Earth and Environmental Sciences encompasses an interdisciplinary suite of studies, all engaged to better understand the Earth and the environmental problems facing us. By integrating principles of physics, chemistry, biology, and mathematics, as well as quantitative and critical thinking skills, our graduates address geological and environmental issues related to the solid earth, the biosphere, hydrosphere, and the atmosphere. We are a department focused on providing students with opportunities to conduct applied and basic research in an effort to understand physical processes on and within the Earth and human influences that affect the environment.

The department offers three undergraduate degrees and two graduate degrees at the master’s level. The BS in environmental science prepares students for careers in areas such as pollution remediation, resource conservation, or environmental management, as well as providing a firm foundation for graduate studies. Graduates with the BS in geology have gone on to careers in soil and water resources, mining, environmental protection, and as park naturalists. The geosciences BS prepares students for careers in K-12 education. Graduate students use their advanced degrees to further their careers in the geological and environmental sciences, working for both public and private agencies. In keeping with the interdisciplinary nature of the department, the faculty represent diverse academic areas, complemented by industrial experience. All have a strong commitment to excellence in teaching and engage in professional development.

Experience
Our department offers many opportunities for students outside the classroom. Our student group, the Association of Geological and Environmental Students (AGES), is open everyone. AGES hosts several off-campus field trips each semester. Many majors are also members of national organizations such as the American Geophysical Union, Groundwater Resources of America, American Meteorological Society, and the Geological Society of America. Lecture courses are accompanied by laboratories, discussions, and field trips. Internships and work experience are also available.

Students have many opportunities to engage in research with faculty. We are very proud of the excellent research facilities we have developed over the years with support from national funding sources such as the National Science Foundation, National Oceanic and Atmospheric Administration, and NASA. Department equipment and facilities are extensive and include equipment for field and laboratory work in environmental science, geology, and hydrology/hydrogeology including cutting edge geochmical analysis, field environmental sensors, and tools for studying wind and atmospheric turbulence. In recent years, our undergraduate students have been involved in a number of research studies from the effects of local wildfires to modeling volcanic eruptions and international projects in Europe, South America, and Africa.

Outlook
Employment opportunities are excellent and growing as society accepts the challenges we face with climate change and loss of water resources. Our graduates work for agencies such as the California Department of Water Resources, the United States Geological Survey, and the Environmental Protection Agency. Graduates are also employed by private companies specializing in mineral and petroleum exploration, engineering or environmental consulting, and pollution remediation. Graduates with a bachelor’s degree find entry-level positions which involve gathering and interpreting scientific data, while management and field-oriented research positions generally require a master’s degree.

Programs
Undergraduate
Bachelor’s
• Environmental Science BS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/earth-environmental-sciences/environmental-science-bs/)
• Geology BS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/earth-environmental-sciences/geology-bs/)
• Geosciences BS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/earth-environmental-sciences/geosciences-bs/)

Minors
• Geology Minor (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/earth-environmental-sciences/geology-minor/)

Credentials

Graduate
Master’s
• Environmental Science MS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/earth-environmental-sciences/environmental-science-ms/)
• Geosciences MS (https://catalog.csuchico.edu/colleges-departments/college-natural-sciences/earth-environmental-sciences/geosciences-ms/)

See Course Description Symbols and Terms (https://catalog.csuchico.edu/academic-standards-policies/course-description-symbols-terms/) for an explanation of course description terminology and symbols, the course numbering system, and course credit units.
ERTH 101 Our Changing Planet  
Typically Offered: Fall and spring
Earth materials, processes, and history, and their significance to humans in California and societies around the world. No college credit for students who have passed ERTH 102. 2 hours activity, 2 hours lecture. (004067)
Grade Basis: Laboratory Activity (B3); Physical Science (B1)
General Education: Physical Science (B1)
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division; Sustainable Course

ERTH 102 Physical Geology  
Prerequisite: High school chemistry or physics is recommended; students with no previous science courses are advised to enroll in ERTH 101. No college credit for those who have passed ERTH 101.
Typically Offered: Fall and spring
Physical and chemical processes in the earth, including origin and identification of rocks and minerals; earth’s interior; movements and major features of the earth’s crust; erosion and sedimentation; geological structures; topographic maps; mineral resources. 3 hours laboratory, 2 hours lecture. (004069)
General Education: Laboratory Activity (B3); Physical Science (B1)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division; Sustainable Course

ERTH 104 Inquiry into the Science of Climate Change  
Typically Offered: Fall and spring
An experiential course that develops skills in critical thinking through inquiry into and analysis of arguments about climate change science (e.g. greenhouse effect, fossil fuels, evidence for human-caused global warming, predictions of our climate future, climate change solutions, etc.). 3 hours lecture. (021130)
General Education: Critical Thinking (A3)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

ERTH 110 Oceanography  
Typically Offered: Fall and spring
Introduction to the ocean environment with a special emphasis on exploring the interactions between the geological, physical, chemical and biological processes. Topics include how ocean basins developed and changed over geological time scales and how the properties of seawater are linked and provide the foundation for marine life, motion, and climate. 2 hours activity, 2 hours lecture. (021716)
General Education: Laboratory Activity (B3); Physical Science (B1)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

ERTH 130 Introduction to Environmental Science  
Typically Offered: Fall and spring
An introduction to human impact upon planet Earth. Scientific principles applied to air pollution, water pollution, and solid and radioactive waste problems. Population dynamics, world hunger, and environmental issue analysis are also covered. 2 hours activity, 2 hours lecture. (004131)
General Education: Laboratory Activity (B3); Physical Science (B1)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division; Sustainable Course

