Earth and Planetary Sciences (EPS)

**EPS 100a, Natural Disasters**  Maureen Long
Natural events and their impact on humanity and the built environment. Earthquakes, volcanoes, tsunamis, landslides, coastal flooding, tornadoes, hurricanes, and meteoritic impacts. Hazard mitigation strategies. Consequences of global warming.  SC

*EPS 102b, Understanding Climate Change Solutions*  Matthew Eisaman
This seminar explores the scientific, technological, economic, and social aspects of potential solutions to global climate change. We briefly survey the full range of possible solutions, including emissions reduction, mitigation, and adaptation, but focus on understanding mitigation approaches such as carbon dioxide removal at a deeper level. We explore the scientific underpinnings, technological and societal challenges, economics, potential risks and co-benefits, and commercialization pathways of various climate change mitigation solutions. In addition, we quantify the enormous scale required to meaningfully address climate change and place this effort into historical context.  SC

**EPS 105b / APHY 100b / ENAS 100b / EVST 100b / PHYS 100b, Energy, Environment, and Public Policy**  Daniel Prober
The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science.  QR, SC, RP

**EPS 110a, Dynamic Earth**  David Evans
An introduction to the Earth as a planetary system, from its atmosphere to its core; and how the constantly changing surface environment controls both the foundation and fate of industrial society. Topics include planetary structure; plate tectonics, earthquakes and volcanoes; minerals, rocks and soils; evolution of landscapes; hydrology and floods; coasts and oceans; climate and weather; Earth history and biological evolution; humanity’s economic dependence on natural resources; and human influences on the natural environment.  SC

**EPS 111La, Dynamic Earth Laboratory and Field Methods**  David Evans
Practical exercises in the laboratory and in the field to complement EPS 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 EPS 110, or after EPS 115.  SC ½ Course cr

*EPS 125b / E&EB 125b, History of Life*  Derek Briggs
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
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 EPS 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: EPS 110 and/or permission of instructor. SC

**EPS 212b, Global Tectonics**  Mark Brandon
The course provides an overview of the theory of plate tectonics, which accounts for the long-term evolution of the rigid exterior of the earth, and the formation and distribution of oceans, continents, mountain belts, volcanoes, and earthquakes at the earth’s surface. The course emphasizes the interdisciplinary approaches used to study the interactions between the mantle, crust, hydrosphere, atmosphere, and biosphere. EPS 110 Dynamic Earth is recommended (but not required) as a prerequisite. SC

**EPS 216b, Global Warming: Climate Physics**  John Wettlaufer
Lectures on the basics of global warming and presentations and discussions of some of the classic papers that combined have led to our current understanding of global warming. The knowns and the unknowns of global warming; the paper trail of cutting-edge climate science through time, from the late 1800s to the present. Recommended preparation: basic calculus and physics. SC

**EPS 220b, 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. Recommended preparation: Introductory chemistry. SC

**EPS 222b, Origin of Everything**  David Bercovici
Study of major scientific origin hypotheses, including the origin of the universe, galaxies, the solar system and planets, continents, oceans, atmospheres, magnetic fields,
and mono- and multicellular life. Climatic and geographical perspectives on the origin of civilizations and human history.  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 310a, Isotope Geochemistry**  Alan Rooney and Jordan Wostbrock
An overview of the fundamental principles of stable and radiogenic isotope geochemistry. Emphasis is placed on applications of such systems to the evolution of the planet and life on Earth. Specific topics include marine geochemistry, geochronology, and biogeochemistry. Prerequisites: CHEM 115, MATH 120, and PHYS 171 or equivalents, or with permission of instructor.  QR, sc

**EPS 312a, Structural Geology**  Mark Brandon
An introduction to the origin and structure of the lithosphere and continental and oceanic crust. Topics include what controls the solid versus fluid behavior of rocks during deformation, and what controls the character and motion of tectonic plates. Laboratory exercises and field trips.  QR, sc

**EPS 325a, Vertebrate Paleontology**  Jacques Gauthier
Phylogeny and evolution of the major clades of vertebrates from Cambrian to Recent, as inferred mainly from the fossilized remains of the musculoskeletal system (cranial, axial, and appendicular skeletons). Special attention given to the evolution of vertebrate feeding, locomotor, and sensory systems. Prerequisite: E&EB 225, or with permission of instructor.  sc  1½ Course cr
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 350a, Rock Formation in Mountain Belts  Jay Ague
The fundamental principles governing the formation of metamorphic and igneous rocks during mountain building. Topics include processes of heat and mass transfer in orogenic belts, generation of igneous rocks in continental and subduction settings, ultrahigh pressure and ultrahigh temperature metamorphism, spatial and temporal patterns of petrologic processes throughout geologic time, and pressure-temperature-time paths of metamorphic and igneous rocks. Prerequisites: EPS220 and introductory college-level calculus and chemistry, or with permission of instructor.

EPS 355a, Extraordinary Glimpses of Past Life  Derek Briggs
Study of exceptionally well-preserved fossil deposits (lagerstaetten) 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.  SC

* EPS 362b / ARCG 362b / EVST 362b, Observing Earth from Space  Xuhui Lee
A practical introduction to satellite image analysis of Earth's surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management. Prerequisites: college-level physics or chemistry, two courses in geology and natural science of the environment or equivalents, and computer literacy.  QR, SC

EPS 375b, Evolution of Lizards  Jacques Gauthier
Comprehensive review of the phylogeny, morphology, biogeography, behavior, fossil record, and evolution of Lizards (sks Squamata), the most diverse clade (11,182 species) of land egg-laying vertebrates. Prerequisites: BIOL 104, EPS 125, EPS 270, or permission of the instructor.  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 487a or b, Individual Study in Earth and Planetary Sciences  Pincelli Hull
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 and EPS 489b, Research in Earth and Planetary Sciences  Pincelli Hull
  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 or b and EPS 491a or b, Research and Senior Thesis  Pincelli Hull
  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
  start of the senior year. The plan requires approval of the full EPS faculty.

* EPS 492a or b, The Senior Essay  Pincelli Hull
  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.