GEOSCI 100 — INTRODUCTORY GEOLOGY: HOW THE EARTH WORKS
3 credits.
Geologic processes; structure and history of the earth; earthquakes, volcanos, glaciers, groundwater, minerals, rocks, deserts, fossils; topographic and geologic maps; climate change on geologic and human time scales. Enroll Info: None
Requisites: Not open to students with credit for GEOSCI/ENVIR ST 106
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI/ATM OCN/ENVIR ST 102 — CLIMATE AND CLIMATE CHANGE
3 credits.
Describes the basic climate principles governing the climate system. It describes the climate and climate variability at present, climate evolution in the past, and the projected climate change into the future. The scientific principles underlying the natural and anthropogenic greenhouse effect and climate model forecasts are elucidated. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Summer 2022

GEOSCI/ATM OCN 105 — SURVEY OF OCEANOGRAPHY
3-4 credits.
Nature and behavior of ocean water; interaction of oceans and atmosphere, structure of the ocean floor, life in the oceans, our relationship to the marine environment. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI/ENVIR ST 106 — ENVIRONMENTAL GEOLOGY
3 credits.
Application of geology to problems resulting from the ever more intense use of the earth and its resources. Enroll Info: None
Requisites: Not open to students with credit for GEOSCI 100
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Summer 2022

GEOSCI 109 — THREE BILLION YEARS BENEATH YOUR FEET: GEOLOGY OF THE NATIONAL PARKS
3 credits.
Famously called "America's best idea", the National Parks of the US record two-thirds of Earth's history, from the most ancient mountains to active volcanic eruptions. The geologic story of the National Parks is explored in the framework of physiography, tectonics, time, and fundamental geologic processes, highlighting the major parks from Hawaii, to Alaska, to the conterminous US. Provides a view of the geological evolution of the Earth using specific examples. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI 110 — EVOLUTION AND EXTINCTION
4 credits.
Contemporary views of the origin and diversification of life and evolutionary processes; crises in the history of life, with emphasis on controversies regarding evolution, mass extinctions, and the co-evolution of Earth and life. Enroll Info: None
Requisites: None
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 111 — VOLCANOES AND CIVILIZATION
1 credit.
An introduction to the impact and influence volcanoes have had on the evolution of the Earth, life, human civilizations, and modern society. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2018
GEOSCI 112 — MOUNTAINS AND MOVING PLATES
1 credit.

An introduction to the Earth's great mountain ranges, the processes that lead to their births and deaths, and the reasons why continental mountain ranges differ dramatically from oceanic mountains and mountains on other planets. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2016

GEOSCI 115 — SCIENCE BEHIND THE NEWS - THE WORLD AROUND US
1-2 credits.

Examines the earth and environmental science behind the news with the goal of producing more informed and knowledgeable citizens. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2018

GEOSCI 117 — EX.FILES: LIFE IN THE EARTH'S EXTREME ENVIRONMENT
2 credits.

Explores the diversity of microbial life forms in modern and ancient geological environments, with a focus on extreme environments of geological origin or relevance. Includes exploration of unusual aspects of microbial life in everyday settings. Enroll Info: None
Requisites: None
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI 118 — EYE IN THE SKY: MONITORING THE EARTH BY SATELLITE
1 credit.

Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2021

GEOSCI/ATM OCN 140 — NATURAL HAZARDS AND DISASTERS
3 credits.

An exploration of the science behind natural disasters including earthquakes, tsunamis, volcanic eruptions, landslides, tornadoes, hurricanes, and floods. Why, where, and when do these events occur, and why are some predictable but others are not? Addresses hazard assessment, forecasting, and mitigation to lessen their impact on society. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Summer 2022

GEOSCI/ASTRON 160 — LIFE IN THE UNIVERSE
2 credits.

An examination of the origin and evolution of life in the universe based on our knowledge of astronomy, biology, and geology. Includes discussions on the search for extraterrestrial life and the history of life in our solar system. Enroll Info: None
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 198 — DIRECTED STUDY
1-3 credits.

