EARTH SCIENCES (EAR)

EAR 100 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

EAR 104 Earth Sciences Laboratory (1 Credit)
Arts & Sciences
Laboratory exploration of the Earth Sciences. Topics include: principles of rock and mineral identification, plate tectonics, earthquakes, volcanoes, geologic time, and field trips. Students may not receive credit for both EAR 104 and 110.
Coreq: EAR 105

EAR 105 Earth Science (3 Credits)
Arts & Sciences
Processes that shape Earth and affect humans: Earth's structure; plate tectonics; geologic time; and surficial processes. Students needing laboratory credit must register for EAR 104. Students may not receive credit for EAR 105 and 110.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 106 Geohazards & Natural Disasters (4 Credits)
Arts & Sciences
Investigation of Earth processes that create geohazards, such as earthquakes, volcanic eruptions, floods, climate change, and environmental contamination, and how specific research can inform policy and decision-making to mitigate their impact on humans.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/)

EAR 110 Dynamic Earth (4 Credits)
Arts & Sciences
Chemical, physical and biological processes and principles affecting the history and development of the Earth. Lectures, laboratory, and field trips. Students may not receive credit for both EAR110, EAR101, and 105. Recommended for majors.

EAR 111 Climate Change Past and Present (3 Credits)
Arts & Sciences
Introduction to the science of climate change from the geological record of the last century. Major drivers of global climate, measuring change, and forecasting future climate. Role of human activities in present climate.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 117 Oceanography (3 Credits)
Arts & Sciences
A comprehensive introduction to the geology, physics, chemistry, and biology of the world ocean and its impact on global climate and environmental concerns.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 180 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the SU academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

EAR 190 Independent Study (1-6 Credits)
Arts & Sciences
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

EAR 200 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

EAR 201 Introduction to Earth and Environmental Data Analysis (2 Credits)
Arts & Sciences
An introduction to basic data analysis, quantitative and computer skills necessary to succeed in geoscience careers. Topics include basic statistics, working with data and visualization, databases, surface contouring and modeling, basic GIS principles, and simple modeling of geologic processes.
Prereq: EAR 105 or EAR 203
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 203 Earth System Science (4 Credits)
Arts & Sciences
An integrated view of interactions among Earth's systems (lithosphere, biosphere, hydrosphere, atmosphere) and the timescales over which they operate. Topics covered in this course include: plate tectonics, atmospheric circulation, oceanic circulation, the greenhouse effect, the carbon cycle, the origin of the earth and life, and climate.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 204 Introduction to Field Methods in Earth and Environmental Sciences (2 Credits)
Arts & Sciences
Introduction to field methods in earth and environmental sciences. Topics include basic field observation, description of geological features and collection of data. Students learn traditional methods and are introduced to modern approaches involving digital data collection/analyses.
Prereq: EAR 105/104 or EAR 203

EAR 205 Water and Our Environment (3 Credits)
Arts & Sciences
Investigates origin, occurrence, chemistry and hydrology of water on earth. Includes climate change, contamination and water supply issues within context of water sustainability.
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 210 History of Earth and Life (4 Credits)
Arts & Sciences
Major transitions in the surface environments of our planet and the life that occupies them over the last 4.5 billion years. Evolutionary radiations, mass extinctions, climate change, plate tectonics, mountain building. Lectures, labs, field trip.
Prereq: EAR 101 or 110 or 203 or (EAR 104 and 105)
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 225 Volcanoes and Earthquakes (3 Credits)
Arts & Sciences
Examination of the geologic nature of volcanoes and earthquakes as they are related to plate tectonic activity in the Earth. Discussion of related societal hazards.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 270 Experience Credit (1-6 Credits)
Arts & Sciences
Participation in a discipline or subject related experience. Student must be evaluated by written or oral reports or an examination. Permission in advance with the consent of the department chairperson, instructor, and dean. Limited to those in good academic standing.
Repeatable

EAR 280 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

EAR 290 Independent Study (1-6 Credits)
Arts & Sciences
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable

EAR 296 Oceanography & Limnology (1 Credit)
Arts & Sciences

EAR 300 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

EAR 305 The Energy Transition: Earth and Environmental Sciences (3 Credits)
Arts & Sciences
Science of energy in the 21st century, from an Earth Science perspective: Climatology of wind/solar energy; Hydrocarbons-conventional/unconventional resources; Geothermal power; Geology of Uranium; Oceanography of tidal power; Hydroelectric power; Ocean/Lake Source Cooling; Carbon Capture, Utilization and Sequestration: Critical Minerals for the Energy Transition
Prereq: EAR 105 OR EAR 106 OR EAR 111 OR EAR 117 OR EAR 203 OR EAR 225 OR EAR 205

EAR 309 Honor Tutorial Geology (1-6 Credits)
Arts & Sciences
Selected topics under guidance of senior staff members. Open only to students in the Honors Program.