ERTH 165 Principles of Environmental Science  
Typically Offered: Fall only
An introduction to environmental science as an integrative field of study and its parent disciplines. Field and laboratory techniques are introduced through examination of case studies. Students learn about the various professions engaged in environmental and resource management. 3 hours laboratory, 1 hour lecture. (020687)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Lower Division; Sustainable Course

ERTH 170 Atmospheric Science  
Typically Offered: Spring only
Composition and mean vertical structure of the atmosphere, energy and warming and cooling of the atmosphere and the surface, atmospheric water vapor, cloud types, static stability, the formation of clouds, precipitation, air pressure, and wind. 3 hours lecture. (004130)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

ERTH 198 Special Topics  
Typically Offered: Fall and spring
This course is for special topics. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3 hours discussion. (004136)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Lower Division

ERTH 199 Special Problems  
Typically Offered: Fall only odd years
This course is an independent study of special problems. 9 hours supervision. (020352)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Lower Division

ERTH 203 Principles of Historical Geology  
Typically Offered: Fall only odd years
Principles of historical geology as they relate to rock sequences and geologic maps. 3 hours laboratory, 2 hours lecture. (004070)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division

ERTH 265 Soils and Surficial Processes  
Typically Offered: Fall only
In-depth survey of the hydrologic cycle, and soil systems. Interactions between these systems are examined through case studies. 3 hours laboratory, 2 hours lecture. (020723)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Lower Division; Sustainable Course
### Earth and Environmental Sciences

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Offered</th>
<th>Prerequisite</th>
<th>Grade Basis</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 289</td>
<td>Geoscience Internship</td>
<td></td>
<td>Fall and spring</td>
<td>This course is an internship. You must register directly with a supervising faculty member. 9 hours supervision. (021015)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 15 units</td>
</tr>
<tr>
<td>ERTH 299</td>
<td>Special Problems</td>
<td>1-3</td>
<td>Fall and spring</td>
<td>Study of the identification and origins of the more common minerals and rocks. (1-3 units)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 6 units</td>
</tr>
<tr>
<td>ERTH 300W</td>
<td>Earth System Science (W)</td>
<td>3</td>
<td></td>
<td>Study of Earth System Science. (1-3 units)</td>
<td>Grade/No Credit</td>
<td>You may take this course for a maximum of 3 units</td>
</tr>
<tr>
<td>ERTH 303</td>
<td>Invertebrate Paleontology</td>
<td>3</td>
<td></td>
<td>Study of invertebrate fossils and their uses in strata. (2 hours lecture)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
</tr>
<tr>
<td>ERTH 304</td>
<td>Atmospheric Science II</td>
<td>3</td>
<td></td>
<td>Study of air masses and fronts, midlatitudes cyclones. (2 hours lecture)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
</tr>
<tr>
<td>ERTH 306</td>
<td>Mineralogy and Lithology</td>
<td>4</td>
<td></td>
<td>Study of mineralogy and lithology. (2 hours lecture)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
</tr>
<tr>
<td>ERTH 307</td>
<td>Stratigraphy</td>
<td>3</td>
<td></td>
<td>Study of stratigraphy. (2 hours lecture)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
</tr>
<tr>
<td>ERTH 310</td>
<td>Geological Field Reconnaissance</td>
<td>2</td>
<td></td>
<td>Study of geological field. (2 hours lecture)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 4 units</td>
</tr>
<tr>
<td>ERTH 315</td>
<td>Pollution Science</td>
<td>3</td>
<td></td>
<td>Study of pollution science. (2 hours lecture)</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
</tr>
<tr>
<td>ERTH 320</td>
<td>Water Equity and Power</td>
<td>3</td>
<td>GE Oral Comm.</td>
<td>Study of water equity and power. (2 hours lecture)</td>
<td>Upper Division</td>
<td>You may take this course for a maximum of 3 units</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Comm. (A1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Typically Offered:**
- Fall and spring
- Spring only
- Fall only
- Fall only even years
- Fall and spring vacation; and additional work or classroom meetings.

**Prerequisites:**
- ERTH 102 or course in biology.
- ERTH 101 or ERTH 102.
- ERTH 203 and ERTH 306 (both may be taken concurrently), or faculty permission.
- ERTH 203 and ERTH 306 (both may be taken concurrently), or faculty permission.
- Faculty permission.
- ERTH 310 or ERTH 265.
- CHEM 107 or CHEM 111; ERTH 265.
- CHEM 107 or CHEM 111; ERTH 265.
- Faculty permission.
- Faculty permission required to take the course a second time for credit.

**General Education Requirements:**
- Upper-Division Scientific Inquiry/Quantitative Reasoning (UBD)
- General Education: Upper-Division Scientific Inquiry/Quantitative Reasoning (UBD)

**Additional Information:**
- GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
- General Education: Upper-Division Scientific Inquiry/Quantitative Reasoning (UBD)
- GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.