Independent study as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2012

GEOSCI 199 — DIRECTED STUDY
1-3 credits.

Independent study as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Elementary
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2022
GEOSCI 202 — INTRODUCTION TO GEOLOGIC STRUCTURES
4 credits.
Introduction to recognition and mapping of geologic structures in the field. Landforms, folds, faults, tectonics, geologic maps, and field instrumentation. Enroll Info: None
Requisites: GEOSCI 100 or ENVIR ST/GEOSCI 106
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI 204 — GEOLOGIC EVOLUTION OF THE EARTH
4 credits.
Physical evolution of the earth and its relationship to the development of life through geologic time. Includes field trip. Enroll Info: None
Requisites: GEOSCI 100 or ENVIR ST/GEOSCI 106
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 304 — GEOBIOLOGY
3 credits.
An integrative approach to studying the interaction between the atmosphere, hydrosphere, biosphere, and geosphere as they have evolved during earth history. Overarching theme includes ocean-climate system changes, biogeochemical cycles, evolution from microbes to mammals, and critical events in life history. Enroll Info: None
Requisites: GEOSCI 204 or graduate/professional standing
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2020

GEOSCI/GEOG 320 — GEOMORPHOLOGY
3 credits.
Principles and analysis of geomorphic processes and resulting land forms. Enroll Info: None
Requisites: GEOSCI/ENVIR ST 106, GEOSCI 100, 109, 204, ENVIR ST/GEOG 120, 127 or graduate/professional standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI/GEOG 326 — LANDFORMS-TOPICS AND REGIONS
3 credits.
Emphasis on natural and human processes that control the morphology of the land and its waterways. Enroll Info: None
Requisites: GEOSCI/ENVIR ST 106, GEOSCI 100, 109, 204, ENVIR ST/GEOG 120, 127, GEOSCI/GEOG 320, or graduate/professional standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2016

GEOSCI 331 — GEMS: THE SCIENCE BEHIND THE SPARKLE
1-2 credits.
Explores the formation, collection, properties, and treatment of many popular gemstones. Enroll Info: None
Requisites: Junior standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI/ATM OCN/ENVIR ST/GEOG 335 — CLIMATIC ENVIRONMENTS OF THE PAST
3 credits.
Climate change at timescales from the last several million years to the last 100 years, with emphasis on more recent timescales. Examines how climate variability arises from interplay between external forcings, feedbacks within the earth system, and (more recently) human activity. Enroll Info: None
Requisites: Sophomore standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI/G L E 350 — INTRODUCTION TO GEOPHYSICS: THE DYNAMIC EARTH
3 credits.
Methods of geophysics applied to earth structure and plate tectonics. Principles of seismology, gravity, geodesy, magnetism and heat flow. Enroll Info: None
Requisites: MATH 217, 221, 275, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022
**GEOSCI/GLE 360 — PRINCIPLES OF MINERALOGY**
3 credits.

Minerals, their physical and chemical properties, crystallography, and geologic significance. Enroll Info: None

**Requisites:** (GEOSCI 100 or ENVIR ST/GEOSCI 106) and (CHEM 103, 109, 115, or concurrent enrollment), graduate/professional standing, or member of Engineering Guest Students

**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2021

**GEOSCI/GLE 370 — ELEMENTARY PETROLOGY**
3 credits.

Igneous and metamorphic rocks, studied in hand sample and thin section. Enroll Info: None

**Requisites:** GLE/GEOSCI 360, graduate/professional standing, or member of Engineering Guest Students

**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2022

**GEOSCI/ENVIR ST/F&W ECOL/GL E/GEOG/LAND ARC 371 — INTRODUCTION TO ENVIRONMENTAL REMOTE SENSING**
3 credits.

Introduction to the Earth as viewed from above, focusing on use of aerial photography and satellite imagery to study the environment. Includes physical processes of electromagnetic radiation, data types and sensing capabilities, methods for interpretation, analysis and mapping, and applications. Enroll Info: None