EAR 311 Environmental Geophysics (4 Credits)
Arts & Sciences
An introduction to the study of the Earth's near surface using geophysical methods and quantitative data analysis, specifically: seismic reflection and refraction, gravity, magnetic, electrical and electromagnetic methods. Participation in geophysical field survey is required.
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 314 Mineralogy (4 Credits)
Arts & Sciences
Introduction to the distribution of minerals within the Earth, mineral properties (crystallography, crystal chemistry and structure), and the processes that form them. Methods used to identify minerals in hand specimens and an introduction to the techniques of optical mineralogy. Lecture, laboratory and fieldtrips.
Prereq: EAR 210 Coreq: CHE 106 and 107 and (MAT 194 or MAT 285 or MAT 295)
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 317 Sedimentary Processes and Systems (4 Credits)
Arts & Sciences
Ancient sedimentary rocks and their modern analogs. Physical and chemical aspects of sedimentation and diagenesis. Introduction to sedimentary basins. Economic resources of sedimentary systems. Lecture, laboratory, and field trips. Students should have background knowledge of mineralogy and the history of Earth and life.
Prereq: EAR 210 and CHE 106 and CHE107 and (MAT 194 or MAT 285 or MAT 295)

EAR 325 Introduction to Paleontology (4 Credits)
Arts & Sciences
Patterns and processes of evolution as expressed in the fossil record. Macroevolution, diversification of major skeletonized phyla, evolutionary paleoecology, and mass extinctions. Lecture, laboratory, and field trips.
Prereq: EAR 102 or 210 or BIO 345 or EFB 311 or EFB 320
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 333 Structural Geology (4 Credits)
Arts & Sciences
Concepts of structural analysis of rocks, stress and strain, rock deformation mechanisms, geologic structures, their properties, and how they are formed. Three lectures and one laboratory a week, field trips including some weekends. Knowledge of trigonometry and geometry required.
Prereq: EAR 210 and 314 and CHE 106 and CHE 107 and (MAT 194 or MAT 285 or MAT 295) Coreq: EAR 317
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 380 International Course (1-12 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

EAR 400 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

EAR 401 Hydrogeology (3 Credits)
Arts & Sciences
Double-numbered with EAR 601
Fundamentals of groundwater hydraulics. Aquifer flow systems analysis and evaluation. Groundwater-surfacewater relationships. Groundwater chemistry. Additional work required of graduate students.
Prereq: MAT 194 or MAT 285 and PHY 211
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 402 Numerical Methods in Geosciences (3 Credits)
Arts & Sciences
Double-numbered with EAR 602
Numerical methods and data analysis in geosciences using MATLAB. Topics will include basic statistics for univariate and bivariate datasets including linear regression and interpolation, time-series analysis, the discrete Fourier transform, numerical integration and finite differences. Additional work required of graduate students.
Prereq: EAR 110 or EAR 105 or EAR 203; Coreq: MAT 285 or MAT 295
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 403 Geomorphology (3 Credits)
Arts & Sciences
Double-numbered with EAR 603
Landscape formation and evolution as a function of hydrogeologic, glacial, eolian, and tectonic processes acting on Earth materials. Lecture, labs, and field trips, including some weekends. Additional work required of graduate students.
Prereq: EAR 101 or 110 or 203 or (EAR 104 and 105)
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 404 Advanced Structural Geology (3 Credits)
Arts & Sciences
Double-numbered with EAR 604
Selected topics in structural geology and tectonics focusing on the mechanics and kinematics of lithospheric deformation. Fundamentals of stress, strain, brittle and ductile deformation, microstructures and rheology. Additional work required of graduate students
Prereq: EAR 314 and 333

EAR 405 Global Change:Geologic Record (3 Credits)
Arts & Sciences
Double-numbered with EAR 605
The geologic record provides perspective for evaluating future global change. This course will focus on the evolution of climate through Earth's 4.6 billion years and how this record is preserved in ancient rocks and sediments.
Prereq: EAR 101 or 110 or 203 or (EAR 104 and 105)
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 406 Reflection Seismology: Theory and Practice (3 Credits)
Arts & Sciences
Double-numbered with EAR 606
Students will develop a working understanding of the strengths and pitfalls of the method through classroom lectures, exercises, and hands-on data processing using PROMAX seismic processing software.
Prerequisites: coursework/experience in geophysics/permission of instructor. Additional work required of graduate students.

