

GEOLGY (GEOL)

GEOL 101 Physical Geology (3 credits)

General Education: Natural/Integrated Science

The earth, its composition, structure, and natural processes. Three lectures and 2 hours of lab per week; one 1-day field trip. Typically Offered: Fall and Spring.

GEOL 101L Physical Geology Lab (1 credit)

General Education: Natural/Integrated Science

The earth, its composition, structure, and natural processes. Three lectures and 2 hours of lab per week; one 1-day field trip.

GEOL 102 Historical Geology (3 credits)

General Education: Natural/Integrated Science

Evolution of the physical earth, plants, and animals; techniques used in interpretation of geologic history and how organisms have changed our planet through geologic time. The geologic rock record, past extinction events, evolution of organisms through time, and recovery from gradual and catastrophic events such as climate change and major volcanic events are discussed. The current '6th extinction' and changing climate is used to critically think about practices of sustainability and how future Earth may be impacted. Includes one 1-day field trip. Typically Offered: Fall and Spring.

Coreqs: GEOL 102L or permission Cooperative: open to WSU degree-seeking students

GEOL 102L Historical Geology Lab (1 credit)

General Education: Natural/Integrated Science

Evolution of the physical earth, plants, and animals; techniques used in interpretation of geologic history. Typically Offered: Fall and Spring.

GEOL 111 Physical Geology for Science Majors (3 credits)

Introductory course in earth science for geology and other science majors. Three lectures and one 2-hour lab per week; two 1-day field trips.

GEOL 111L Physical Geology for Science Majors Lab (1 credit)

Introductory course in earth science for geology and other science majors. Three lectures and one 2-hour lab per week; two 1-day field trips.

GEOL 200 (s) Seminar (1 credit)

Credit arranged

GEOL 203 (s) Workshop (1-16 credits)

Credit arranged

GEOL 204 (s) Special Topics (1-16 credits)

Credit arranged

GEOL 212 Paleontology: Dinosaurs and Prehistoric Life (4 credits)

General Education: Natural/Integrated Science

Studies of morphology, classification of fossil groups, and utility of fossils in interpreting depositional environments and ages of sedimentary rocks. This class discusses organisms through time and how they moved into or out of available niches as their environment changed. It provides a deep Earth perspective regarding how organisms reacted amongst major climatic changes and relates to sustainability practices for the current and future organisms. One 4 day to 1 week field trip. Recommended preparation: GEOL 102. Typically Offered: Fall. Cooperative: open to WSU degree-seeking students.

GEOL 226 Crime Scene Science (3 credits)

Introduction to the use of geological and mineralogical materials and techniques within the criminal/civil justice system. Topics will include the origin and description of minerals, rocks, soils and sands, fossils, industrial materials, and pollen, the history of forensic science, instrumental & forensic laboratory techniques, and the legal aspects of scientific evidence. Two lectures and one 2-hour lab per week; one 1-day field trip. Typically Offered: Fall.

Prereqs: One of the following: GEOL 101/GEOL 101L, GEOL 111/GEOL 111L, CHEM 101/CHEM 101L, CHEM 111/CHEM 111L; or Permission Cooperative: open to WSU degree-seeking students.

GEOL 249 Mineralogy and Optical Mineralogy (4 credits)

Principles of crystallography, crystal chemistry, and crystal structure; mineral identification; principles of optical mineralogy and use of the polarized light microscope. Three lectures and one 2-hour lab per week; two 1-day field trips.

Prereqs: GEOL 111/GEOL 111L or GEOL 101/GEOL 101L, and CHEM 111/CHEM 111L

GEOL 250 Marine Geology: Fiery Birth to Cold Demise (3 credits)

This course introduces students to fundamental topics in marine geology including the origin of the oceanic lithosphere at mid-ocean ridges and its eventual return to the mantle at subduction zones, the formation of seamounts, and the circulation of hydrothermal fluids. The class will explore how interactions between the mantle, lithosphere, hydrosphere, and atmosphere govern the Earth's carbon budget, provide opportunities for deep-sea mining of critically rare minerals, and maintain a thriving, but still poorly explored deep-sea biosphere. Typically Offered: Fall (Odd Years). Cooperative: open to WSU degree-seeking students.