**Requisites:** (Sophomore standing and MATH 113, 114, or 171), graduate/professional standing, or member of Engineering Guest Students

**Course Designation:** Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Sustain - Sustainability

**Repeatable for Credit:** No

**Last Taught:** Summer 2022

**GEOSCI/ENVIR ST/F&W ECOL/GL E/GEOG/LAND ARC 372 — INTERMEDIATE ENVIRONMENTAL REMOTE SENSING**
3 credits.

Examines intermediate-level concepts in information extraction, data processing and radiative transfer relevant to remote sensing of the environment. Includes transforms, image correction, classification algorithms and change detection, with emphasis on applications for land use planning and natural resource management. Enroll Info: None

**Requisites:** LAND ARC/ENVIR ST/F&W ECOL/GL E/GEOG/GEOSCI 371, graduate/professional standing, or member of Engineering Guest Students

**Course Designation:** Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Sustain - Sustainability

**Repeatable for Credit:** No

**Last Taught:** Spring 2015

**GEOSCI 375 — PRINCIPLES OF GEOCHEMISTRY**
3 credits.

Provides a chemical basis for understanding the origin, evolution, distribution and interactions of chemical elements and isotopes between the lithosphere, hydrosphere, biosphere, and atmosphere in geological and environmental processes. Enroll Info: None

**Requisites:** GLE/GEOSCI 360, (CHEM 109, 104, or 115) and GLE/GEOSCI 370 or concurrent enrollment in GLE/GEOSCI 370, or graduate/professional standing

**Course Designation:** Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2022

**GEOSCI 376 — TOPICS IN GEOLOGY**
1-3 credits.

Special topics or discussions of recent research in Geoscience. Enroll Info: None

**Requisites:** Consent of instructor

**Course Designation:** Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Spring 2022

**GEOSCI 402 — RESEARCH AND COMMUNICATION IN THE GEOLOGICAL SCIENCES**
3 credits.

Skills and strategies to conduct research in the geological sciences, including collection of data, analysis of the data, generation of models to explain the data, and clear communication of both the research process and results. As part of the research process, find, evaluate, and utilize information in the existing scientific literature. Practice effective scientific communication skills, including writing, oral presentations, and producing effective visualizations. Enroll Info: None

**Requisites:** Senior standing and declared in Geology and Geophysics

**Course Designation:** Gen Ed - Communication Part B
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S

**Repeatable for Credit:** No

**Last Taught:** Fall 2020
GEOSCI/ENVIR ST 411 — ENERGY RESOURCES
3 credits.
A critical examination of the full spectrum of renewable and nonrenewable energy options, from the unifying perspective of the Earth systems that govern their use. Energy conversion and efficiency, consumption patterns and trends, and environmental consequences of energy production and use. Enroll Info: None
Requisites: Sophomore standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Summer 2022

GEOSCI/GEOG 420 — GLACIAL AND PLEISTOCENE GEOLOGY
3 credits.
Principles, characteristics and work of glaciers; events of the Pleistocene. Field trip. Enroll Info: None
Requisites: GEOSCI/ENVIR ST 106, GEOSCI 100, 109, ENVIR ST/GEOG 120, 127, or graduate/professional standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

GEOSCI 430 — SEDIMENTOLOGY AND STRATIGRAPHY
3 credits.
Comprehensive survey of the processes and products of sedimentation, including depositional environments, sedimentary tectonics, sequence stratigraphic principles, and analytical methods. Enroll Info: None
Requisites: GEOSCI 204 and G LE/GEOSCI 370, or graduate/professional standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI/G LE 431 — SEDIMENTARY & STRATIGRAPHY LAB
1 credit.
Covers Sedimentology and Stratigraphy; emphasizes qualitative and quantitative description and interpretation of sediments and sedimentary deposits. Enroll Info: None
Requisites: GEOSCI 204 or G LE/GEOSCI 360, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI/CIV ENGR/ENVIR ST/G LE 444 — PRACTICAL APPLICATIONS OF GPS SURVEYING
2 credits.
Requisites: MATH 211, 217, 221, 275, or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