EAR 407 Climate Change and Human Origins (3 Credits)
Arts & Sciences
Cross-listed with ANT 439
Double-numbered with EAR 607, ANT 639
This course considers the influence of long term climate changes on hominid evolution and human adaptation, as well as how abrupt climate events and transitions may have impacted the distribution of human populations, the development of agriculture, human conflict and societal change. Additional work required of graduate students.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/)

EAR 408 Sedimentary Basin Analysis (3 Credits)
Arts & Sciences
Double-numbered with EAR 608
Analysis of sedimentary basins in various tectonic settings, including the study of crustal and surficial processes. Uses techniques of subsurface analysis including the interpretation of seismic reflection data sets. Additional work required of graduate students.
Prereq: EAR 317

EAR 409 Senior Thesis in Earth Science (3-6 Credits)
Arts & Sciences
Independent, hypothesis-driven research involving investigative tools and techniques in the Earth Sciences. Students must submit a written thesis to the department and give a public seminar.

EAR 410 Applications of GIS in the Earth Sciences (3 Credits)
Arts & Sciences
Double-numbered with EAR 610
Introduction to some of the many uses of image and topographic data within a geographic information system (GIS) to extract information relevant to the study of the Earth. Additional work required of graduate students.

EAR 413 Physical Hydrology (3 Credits)
Arts & Sciences
Cross-listed with CEE 413
Double-numbered with CEE 613, EAR 613
Fundamentals of watershed hydrology presented from a physical hydrology perspective; course topics include: the water cycle, hydrologic processes, streamflow generation, groundwater-surface water interactions, and introduction to hydrologic modeling concepts. Additional work required of graduate students.
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 414 The Holocene: Climate and Environmental Change (3 Credits)
Arts & Sciences
Double-numbered with EAR 614
This course introduces students of all disciplines to the science behind our understanding of Earth¿s climate and environmental changes during the past 12,000 years. Lectures and discussions focus on interactions between climate, landscapes, and humans. Additional work required for graduate students.
Shared Competencies: Critical and Creative Thinking (https://coursecatalog.syracuse.edu/shared-competencies/critical-and-creative-thinking/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 415 Introduction to Climate Dynamics (3 Credits)
Arts & Sciences
Double-numbered with EAR 615
The course introduces the physical principles underlying the climate system. Topics include Earth's energy balance; circulation; climate variability; climate feedbacks and climate change, observational evidence of climate change. Additional work required for graduate students.
Shared Competencies: Information Literacy and Technological Agility (https://coursecatalog.syracuse.edu/shared-competencies/information-literacy-and-technological-agility/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 416 Practicum in Earth and Environmental Scientific Communication (2 Credits)
Arts & Sciences
Double-numbered with EAR 616
Being able to effectively communicate is an essential part of being a successful scientist. In this practicum you will learn techniques to refine your scientific communication skills (oral, written, and graphical). Additional work is required for graduate students.
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/)

EAR 417 Geochemistry (3 Credits)
Arts & Sciences
Double-numbered with EAR 617
Chemistry of Earth processes, including basic thermodynamics, solution chemistry, isotopic chemistry, and kinetics; magmatic crystallization, isotope fractionation, formation of carbonate and evaporitic sediment, ion exchange in clays, and Cosmochemistry.
Prereq: EAR 210 and CHE 116 and CHE 117
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 418 Petrology (4 Credits)
Arts & Sciences
Double-numbered with EAR 618
Introduction to the origin of igneous, metamorphic, and sedimentary rocks. Classifications, compositions, tectonic setting, and processes governing the distribution of rocks within the Earth. Lecture, laboratory, and fieldtrips. Additional work required of graduate students.
Prereq: EAR 314