**Course Attributes:**
- Upper Division
- Sustainable Course
- Writing Course
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Prerequisite</th>
<th>Typically Offered</th>
<th>General Education</th>
<th>Grade Basis</th>
<th>Repeatability</th>
<th>Course Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 321</td>
<td>Introduction to Meteorology</td>
<td>3</td>
<td>ERTH 170.</td>
<td>Fall only</td>
<td>Survey of physical and dynamic meteorology. Topics covered include thermodynamics,</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper-Division Scientific Inq/Quant Reason (UDB); Sustainability and Climate Change Pathway</td>
</tr>
<tr>
<td>ERTH 322</td>
<td>Mineral Resources</td>
<td>3</td>
<td>ERTH 102 or equivalent.</td>
<td>Fall and spring</td>
<td>Where do the 82 elements in our cell phones come from? Why do we see the scars of</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
<tr>
<td>ERTH 325</td>
<td>Geology of California</td>
<td>3</td>
<td>ERTH 101 or ERTH 102.</td>
<td>Spring only even years</td>
<td>Geologic setting of California and historical development of its geologic</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
</tr>
<tr>
<td>ERTH 330</td>
<td>Environmental Science</td>
<td>3</td>
<td>GE Oral Communication (A1); GE Written Communication (A2); GE Critical</td>
<td>Spring, summer, fall</td>
<td>Human impact on life-support systems; use of physical and ecological</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division; Sustainable Course</td>
</tr>
<tr>
<td>ERTH 330W</td>
<td>Environmental Science (W)</td>
<td>3</td>
<td>GE Oral Communication (A1); GE Written Communication (A2); GE Critical</td>
<td>Fall and spring</td>
<td>Human impact on life-support systems; use of physical and ecological</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division; Sustainable Course</td>
</tr>
<tr>
<td>ERTH 341</td>
<td>Teaching Practicum in Geological and Environmental</td>
<td>3</td>
<td>ERTH 102 or SCED 342.</td>
<td>Inquire at department</td>
<td>This course provides students with classroom experience that utilizes a</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division; May be repeated</td>
</tr>
</tbody>
</table>
ERTH 342 Concepts in Earth and Space Science 3 Units
Prerequisite: SCED 141, SCED 142, GE Physical Sciences (B1), or GE Life Sciences (B2). Open to Liberal Studies online students only.
Typically Offered: Fall and spring
This course is for future elementary/middle school teachers and designed to meet the Elementary Subject Matter Standards required by the California Commission on Teacher Credentialing. The overall goal is to provide a learning environment that fosters content knowledge and interest in teaching earth and space science and appreciation for the role that science plays in our everyday lives. 3 hours lecture. (022004)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 352 Recovery of Altered Ecosystems 3 Units
Prerequisite: BIOL 350W (may be taken concurrently), ERTH 265 and ERTH 315 (may be taken concurrently).
Typically Offered: Spring only
This course provides students with an understanding of the role of stresses and disturbances in aquatic and terrestrial ecosystems and natural processes of recovery. Students are introduced to the practices used to modify, restore, and remediate ecosystems altered by human activities and develop a restoration program for a nearby, altered ecosystem that contains both land and water components. In addition, we discuss policy and regulations as they relate to specific projects. 3 hours laboratory, 2 hours lecture. (021925)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 353 Environmental Fluid Mechanics 3 Units
Prerequisite: MATH 109 or MATH 120; PHYS 202A or PHYS 204A.
Typically Offered: Fall only odd years
Fluids (gases and liquids) are ubiquitous and play central roles in shaping the environment and transporting heat, momentum, pollutants, and constituents that support life and control climate. This course provides students with an introduction to fundamental concepts in fluid mechanics and an illumination of the vital and fascinating, and often non-intuitive, world of fluid phenomena. 3 hours lecture. (022002)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 355 Natural Disasters 3 Units GE
Prerequisite: GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Physical Sciences (B1), GE Life Sciences (B2); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
The purpose of this course is to provide students with the material and opportunity to learn the science behind geological and natural disasters and gain an appreciation of how these events shape both our lives and the development of societies with specific reference to California. The course focuses on, but not be limited to, a discussion of how much of a disaster is a natural phenomenon and how much a tragedy is imposed by the designs of populations. Along the way, we develop the methodology of science and build writing and quantitative skills. 3 hours lecture. (004148)
General Education: Upper-Division Scientific Inf/Quant Reason (UDB); California Studies Pathway; Sustainability and Climate Change Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 360 Field Methods 2 Units
Prerequisite: ERTH 306, ERTH 307 with a grade of C- or higher.
Typically Offered: Spring only
Elementary geologic field methods, descriptive geometry, photogeology, and geologic mapping. Ten days in the field during January intersession. 6 hours laboratory. (004074)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Upper Division

ERTH 361W Preparation of the Geological Report (W) 1 Unit W, GW
Prerequisite: GE Written Communication (A2) requirement.
Corequisites: ERTH 360.
Typically Offered: Spring only
This course is a continuation of the writing experience that is initiated in ERTH 360. It deconstructs scientific writing through a re-writing of the ERTH 360 field report and analysis of other examples of geologic articles. 1 hour lecture. (004075)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 1 unit
Course Attributes: Upper Division; Writing Course; Graduation Writing Assessment

ERTH 370W Energy in the Human Environment (W) 3 Units W, GW
Prerequisite: GE Written Communication (A2) requirement; ERTH 170 (may be taken concurrently) or ERTH 306; and PHYS 202A or PHYS 204A (may be taken concurrently).
Typically Offered: Fall only
Analysis of present and long-term global energy crises; coverage of scientific concepts needed to understand energy and its environmental interactions; in-depth examination of alternative energy sources and their environmental impact. 3 hours lecture. (004149)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course; Writing Course; Graduation Writing Assessment