GEOSCI/G LE 455 — STRUCTURAL GEOLOGY
4 credits.
Principles of rock deformation, structures in layered rocks, structural analysis, intrusive structures. Lab: three-dimensional problems involving structural concepts; field trip. Enroll Info: None
Requisites: GEOSCI 202, 204, and (G LE/GEOSCI 370 or concurrent enrollment), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 456 — GEOLOGIC FIELD METHODS
2 credits.
Theory and techniques of geologic mapping; field trips. Enroll Info: None
Requisites: G LE/GEOSCI 455 or concurrent enrollment
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

GEOSCI 457 — CONDUCTED FIELD TRIP
2 credits.
Study of the principles and methods of geologic mapping. Enroll Info: None
Requisites: G LE/GEOSCI 370 or concurrent enrollment
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2020
GEOSCI 459 — FIELD GEOLOGY
6 credits.
Detailed geologic mapping and solution of related problems in the field. Enroll Info: None
Requisites: GEOSCI 202, G L E/GEOSCI 370, and 455
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Summer 2019

GEOSCI/CIV ENGR/G L E/M S & E 474 — ROCK MECHANICS
3 credits.
Classification of rock masses, stress and strain in rock, linear and non-linear behavior of rock, failure mechanisms, state of stress in rock masses, lab testing, geological and engineering applications. Enroll Info: None
Requisites: E M A 201, PHYSICS 201, 207, or 247, or graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI/HIST SCI 514 — HISTORY OF GEOLOGIC THOUGHT
3 credits.
Major concepts from earliest to modern times. Enroll Info: None
Requisites: GEOSCI 204 or graduate/professional standing
Course Designation: Breadth - Humanities
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2016

GEOSCI/G L E 537 — QUANTITATIVE METHODS FOR GEOSCIENCE
3 credits.
MATLAB is a powerful, high-level programming language and integrated development environment (IDE) that is used across a broad variety of scientific disciplines for tasks including data visualization, modeling, and application development. Focus on the active use of MATLAB for developing practical programming and data analysis skills that can be applied across a range of geoscience-relevant problems. Applications will include: data visualization and publishable figure development; automation of data processing; statistical and time-series analysis; image processing and mapping; and optimization. Additional topics may be guided by student interest. Enroll Info: None
Requisites: MATH 222, 276, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI/ZOOLOGY 541 — PALEOBIOLOGY
3 credits.
The evolutionary process as interpreted from the fossil record. Topics include: the study of form; tempo and mode of evolution; levels and mechanisms of evolutionary change; extinction in the fossil record; trends and patterns in the history of life; macroevolution. Enroll Info: None
Requisites: GEOSCI 304, ZOOLOGY/BIOLOGY 101, ZOOLOGY/BIOLOGY/BOTANY 152, or graduate/professional standing
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2016

GEOSCI/ZOOLOGY 542 — INVERTEBRATE PALEONTOLOGY
3 credits.
The evolutionary history, morphology, and ecology of fossil invertebrates. Labs emphasize fossil identification and recognition of basic morphological features. Enroll Info: None
Requisites: (GEOSCI 110 or 204), (ZOOLOGY/BIOLOGY 101 and 102), ZOOLOGY/BIOLOGY/BOTANY 152, (BIOCORE 381 and 382), or graduate/professional standing.
Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2014
GEOSCI 551 — PALEOCEANOGRAPHY
3 credits.
Investigates the history of the Earth's oceans, focusing on the last 65 million years, with discussion of the chemical and physical methods through which oceans are studied and the role of oceans in the climate system. Enroll Info: None
Requisites: GEOSCI 100, 110, ATM OCN/GEOSCI 105, ENVIR ST/GEOSCI 106, or graduate/professional standing
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