EAR 419 Environmental Aqueous Geochemistry (3 Credits)
Arts & Sciences
Double-numbered with EAR 619
Fundamentals of aqueous geochemistry in ground water and surface water in the context of carbonate and silicate dissolution, reactions governing metal oxidation and reduction, mixing of waters and isotopic characterization. One year of college chemistry required. Additional work required of graduate students.
Advisory recommendation Prereq: CHE 106 and CHE 107
Shared Competencies: Communication Skills (https://coursecatalog.syracuse.edu/shared-competencies/communication-skills/); Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 420 Contaminant Hydrogeology (3 Credits)
Arts & Sciences
Double-numbered with EAR 620
Fundamentals of solute transport, major classes of groundwater contamination, remediation strategies, natural attenuation characterization, fingerprinting of contaminant types. Additional work required of graduate students.
Prereq: CHE 106 and (PHY 211 or EAR 401)

EAR 422 Applications of Electron Probe Microanalysis (3 Credits)
Arts & Sciences
Double-numbered with EAR 622
Learn practical aspects of sample preparation, perform electron probe microanalysis for research projects, develop theoretical background of electron specimen interactions for imaging and X-ray spectroscopy, and interpret results. Additional work for graduate students.
Prereq: EAR 314 and CHE 106 and CHE 107

EAR 423 Stable Isotope Geochemistry (3 Credits)
Arts & Sciences
Double-numbered with EAR 623
A survey of the chemical, physical and biological factors controlling stable isotope distributions with applications to the Earth and environmental sciences. Additional work for graduate students.
Prereq: CHE 106 and CHE 107

EAR 425 Statistics in Earth and Environmental Sciences (3 Credits)
Arts & Sciences
Double-numbered with EAR 625
This course introduces students to the art and science of statistics in the Earth and environmental sciences. Students will explore and analyzing data using a variety of statistical methods with data and practical examples from the earth and environmental sciences. The course introduces statistical computing in the R language. Additional work required of graduate students.
Prereq: EAR 201 and EAR 210

EAR 428 Seminar in Environmental Science (3 Credits)
Arts & Sciences
Cross-listed with BIO 428
Seminar for students following the environmental science curriculum. Students will work together to critically evaluate, and propose solutions to, current environmental problems using a combination of reading, class discussion, written analyses, and oral presentations.

EAR 429 Topics in Paleobiology (3 Credits)
Arts & Sciences
Double-numbered with EAR 629
Current research in paleobiology with a topical focus. Subjects might include macroevolution, evolutionary paleoecology, extinctions and radiations, stratigraphic paleontology, etc. Additional work required of graduate students.
Repeatable 3 times for 9 credits maximum
Prereq: EAR 325

EAR 430 Topics in Thermochronology & Tectonics (2 Credits)
Arts & Sciences
Double-numbered with EAR 630
Seminar will focus on research topics in thermochronology and tectonics from current literature. Additional work required of graduate students.
Repeatable 4 times for 8 credits maximum

EAR 431 Plate Tectonics (3 Credits)
Arts & Sciences
Double-numbered with EAR 631
Tectonic development of the Earth; definition of plates, their boundaries, motions, and driving forces. Analysis and modeling of plate motions. Additional work required of graduate students.
Coreq: EAR 314 and 333
Shared Competencies: Scientific Inquiry and Research Skills (https://coursecatalog.syracuse.edu/shared-competencies/scientific-inquiry-and-research-skills/)

EAR 432 Seafloor Spreading and Oceanic Lithosphere (3 Credits)
Arts & Sciences
Double-numbered with EAR 632
An investigation of the products and processes of seafloor spreading from the perspective of geological and geophysical studies of mid-ocean ridge spreading centers, oceanic lithosphere and ophiolite complexes. Additional work required of graduate students.
Prereq: EAR 314 and 333

EAR 433 Topics in Active Tectonics (2 Credits)
Arts & Sciences
Double-numbered with EAR 633
The use of modern methods to study tectonic processes along active plate margins, focusing on the evolution of topography expressed in orogen and basin development, including the style and accommodation of crustal and mantle deformation. Additional work required of graduate students
Repeatable 3 times for 6 credits maximum
Prereq: EAR 333 or 431

EAR 435 Geophysics (3 Credits)
Arts & Sciences
Double-numbered with EAR 635
Fundamental geophysical parameters; seismology and Earth structure; gravity and magnetic fields with application of potential theory; terrestrial rotation and shape; heat flow, thermal state, and evolution of the Earth. Additional work required of graduate students.
Prereq: MAT 285 or MAT 295 or PHY 211