ERTH 375 Geology of Food and Health 3 Units GE
Prerequisite: GE Oral Communication (A1); GE Written Communication (A2); GE Critical Thinking (A3); GE Mathematics/Quantitative Reasoning (B4) requirements, or consent of the instructor.
Typically Offered: Fall and spring
Focuses on the relation between natural geological factors, food production, and health problems in humans and animals on a global scale, and explores the impacts of diverse proposed solutions on population health and public policy. 3 hours lecture. (021128)
General Education: Upper-Division Scientific Inf/Quant Reason (UDB); Agriculture, Food, and Environment Pathway
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 1 unit
Course Attributes: Upper Division; Sustainable Course

ERTH 380 Hydrology 3 Units
Prerequisite: PHYS 202A or PHYS 204A (may be taken concurrently).
Typically Offered: Fall only
A survey of the mass transfer processes and storage elements within the hydrologic cycle: precipitation, interception, surface runoff, infiltration, evapo-transpiration, soil water and groundwater. Quantitative methods for estimating flow and storage, use of probability concepts to predict extreme hydrologic events in a time series. 3 hours laboratory, 2 hours lecture. (004150)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course
ERTH 382 Hydrologic Field Methods [3 Units]
Prerequisite: ERTH 380 (may be taken concurrently) or faculty permission.
Typically Offered: Spring only
This course develops field and related laboratory skills in performing common measurements in surface water and soil water components of the hydrologic cycle. Students learn to critically evaluate the theoretical basis for field methods and hydrologic characterization approaches. 3 hours lecture. (020641)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 398 Special Topics [1-4 Units]
Prerequisite: Department permission.
Typically Offered: Fall and spring
This course is for special topics. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3 hours discussion. (004092)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

ERTH 399 Special Problems [1-3 Units]
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
This course is an independent study of special problems. 3 hours supervision. (004154)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

ERTH 403 Igneous and Metamorphic Petrology [4 Units]
Prerequisite: ERTH 306 with grade of C- or higher.
Typically Offered: Spring only
Physical-chemical development and geotectonic settings of igneous and metamorphic rocks. Analysis of rock thin sections. Field trip required. 4 hours activity, 2 hours lecture. (004097)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

ERTH 408 Structural Geology [4 Units]
Prerequisite: High school or college trigonometry; ERTH 203; ERTH 307 with grade of C- or higher.
Typically Offered: Fall only
Behavior of geologic materials. Folds, faults, small-scale structures in sedimentary, igneous, and metamorphic rocks. Graphic methods. 4 hours activity, 2 hours lecture. (004082)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 4 units
Course Attributes: Upper Division