GEOSCI 556 — MOUNTAIN BELTS
3 credits.
Examination of interaction of tectonic plates and the resulting structures. Enroll Info: None
Requisites: G L E/GEOSCI 455 or graduate/professional standing
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

GEOSCI 557 — STRUCTURAL PETROLOGY
3 credits.
Petrographic investigation of rock fabrics and deformation using thin sections. Use of petrographic microscopes and Scanning Electron Microscopes (SEMs). Enroll Info: None
Requisites: G L E/GEOSCI 370 and 455, or graduate/professional standing
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2020

GEOSCI/G L E 594 — INTRODUCTION TO APPLIED GEOPHYSICS
3 credits.
Survey of applied geophysics, including seismic refraction, seismic reflection, electrical resistivity, gravity, and magnetics methods. Basic physics of each method and modeling techniques and field procedures. Enroll Info: None
Requisites: (MATH 222 or 276) and (PHYSICS 202, 208, 248, or E M A 202), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI/G L E 595 — FIELD METHODS IN APPLIED AND ENGINEERING GEOPHYSICS
1 credit.
The application of geophysical field methods for delineating near-surface features and/or structures as applied to engineering, environmental and exploration problems. Enroll Info: None
Requisites: GEOSCI/G L E 594 or concurrent enrollment, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI/G L E 596 — GEOMECHANICS
3 credits.
Observation, description, and prediction of deformation of geomechanical systems at depth, and the forces (stress) causing those deformations, relevant for petroleum/geothermal reservoirs and studies of earthquake mechanics. Emphasis on computational exercises using datasets from the petroleum industry and earthquake catalogues, as well as prediction of ground deformation. Enroll Info: None
Requisites: M S E/GEOSCI/CIV ENGR/G L E/M S & E 474, graduate/professional standing, or member of Engineering Guest Students
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

GEOSCI 610 — GEOCHRONOLOGY, TIMESCALES, AND RATES OF GEOLOGIC PROCESSES
3 credits.
Application of radioisotopic (Ar-Ar, U-Pb, U-Th, U-He) and cosmogenic (He, Ne, Cl, Be, C) dating methods. Status of geologic, astronomic and paleomagnetic timescales, Chronology of flood basalts, impacts, extinctions, glaciations. Constraints on rates of magmatism, mountain uplift, deformation, erosion, sedimentation. Enroll Info: None
Requisites: G L E/GEOSCI 370 or graduate/professional standing
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021
GEOSCI/G L E 627 — HYDROGEOLOGY
3-4 credits.
Mathematical treatment of the physical principles governing the flow of groundwater; emphasis on well hydraulics and flow system analysis. Enroll Info: None
Requisites: (GEOSCI 100, 109, 110, ATM OCN/GEOSCI 105, 140, ENVIR ST/GEOSCI 106, or ASTRON/GEOSCI 160) and (MATH 217, 221, or 275), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI/G L E 629 — CONTAMINANT HYDROGEOLOGY
3 credits.
Physical and chemical processes governing the transport of solutes in groundwater; application of hydrogeologic and geochemical theory and practice to the protection of aquifers from contamination. Enroll Info: None
Requisites: G L E/GEOSCI 627 and (MATH 222 or 276), graduate/professional standing, or member of Engineering Guest Students
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Sustain - Sustainability
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 681 — SENIOR HONORS THESIS
3 credits.
Individual mentored study for seniors completing theses for Honors in the Major as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Honors - Honors Only Courses (H)
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI 682 — SENIOR HONORS THESIS
3 credits.
Individual mentored study for seniors completing theses for Honors in the Major as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Honors - Honors Only Courses (H)
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 691 — SENIOR THESIS
3-4 credits.
Mentored individual research and study for students completing a senior thesis. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI 692 — SENIOR THESIS
3-4 credits.
Mentored individual research and study for students completing a senior thesis. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 698 — DIRECTED STUDY
1-6 credits.
Independent study as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2018

