aqueous and igneous systems. Element fractionation and isotope geochemistry. Biogeochemical cycles, geochronology, cosmochemistry. After CHEM 161, 165, or 167 (or CHEM 115 or 118), and MATH 115; G&G 220 recommended.  QR, SC

EPS 335a, Physical Oceanography  Alexey Fedorov
An introduction to ocean dynamics and physical processes controlling large-scale ocean circulation, the Gulf Stream, wind-driven waves, tsunamis, tides, coastal upwelling, and other phenomena. Modern observational, theoretical, and numerical techniques used to study the ocean. The ocean's role in climate and global climate change. After PHYS 181 and MATH 120 or equivalents, or with permission of instructor.  QR, SC

* EPS 336b / ANTH 336b / ARCG 336b, Geoarchaeology  Ellery Frahm
A survey of the numerous ways in which theories, approaches, techniques, and data from the earth and environmental sciences are used to address archaeological research questions. A range of interfaces between archaeology and the geological sciences are considered. Topics include stratigraphy, geomorphology, site formation processes, climate reconstruction, site location, and dating techniques. Prior introductory coursework in archaeology or geology (or instructor permission) suggested.  SC, SC

EPS 335a, Extraordinary Glimpses of Past Life  Derek Briggs
Study of exceptionally well-preserved fossil deposits (lagerstätten) that contain nonmineralized animal skeletons and casts of the soft parts of organisms. Examples such as the Burgess Shale and Solnhofen limestones; what they can reveal about the history and evolution of life, ancient lifestyles and environments, and preservational processes. After G&G 230.  SC

EPS 370b, Regional Perspectives on Global Geoscience  David Evans
Examination of the geological record of a specific region of the world. The region studied varies from year to year and is selected by interested students. Successful completion of the course earns priority eligibility status for attendance on a departmental field trip to the studied region. Prerequisite: G&G 110, 115, or 212.  SC

EPS 421b, Geophysical Fluid Dynamics  Mary-Louise Timmermans
A survey of fluid dynamics, with applications to planetary atmospheres and oceans. Mathematical models illustrate the fundamental dynamical principles of geophysical fluid phenomena such as waves, boundary layers, flow stability, turbulence, and large-scale flows. Concepts are investigated through laboratory experiments in a rotating water tank. Prerequisites: differential equations, or mathematical physics or equivalent.  QR, SC

EPS 428a / AMTH 428a / E&EB 428a / PHYS 428a, Science of Complex Systems  Jun Korenaga
Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations.
Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory. Prerequisite: PHYS 301, MATH 247, or equivalent. QR, SC

**EPS 450a, Deformation of Earth Materials**  Shun-ichiro Karato
Basic physics and chemistry of Earth materials, with emphasis on kinetic and transport properties. Geochemical and geophysical processes in Earth’s crust and mantle and their influence on the dynamics and evolution of this planet. Topics include plastic flow, diffusion, electrical conductivity, and chemical reaction. Prerequisites: CHEM 115, MATH 120, and PHYS 181, or equivalents. QR, SC

**EPS 456a, Introduction to Seismology**  Maureen Long
Earthquakes and seismic waves, P and S waves, surface waves and free oscillations. Remote sensing of Earth’s deep interior and faulting mechanisms. Prerequisites: MATH 120, 222, and PHYS 181, or equivalents. QR, SC

* EPS 457b / ANTH 457b, Topics in Evolutionary Theory  Eric Sargis and Jacques Gauthier
Classic and current literature in theoretical evolutionary biology. Intensive training in critical analysis of theoretical concepts and in scientific writing. Recommended preparation: ANTH 267. SO

* EPS 487a or b, Individual Study in Earth and Planetary Sciences  Staff
Individual study for qualified undergraduates under faculty supervision. To register for this course, each student must submit a written plan of study, approved by the adviser, to the director of undergraduate studies. May be taken more than once for credit. ½ Course cr

* EPS 488a, Research in Earth and Planetary Sciences  Mary-Louise Timmermans
Individual study for qualified juniors and seniors under faculty supervision. To register for this course, each student must submit a written plan of study, approved by the adviser, to the director of undergraduate studies.

* EPS 489b, Research in Geology and Geophysics  Mary-Louise Timmermans
Individual study for qualified juniors and seniors under faculty supervision. To register for this course, each student must submit a written plan of study, approved by the adviser, to the director of undergraduate studies.

* EPS 490a and EPS 491b, Research and Senior Thesis  Mary-Louise Timmermans
Two terms of independent library, laboratory, field, or modeling-based research under faculty supervision. To register for this course, each student must submit a written plan of study, approved by a faculty adviser, to the director of undergraduate studies by the end of the junior year. The plan requires approval of the full G&G faculty.

* EPS 492a or b, The Senior Essay  Mary-Louise Timmermans
One term of independent library, laboratory, field, or modeling-based research under faculty supervision. To register for this course, each student must submit a written plan of study, approved by a faculty adviser, to the director of undergraduate studies at the beginning of the term in which the essay is to be written.