ERTH 410 Introduction to Watershed Hydrology [3 Units]
Prerequisite: ERTH 380 or prior hydrology course work and consent of instructor.
Typically Offered: Spring only
A survey of the hydrologic processes governing the movement and storage of water at the watershed scale. Emphasis is on computer-based methods for characterizing the physical framework and quantifying the resultant hydrology in terms of its temporal and spatial variability. 3 hours laboratory, 2 hours lecture. (004161)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 415 Hydrogeology [3 Units]
Prerequisite: CHEM 111, ERTH 306, ERTH 380, MATH 120; PHYS 202A or PHYS 204A. Recommended: ERTH 307.
Typically Offered: Spring only
Theory and analysis of groundwater flow, including fluid physics, aquifer properties, soil water, groundwater recharge, hydrogeologic environments, aquifer mechanics, and water quality degradation. 3 hours laboratory, 2 hours lecture. (004102)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 420 Earth Systems Modeling [3 Units]
Prerequisite: BIOL 350W; CHEM 107 or CHEM 111; ERTH 102, ERTH 170, ERTH 265; PHYS 202A, PHYS 204A, or PHYS 341.
Typically Offered: Spring only
This course will seek to understand fundamental earth system processes and interactions on a global scale. Particular emphasis is placed on climate change and its impacts. 3 hours lecture. (021924)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 425 Surficial Processes [3 Units]
Prerequisite: ERTH 101 or ERTH 102; MATH 120; PHYS 202A or PHYS 204A.
Typically Offered: Fall only odd years
A survey of the processes governing uplift and denudation of landscapes, including isostasy, chemical and physical weathering, mass movements, surface water erosion, formation of channels, and flow and sediment transport. 3 hours laboratory, 2 hours lecture. (004152)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 430 Surficial Geology [3 Units]
Prerequisite: ERTH 380 or prior hydrology course work and consent of instructor.
Typically Offered: Spring only
A survey of the surficial geologic processes that govern the movement and storage of water at the watershed scale. Emphasis is on computer-based methods for characterizing the physical framework and quantifying the resultant hydrology in terms of its temporal and spatial variability. 3 hours laboratory, 2 hours lecture. (004161)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course
ERTH 430  Wetland Ecology and Management  3 Units
Prerequisite: Upper division standing in BS Environmental Science, BA Biological Sciences, BS Biological Sciences, BS Microbiology, BA Geography, or BS Agriculture. Highly recommended: BIOL 161 and/or BIOL 350W.
Typically Offered: Fall only even years
This course examines the ecology, management, and restoration of wetland ecosystems, including biotic and abiotic processes, functions, wildlife and policy discussions. We place emphasis on biological, physical, chemical, and ecological aspects of major wetland ecosystems found in North America. We also discuss ecosystem services, wetland classification/delineation, legal protection of wetlands, and the relationship between wetlands and climate change. 3 hours laboratory, 2 hours lecture. (022003)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 435  Boundary Layer Meteorology  3 Units
Prerequisite: MATH 109 or MATH 120; PHYS 202A or PHYS 204A.
Typically Offered: Spring only
The atmospheric boundary layer (ABL) is the lowest part of the Earth’s atmosphere that is in constant contact with the surface of the Earth and responds quickly to the thermal and mechanical forcings. The ABL has a very strong role in the vertical fluxes of heat, momentum, and trace gases. Turbulence is the main physical process by which those fluxes occur and hence statistical descriptions are the norm. Therefore, this course focuses on small scale meteorology (also know as micrometeorology), turbulence, and the behavior of the atmosphere near the surface. 3 hours lecture. (022043)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 436  Volcanology  3 Units
Prerequisite: ERTH 101 or ERTH 102, ERTH 306, or faculty permission.
Typically Offered: Spring only odd years
An introduction to physical processes associated with terrestrial and extraterrestrial volcanoes and their products. Specific topics include volcano monitoring, rheologic properties of magma and volcanic flows, experimental volcanology, theoretical and analog flow modeling, as well as in-depth examination of local volcanoes and various eruptions (past, present, and future). This course includes an extended (4-5 days) field trip, required for all students. Students participate in the field by collecting data for future course projects, presenting prepared information at various field trip stops, or both. Students also complete research projects throughout the semester. 3 hours lecture. (020293)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 440  Environmental Sensing  3 Units
Prerequisite: PHYS 202B, PHYS 204B, or PHYS 204C (may be taken concurrently).
Typically Offered: Fall only
Instruments are critical to making quantitative observations, and observations are critical to the scientific method. The subject of environmental instrumentation is vast and constantly changing as new technologies emerge. Through a combination of lectures and hands-on projects, students are (1) introduced to the process of assembling and characterizing an electronic instrument of their own, (2) forming a hypothesis and testing it by collecting data, and (3) writing reports and giving presentations on their results. 3 hours laboratory, 2 hours lecture. (020639)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 455  Sedimentary Basin Analysis  3 Units
Prerequisite: ERTH 307, ERTH 403 (may be taken concurrently) both with a grade of C- or higher.
Typically Offered: Spring only even years
Study of the paleographic evolution of sedimentary basins. Includes stratigraphic and paleontologic correlation, facies analysis, sedimentary petrology, depositional systems, and the tectonic framework of sedimentary basins. 3 hours laboratory, 2 hours lecture. (004114)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 460  Water Resources Management  3 Units
Prerequisite: ERTH 380 (may be taken concurrently).
Typically Offered: Spring only even years
Water-resources, management plans of world; emphasis on California and Israeli plans. Water plans in primitive, agrarian, and industrial societies. Data gathering and interpretation, regulation of water resources, and control of water pollution. 3 hours lecture. (004168)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 470  Renewable Energy  3 Units
Prerequisite: ERTH 370.
Typically Offered: Fall only odd years
Teach students about the wide range of renewable energy technologies that are available, how they harvest energy from the environment, how they impact the environment, and their varying degrees of competitiveness with fossil fuels. Major forms of renewable energy covered include solar thermal, solar photovoltaics, bioenergy, hydroelectricity, tidal power, wind energy, wave energy, and geothermal energy. Students also gain experience reading, researching, and presenting findings. 3 hours lecture. (021766)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division
ERTH 471 Field Geology 2 Units
Prerequisite: ERTH 360, ERTH 403, ERTH 408 all with grade of C- or higher.
Typically Offered: Spring only
Mapping, recording, and interpreting data in the field; use of Brunton compass and topographic maps emphasized. Reports required. Field work during January Intersession totaling at least 10 days. 6 hours laboratory. (004105)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Upper Division

ERTH 475 Senior Seminar 3 Units
Prerequisite: Senior standing in Environmental Science.
Typically Offered: Spring only
This seminar provides a culminating experience for students to draw on their accumulated content knowledge and skills to address one or more environmental problems. Select problems addressed by students working in interdisciplinary teams. Project plans and timelines described in individually-prepared proposals. Relevant policies and regulations indentified, and this guidance informs student projects. Existing comparative data employed and analyzed to develop project plans and reports. Computer skills employed, possibly including spreadsheets, statistical software, and GIS. 3 hours discussion. (004169)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 480 Seminar in the Geological and Environmental Sciences 1 Unit
Prerequisite: Geological and Environmental Sciences (GEOS) majors only
Typically Offered: Fall and spring
The seminar series engages students in recent research and developments in the Geological and Environmental Sciences, and develops skills in scientific literature retrieval. 1 hour seminar. (021562)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 8 units
Course Attributes: Upper Division; Sustainable Course

ERTH 489 Geoscience Internship 1-3 Units
Typically Offered: Fall and spring
This course is an internship. You must register directly with a supervising faculty member. 9 hours supervision. (021016)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 15 units
Course Attributes: Upper Division

ERTH 489T Internship in Geoscience Teaching 3 Units
Prerequisite: ERTH 101 or ERTH 102, ERTH 203.
Typically Offered: Fall and spring
This is a supervised internship in geoscience teaching which takes place in a local junior high or high school geoscience classroom, supervised by the classroom teacher and by a faculty member of the CSUC Department of Earth and Environmental Sciences. 9 hours supervision. (020620)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division