GEOSCI 699 — DIRECTED STUDY
1-6 credits.
Independent study as arranged with a faculty member. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2022

GEOSCI 701 — QUANTITATIVE GEOMORPHOLOGY
4 credits.
Quantitative study of processes that shape Earth’s surface. Use theory and field observations to investigate major components of continental geomorphic systems, including hillslopes, rivers, and glaciers. Understand how the major factors that shape Earth’s surface-tectonics, climate, and life-create the landscapes we observe. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2020
GEOSCI 720 — GLACIOLOGY
3 credits.
Addresses the fundamentals of glaciology and glacier landform mechanics: mass balance, ice deformation, basal slip, temperature structure, glacial hydrology, sediment deformation and deposition, and landform building processes. Emphasizes an understanding of the mathematical principles that dictate how glaciers function. Begins with a classical treatment of the mechanics of glaciers and moves onto fundamental advances in the field of glaciology. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2019

GEOSCI/G LE 724 — GROUNDWATER FLOW MODELING
3 credits.
An introduction to the principles of modeling groundwater flow systems, with emphasis on regional flow system analysis. Conceptual understanding of governing equations, and the use of finite difference techniques to solve such equations are stressed. Develop codes and become introduced to packaged models, including those developed by the U. S. Geological Survey. Enroll Info: Knowledge of hydrogeology [such as G L E/GEOSCI 627 or 629] required.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2022

GEOSCI 727 — ADVANCED HYDROGEOLOGY
1-3 credits.
Advanced topics in Hydrogeology. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2016

GEOSCI 729 — FIELD APPLICATIONS IN HYDROGEOLOGY
2 credits.
Instruction and practice in instrumentation and techniques used in collection and interpretation of data. Includes field work in and around Madison. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Summer 2015

GEOSCI 731 — CARBONATE GEOLOGY
2 credits.
Comprehensive survey of the processes and products of carbonate sedimentation. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2021

GEOSCI 732 — GEOCHEMISTRY OF SEDIMENTS
3 credits.
Processes involved in the origin of chemical sediments; shales, carbonates, and evaporites. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021

GEOSCI 740 — MICROPALEONTOLOGY I
3 credits.
Microscopic fossils; conodonts, foraminifera, and ostracodes in particular; their biology, ecology, evolution, and stratigraphic distribution. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2014

GEOSCI/G LE 747 — TECTONOPHYSICS
3 credits.
Elasticity and flexure of the earth's lithosphere, heat conduction, mantle convection, earthquake mechanisms, rock rheology, and fluid migration in the earth's crust; integration of geophysical observations, laboratory experiments, and theoretical models. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

GEOSCI/ATM OCN/ENVIR ST/ZOOLOGY 750 — PROBLEMS IN OCEANOGRAPHY
3 credits.
Introduction to techniques used in the study of the biology, chemistry, geology, and physics of the marine environment. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2021
### GEOSCI 755 — ADVANCED STRUCTURAL GEOLOGY

3 credits.

Structures in layered, intrusive, and metamorphic rocks; structural analysis. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Fall 2021

### GEOSCI/G L E 757 — ADVANCED ROCK MECHANICS

3 credits.

Experimental rock mechanics, rock mechanics apparatus design, static and dynamic rock friction, rate and state friction, crack phenomena and rock fracture mechanics, earthquake energy budget, elastic/viscoelastic/plastic behavior of rocks, engineering and geological applications. Enroll Info: Knowledge of introductory rock mechanics [such as M S E/GEOSCI/CIV ENGR/G L E/M S & E 474] required.
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Fall 2021

### GEOSCI 758 — MECHANICS OF EARTHQUAKES AND FAULTING

3 credits.