EAR 443 Advanced Topics in Geomorphology (3 Credits)
Arts & Sciences
Double-numbered with EAR 643
This course presents selected papers from the literature that contribute to current thought in geomorphology and later focus on a topic that can vary from year to year. Additional work required of graduate students.
Repeatable 2 times for 6 credits maximum
Prereq: EAR 403

EAR 444 Thermochronology (3 Credits)
Arts & Sciences
Double-numbered with EAR 644
Methods used in Earth Sciences to determine temperature-time histories of crustal terranes including 40Ar/39Ar, fission track, and U-Th/He techniques. Diffusion theory and applications of thermochronology to tectonics and landscape evolution, P-T-t paths of crustal terranes. Additional work required of graduate students.

EAR 455 Geochemical Patterns in the History of Earth and Life (3 Credits)
Arts & Sciences
Double-numbered with EAR 655
Insights gained from the geochemistry of fossils and sedimentary sequences into the history of the Earth's surface. Emphasis on relationships between the biological world and the physical environment as revealed through stable and radiogenic isotopes and elemental chemistry. Additional work required of graduate students.
Prereq: EAR 325 and 417

EAR 470 Experience Credit (1-6 Credits)
Arts & Sciences
Participation in a discipline- or subject-related experience. Students must be evaluated by written or oral reports or an examination. Limited to those in good academic standing.
Repeatable

EAR 478 Isotope Geology (3 Credits)
Arts & Sciences
Double-numbered with EAR 678
Isotope geochemistry is used in all branches of Earth Sciences. This course covers the following topics: Radioactive decay, Rb-Sr, Sm-Nd, and Lu-Hf isotope geochemistry; U-Pb geochronology, 14C dating; O, H, and C isotope geochemistry. Additional work required of graduate students.
Prereq: EAR 417

EAR 479 Introduction to Unmanned Aerial Vehicles: Research & Applications (3 Credits)
Arts & Sciences
Cross-listed with GEO 479
Double-numbered with EAR 679, GEO 679
Introduction to UAV operations, including FAA airspace, platforms and sensors; flight planning, data collection, image processing, and data analysis for geospatial mapping. Applications and societal impacts, including legal, safety, privacy, ethical issues. Additional work required of graduate students.

EAR 480 International Course (1-6 Credits)
Arts & Sciences
Offered through SUAbroad by educational institution outside the United States. Student registers for the course at the foreign institution and is graded according to that institution's practice. SUAbroad works with the S.U. academic department to assign the appropriate course level, title, and grade for the student's transcript.
Repeatable

EAR 483 Departmental Colloquium (1 Credit)
Arts & Sciences
Double-numbered with EAR 683
Students attend the Department of Earth Sciences colloquium lectures and write up summaries of a subset of talks. Provides exposure to current research in a wide array of Earth Science disciplines. Additional work required of graduate students.
Repeatable 3 times for 3 credits maximum

EAR 485 Societal Approaches to Environmental Problem Solving I (3 Credits)
Arts & Sciences
Repeatable 2 times for 6 credits maximum

EAR 490 Independent Study (1-6 Credits)
Arts & Sciences
In-depth exploration of a problem or problems. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor or instructors and the department.
Repeatable

EAR 499 Honors Capstone Project (1-3 Credits)
Arts & Sciences
Completion of an Honors Capstone Project under the supervision of a faculty member.
Repeatable 3 times for 3 credits maximum

EAR 500 Selected Topics (1-6 Credits)
Arts & Sciences
Exploration of a topic (to be determined) not covered by the standard curriculum but of interest to faculty and students in a particular semester.
Repeatable

EAR 507 Experimental Skills (0 Credits)
Arts & Sciences

EAR 510 Paleolimnology (3 Credits)
Arts & Sciences
The records of environmental change contained within lake sediments. Basic background in limnology followed by field/laboratory research projects and presentations. Upper division undergraduate science majors.

EAR 544 Quaternary Environmental and Climate Change (3 Credits)
Arts & Sciences
Proxy records from marine, lacustrine, glacial, and terrestrial environments for climate and environmental change during the Quaternary. Comparison with numerical models of atmosphere and oceans. Discussion of current literature and the potential for future global change.

EAR 590 Independent Study (1-3 Credits)
Arts & Sciences
Exploration of a problem, or problems, in depth. Individual independent study upon a plan submitted by the student. Admission by consent of supervising instructor(s) and the department.
Repeatable