ERTH 498 Special Topics 1-3 Units
Prerequisite: Department permission.
Typically Offered: Fall and spring
This course is for special topics. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3 hours discussion. (004172)
Grade Basis: Graded
Repeatability: You may take this course more than once
Course Attributes: Upper Division

ERTH 499 Special Problems 1-3 Units
Prerequisite: Faculty permission.
Typically Offered: Fall and spring
This course is an independent study of special problems. You must register directly with a supervising faculty member. 3 hours supervision. (004175)
Grade Basis: Credit/No Credit
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

ERTH 499H Honors Research in the Geosciences 3 Units
Prerequisite: First semester: 9 upper-division units in major, B average, faculty permission. Second semester: B or higher in first semester, faculty permission.
Typically Offered: Fall and spring
An intensive two-semester course in research within a subdiscipline of the physical sciences. Students enroll for 3 units each semester. Open only to students with at least a 3.0 GPA in the major. The course consists of a research project done under the supervision of a faculty member, a formal written paper, and a public presentation. This course may be used to fulfill a maximum of 3 units of the upper-division requirement for the major. 9 hours supervision. (004176)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 6 units
Course Attributes: Upper Division

ERTH 536 Applied Ecology 3 Units
Prerequisite: BIOL 350W, MATH 315.
Typically Offered: Spring only
Examination of the mechanisms, directions, and magnitude of an organism’s or ecosystem’s response to human perturbation. 3 hours discussion. (004166)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course

ERTH 537 Ecohydrology 3 Units
Prerequisite: BIOL 350W, ERTH 380, or instructor consent.
Typically Offered: Spring only odd years
The study of linkages between hydrologic processes and ecosystem functions; field methods for data gathering; hydrologic transport of nutrients and pollutants through ecosystems; case studies of problems in ecohydrology. 3 hours lecture. (020330)
Grade Basis: Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Upper Division; Sustainable Course
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
<th>Grade Basis</th>
<th>Repeatability</th>
<th>Course Attributes</th>
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<tbody>
<tr>
<td>ERTH 565</td>
<td>Geochemistry</td>
<td>3</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
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<td>Prerequisite: CHEM 111, ERTH 102. Recommended: ERTH 306.</td>
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<td>Typically Offered: Fall only even years</td>
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<tr>
<td>Investigation of the chemistry of minerals, rocks, and natural waters. Provides students with interests in geology, hydrology, environmental science, and other disciplines a background on the chemical compositions of rocks, minerals, and natural waters; chemical processes in the formation of rocks and waters; principles of reaction chemistry, thermodynamics, and kinetics applied to geochemical systems; and migration of chemical contaminants in the environment. 3 hours lecture. (004115)</td>
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<td>Grade Basis: Graded</td>
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<td>ERTH 572W</td>
<td>Advanced Field Geology (W)</td>
<td>3</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division, Writing Course, Graduation Writing Assessment</td>
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<tr>
<td>Prerequisite: GE Written Communication (A2) requirement; ERTH 403 with a grade of C- or higher.</td>
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<td>Corequisites: ERTH 471 (winter field - grade of C- or higher).</td>
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<td>Typically Offered: Spring only</td>
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<td>Independent geologic mapping of a difficult area. Report required. Field work on weekends or during spring recess, totaling at least 10 days. 6 hours laboratory. (004107)</td>
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<td>ERTH 580</td>
<td>Geological Evolution of North America</td>
<td>3</td>
<td>Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Upper Division</td>
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<td>Prerequisite: ERTH 408, ERTH 455 (with grade of C- or higher for both).</td>
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<td>Typically Offered: Spring only</td>
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<td>Group study of topics related to the geological evolution of North America. Student presentations and group discussion will focus on common themes or geologic regions. 3 hours lecture. (004170)</td>
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<td>Grade Basis: Graded</td>
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<td>ERTH 598</td>
<td>Special Topics</td>
<td>1-4</td>
<td>Graded</td>
<td>You may take this course more than once</td>
<td>Upper Division</td>
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<td>Prerequisite: Department permission.</td>
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<td>Typically Offered: Fall and spring</td>
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<td>This course is for special topics. Typically the topic is offered on a one-time-only basis and may vary from term to term and be different for different sections. See the Class Schedule for the specific topic being offered. 3 hours discussion. (020063)</td>
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<td>Grade Basis: Graded</td>
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<td>ERTH 599</td>
<td>Special Problems</td>
<td>1-3</td>
<td>Graded</td>
<td>You may take this course for a maximum of 6 units</td>
<td>Upper Division</td>
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<td>Prerequisite: Faculty permission.</td>
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<td>Typically Offered: Fall and spring</td>
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<td>This course is an independent study of special problems. You must register directly with a supervising faculty member. 3 hours supervision. (021283)</td>
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<td>Grade Basis: Credit/No Credit</td>