Addresses current topics and controversies on fault mechanics, earthquake physics, and the rock record of seismicity. Emphasizes critical reading and in-depth discussion of recent publications drawn from a variety of disciplines, including geophysical, geological, and geochemical studies and approaches. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Fall 2021

### GEOSCI 765 — CRYSTAL CHEMISTRY

3 credits.

Principles of crystal chemistry, emphasizing the structure and behavior of rock forming minerals. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Spring 2022

### GEOSCI 771 — IGNEOUS PETROLOGY

3 credits.

Classification, characteristics, and petrogenesis of igneous rocks. Representative rock suites studied in lab. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Fall 2020

### GEOSCI 776 — INTERFACIAL BIOGEOCHEMISTRY

3 credits.

Geochemical basis for understanding reactions at interfaces between mineral surfaces, dissolved organic compounds, biomembranes and aqueous solutions. Topics include sorption, heterogeneous nucleation, mineral dissolution kinetics electric double-layer theory, surface-complexation models, surface spectroscopy, interfacial thermodynamics, biomineralization biomimetic materials synthesis, early evolution of life. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Spring 2014

### GEOSCI 777 — ELECTRON MICROPROBE ANALYSIS

3 credits.

Proper use and functioning of electron probe and SEM, their use in microanalysis (WDS, EDS), range of applications, and limitations. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Spring 2022

### GEOSCI 793 — GEOPHYSICAL INVERSE THEORY

3 credits.

Application of inverse methods to geophysical measurements of the structure of the earth. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Spring 2020

### GEOSCI 796 — PHYSICS OF THE EARTH II

3 credits.

Theory and observations of earthquakes, seismic waves and plate tectonics. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** No
**Last Taught:** Fall 2016

### GEOSCI 875 — ADVANCED TOPICS IN GEOLOGY

1-3 credits.

Special topics in Geoscience. Enroll Info: None
**Requisites:** Graduate/professional standing
**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement
**Repeatable for Credit:** Yes, unlimited number of completions
**Last Taught:** Spring 2022
GEOSCI/ATM OCN/BOTANY/CIV ENGR/ENVIR ST/ZOOLOGY 911 — LIMNOLOGY AND MARINE SCIENCE SEMINAR
1 credit.

Sections in various fields of zoological research. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2022

GEOSCI 920 — SEMINAR IN GLACIAL AND PLEISTOCENE GEOLOGY
1-3 credits.

An exploration of modern glacial, glaciology, and Pleistocene geology literature. Includes a field trip to explore local glacial geology. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2021

GEOSCI 929 — SEMINAR-HYDROGEOLOGY
1-2 credits.

Special topics in Hydrogeology. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2021

GEOSCI 940 — SEMINAR IN PALEONTOLOGY
1 credit.

Review of published literature on how patterns of biotic evolution and extinction are preserved in the fossil record, with particular emphasis on mass extinction events and the biological consequences of abrupt climate change. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2015

GEOSCI 970 — SEMINAR-GEOCHEMISTRY
2 credits.

Exploration of topics in the field of Geochemistry with an emphasis on engagement with recent literature. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2022

GEOSCI/ATM OCN/BOTANY/ENVIR ST/F&W ECOL/GEOG/ZOOLOGY 980 — EARTH SYSTEM SCIENCE SEMINAR
1 credit.

Topics in earth system science. Emphasis on the coupling between atmospheric, oceanic and land surface systems, involving physical geochemical and biological processes, and including interactions with human systems. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2016

GEOSCI 990 — RESEARCH
1-12 credits.

Research supervised by individual faculty members. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2022

GEOSCI 991 — SEMINAR: GEOPHYSICS
1-3 credits.

Topics in geophysics, emphasizing current research comparing models, experiments, and data. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2017

GEOSCI 999 — ADVANCED INDEPENDENT READING
1-3 credits.

Advanced level mentored reading and research for students with dissertator status. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2017