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<td>Repeatability: You may take this course for a maximum of 3 units</td>
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<td>Course Attributes: Upper Division</td>
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<td>ERTH 600</td>
<td>Graduate Seminar I</td>
<td>1</td>
<td>Graduate Graded</td>
<td>You may take this course for a maximum of 1 unit</td>
<td>Graduate Division</td>
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<td>Typically Offered: Fall only</td>
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<td>This course is the first of a series of writing courses specifically for students in the M.S. Geosciences or Environmental Science programs. The goal of the course is to introduce students to the M.S. program, and aid them in putting together the preliminary literature review for their thesis research. This course introduces the principles of excellent academic writing for scientists while also utilizing peer support to improve communication. 1 hour seminar. (004177)</td>
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<td>Grade Basis: Graduate Graded</td>
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<td>Repeatability: You may take this course for a maximum of 1 unit</td>
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<td>Course Attributes: Graduate Division</td>
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<td>ERTH 601</td>
<td>Graduate Seminar II</td>
<td>1</td>
<td>Graduate Graded</td>
<td>You may take this course for a maximum of 1 unit</td>
<td>Graduate Division</td>
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<td>Typically Offered: Spring only</td>
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<td>This course is the second of a series of writing courses specifically for students in the M.S. Geosciences or Environmental Science programs. The goal of the course is to support students through writing their research proposal. Emphasis placed on students completing an approved written thesis proposal, and giving a public oral presentation of their proposal by the end of the course. 1 hour seminar. (004178)</td>
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<td>Grade Basis: Graduate Graded</td>
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<td>Repeatability: You may take this course for a maximum of 1 unit</td>
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<td>Course Attributes: Graduate Division</td>
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<td>ERTH 602</td>
<td>Graduate Seminar III</td>
<td>1</td>
<td>Graduate Graded</td>
<td>You may take this course for a maximum of 1 unit</td>
<td>Graduate Division</td>
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<td>Typically Offered: Fall only</td>
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<tr>
<td>This course is the third of a series of writing courses specifically for students in the M.S. Geosciences or Environmental Science programs. The goal of the course is to build on the previous courses while focusing on the thesis or project itself. This course provides a forum for intensive analysis of the principles of excellent academic writing for scientists while also utilizing peer support to improve communication. 1 hour seminar. (022020)</td>
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<td>Grade Basis: Graduate Graded</td>
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<td>Repeatability: You may take this course for a maximum of 1 unit</td>
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<td>Course Attributes: Graduate Division</td>
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<td>ERTH 600</td>
<td>Teaching Assistant Preparation</td>
<td>2</td>
<td>Graduate Graded</td>
<td>You may take this course for a maximum of 2 units</td>
<td>Graduate Division</td>
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<td>Prerequisite: ERTH 600, ERTH 601.</td>
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<td>Typically Offered: Fall only</td>
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<td>This is a seminar course for teaching assistants focusing on the theory and practice of active learning in science laboratory settings. The overall goals of the course; 1) To increase participants understanding of strategies to engage students in active learning, 2) to provide opportunities for modeling best practices in science teaching and 3) confidence in his/her ability as effective science lab instructors. 2 hours seminar. (021000)</td>
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<td>Grade Basis: Graduate Graded</td>
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<td>Repeatability: You may take this course for a maximum of 3 units</td>
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<td>Course Attributes: Graduate Division</td>
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<td>ERTH 616</td>
<td>Natural Water Systems</td>
<td>3</td>
<td>Graduate Graded</td>
<td>You may take this course for a maximum of 3 units</td>
<td>Graduate Division; Sustainable Course</td>
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<td>Prerequisite: CHEM 111, ERTH 315. Recommended: CHEM 112.</td>
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<td>Typically Offered: Fall only odd years</td>
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<td>Fundamentals of processes in environmental aquatic systems emphasizing acid-base and pE-pH relationships, solubility of carbon species in natural waters, and interactions at the solid-liquid interface. Students in this course interpret these processes in light of new ideas, problems, and materials. 3 hours lecture. (020287)</td>
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<td>Grade Basis: Graduate Graded</td>
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<td>Repeatability: You may take this course for a maximum of 3 units</td>
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<td>Course Attributes: Graduate Division, Sustainable Course</td>
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</table>
ERTH 617 Advanced Topics in Geology 3 Units
Typically Offered: Fall and spring
You must register directly with a supervising faculty member.
Discussions and library research into selected topics; may include some
lab work. Different topics presented each semester. May be repeated for
credit, with permission of instructor. 9 hours supervision. 
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 9 units
Course Attributes: Graduate Division

ERTH 619 Advanced Topics in Atmospheric Science 3 Units
Typically Offered: Fall and spring
Discussions and library research into selected topics; may include some
lab work. Different topics presented each semester. May be repeated for
credit, with permission of instructor. 9 hours supervision.
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 9 units
Course Attributes: Graduate Division

ERTH 621 Advanced Topics in Hydrology 3 Units
Typically Offered: Fall and spring
Discussions and library research into selected topics; may include some
lab work. Different topics presented each semester. May be repeated for
credit, with permission of instructor. 9 hours supervision.
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 9 units
Course Attributes: Graduate Division

ERTH 650 Environmental Monitoring 3 Units
Typically Offered: Fall only
Survey of environmental monitoring for air quality, water quality, pollution,
waste disposal, environmental resources, etc., including field and
laboratory observations and exercises. An individual term project in
environmental monitoring is required and may involve collection of field
data, interpretation of field data, development of analytical capabilities,
or other subjects pertinent to the student's research interests. 1 hour
discussion, 3 hours laboratory.
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 2 units
Course Attributes: Graduate Division; Sustainable Course

ERTH 652 Science and Environmental Regulations 3 Units
Typically Offered: Fall only
Examination of the scientific basis of environmental regulations, case
studies. 3 hours lecture.
Grade Basis: Graduate Graded
Repeatability: You may take this course for a maximum of 3 units
Course Attributes: Graduate Division
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ERTH 654</td>
<td>Environmental Risk Assessment</td>
<td>3</td>
<td>CHEM 270 or CHEM 320, MATH 120, PHYS 202B.</td>
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<td>Recommended: BIOL 350W or BIOL 360.</td>
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<td><strong>Typically Offered:</strong> Spring only</td>
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<td>The scientific basis of risk assessment in various sectors of human activity,</td>
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<td>with particular emphasis on business, industrial, governmental agency, and</td>
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<td>planning concerns. 3 hours lecture.</td>
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<td><strong>Grade Basis:</strong> Graduate Graded</td>
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<td><strong>Repeatability:</strong> You may take this course for</td>
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<td>a maximum of 3 units</td>
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<td>a maximum of 3 units</td>
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<td><strong>Course Attributes:</strong> Graduate Division</td>
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<td>ERTH 655</td>
<td>Fossil Fuels</td>
<td>3</td>
<td>ERTH 307 or faculty permission.</td>
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<td><strong>Typically Offered:</strong> Fall only even years</td>
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<td>Geological principles and environmental impacts of exploring for and</td>
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<td>exploiting resources of petroleum, natural gas, oil shales, oil sands, coal,</td>
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<td>and coalbed-methane. Applications using geological data, potential sites for</td>
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<td>CO2 sequestration and environmental impact assessments are</td>
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<td>emphasized. This course involves the application of theory to new ideas,</td>
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<td>problems, and materials. 3 hours lecture.</td>
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<td><strong>Grade Basis:</strong> Graduate Graded</td>
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<td></td>
<td><strong>Repeatability:</strong> You may take this course for</td>
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<td>a maximum of 3 units</td>
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<td>a maximum of 3 units</td>
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<td><strong>Course Attributes:</strong> Graduate Division</td>
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<tr>
<td>ERTH 656</td>
<td>Environmental Sciences Capstone</td>
<td>3</td>
<td>Completion of three semesters of coursework in either the Environmental</td>
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<td>Sciences MS program or the proposed PSM option of the Environmental Sciences</td>
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<td>MS program.</td>
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<td><strong>Typically Offered:</strong> Spring only</td>
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<td></td>
<td>Overview of environmental science issues, including biological, chemical,</td>
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<td></td>
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<td>and engineering examples. Particular focus is on future issues and</td>
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<td></td>
<td>approaches. Social and ethical issues are also examined. 9 hours supervision.</td>
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<td><strong>Grade Basis:</strong> Graduate Graded</td>
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<td><strong>Repeatability:</strong> You may take this course for</td>
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<td>a maximum of 3 units</td>
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<td><strong>Course Attributes:</strong> Graduate Division</td>
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<tr>
<td>ERTH 660</td>
<td>Numerical Analysis</td>
<td>3</td>
<td>MATH 120.</td>
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<td><strong>Typically Offered:</strong> Fall only</td>
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<td>Survey and implementation of common numerical techniques in use in</td>
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<td>geoscientific data analysis, including multivariate data analysis,</td>
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<td>geostatistics, finite difference and finite element analyses, time-series</td>
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<td>analysis, and fractal geometry. 3 hours lecture.</td>
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<td><strong>Grade Basis:</strong> Graduate Graded</td>
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<td><strong>Repeatability:</strong> You may take this course for</td>
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<td>a maximum of 3 units</td>
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<td>a maximum of 3 units</td>
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<td><strong>Course Attributes:</strong> Graduate Division</td>
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<tr>
<td>ERTH 670</td>
<td>Environmental and Engineering Geology</td>
<td>3</td>
<td>ERTH 102, ERTH 203, ERTH 306. For majors in related sciences and technical</td>
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<td>fields, ERTH 102 only.</td>
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<td><strong>Typically Offered:</strong> Fall only odd years</td>
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<td>Practical application of techniques to solve geological engineering and</td>
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<td>environmental problems. Techniques of surface investigations and remote</td>
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<td>sensing; borehole and surface geophysics; soil descriptions and properties;</td>
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<td>landslide mapping, mechanics and remediation, subsurface investigation of</td>
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<td>rock masses; mapping of discontinuities, establishing rock quality,</td>
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<td>tunneling techniques. Seismic studies; surface and trench mapping of faults,</td>
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<td>seismic risk analysis. Ground water monitoring, site assessment, techniques</td>
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<td>of hazardous waste cleanup, state and federal regulations on hazardous waste,</td>
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<td>siting of landfills. Students in this course apply these theories to new</td>
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<td>ideas. 3 hours lecture.</td>
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<tr>
<td>ERTH 697</td>
<td>Independent Study</td>
<td>1-4</td>
<td><strong>Typically Offered:</strong> Fall and spring</td>
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<td>This course is a graduate-level independent study. You must register directly</td>
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<td>with a supervising faculty member. 9 hours supervision.</td>
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<td>ERTH 699P</td>
<td>Master's Project</td>
<td>1-6</td>
<td><strong>Prerequisite:</strong> Instructor permission.</td>
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<td><strong>Typically Offered:</strong> Fall and spring</td>
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<td>This course is a master's project. You must register directly with a</td>
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<td>supervising faculty member. 9 hours supervision.</td>
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<tr>
<td>ERTH 699T</td>
<td>Master's Thesis</td>
<td>1-6</td>
<td><strong>Typerequisite:</strong> CR/NC</td>
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<td><strong>Typically Offered:</strong> Fall and spring</td>
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<td>This course is a master's thesis. You must register directly with a</td>
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<td>supervising faculty member. 3 hours supervision.</td>
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**Earth and Environmental Sciences Department**

**The Faculty**

**Emeritus Faculty**