GEOL 299 (s) Directed Study (1-16 credits)

Credit arranged

GEOL 302 Field Geology Methods (3 credits)

Introduction to field mapping and field techniques; mapping sedimentary sequences and tectonic structures; Professional ethics, report preparation, project budgeting, and safety planning. Accident and health insurance required. Single- and multiple-day field trips with camping required. Typically Offered: Summer.

Prereqs: GEOL 101/GEOL 101L or GEOL 111/GEOL 111L or GEOL 102/GEOL 102L or GEOG 100/GEOG 100L Cooperative: open to WSU degree-seeking students.

GEOL 309 Ground Water Hydrology (3 credits)

Occurrence, movement, and properties of subsurface water; introduction to ground water hydrology. Typically Offered: Fall.

Prereqs: GEOL 101/GEOL 101L or GEOL 111; or MATH 143 with a grade of C or better Cooperative: open to WSU degree-seeking students.

GEOL 310 Geological Core Logging (1 credit)

Designed to give students an overview of the mining industry and acquaint students with methods used for mineral exploration. Students will receive hands on training in core logging, a fundamental skill for a mining geologist, from mining industry professionals, and will be able to learn about career opportunities for geologists in the mining industry. Typically Offered: Spring. Cooperative: open to WSU degree-seeking students.

GEOL 318 Economic Geology (3 credits)

Provides an introduction to economic geology through an examination of the lifecycle of a mine—target identification, exploration, mine development, mining methods, ore processing, extraction processes, mine closure, and remediation/restoration, along with discussions regarding the circular economy and green mining. The extraction economy is no longer based on target elements and our ability to remove them from the Earth. Modern mining requires substantial planning at each step of the mine lifecycle from target identification to landscape restoration. Typically Offered: Spring (Even Years).

Prereqs: GEOL 101/GEOL 101L or GEOL 111, and MATH 130 or MATH 143 with a grade of 'C' or better
Cooperative: open to WSU degree-seeking students.

GEOL 324 Principles of Stratigraphy and Sedimentation (4 credits)

Interrelationship of sedimentation and stratigraphy and processes and factors influencing genesis of sedimentary rocks. Topics include weathering, fluid flows, sediment mechanics, depositional environments, stratigraphic logging and field data collection, sedimentary lithofacies, provenance, and application of principles of interpretation of stratigraphic record. Two lectures and one 4-hour lab per week; two 1-day field trips; One 5-day field trip.

Prereqs: GEOL 102/GEOL 102L and MATH 143 with a grade of 'C' or better

GEOL 326 Igneous and Metamorphic Petrology (4 credits)

Hard rock petrology plus megascopic and microscopic petrography of igneous and metamorphic rocks. Two lectures and two 2-hour labs per week; two 1-day or one 2-day field trips.

Prereqs: GEOL 249 and MATH 143 with a grade of 'C' or better

GEOL 335 Geomorphology (3 credits)

Classification, recognition, origin, and significance of land forms; land form analysis in interpretation of geologic structure and history. One 2-day field trip.

Prereqs: GEOL 101/GEOL 101L or GEOL 102/GEOL 102L or GEOL 111/GEOL 111L, or GEOG 100/GEOG 100L; and MATH 143 with a grade of 'C' or better; or Permission

GEOL 344 Earthquakes (3 credits)

The geology of earthquakes including the cause of fault rupture, seismic waves, focal mechanisms, and earthquakes associated with all fault types in a variety of tectonic settings; methods of identifying paleo-earthquakes in the geologic record, and the assessment of seismic risk in active fault environments.

Prereqs: GEOL 101 and GEOL 101L or GEOL 111 and GEOL 111L or GEOG 100 or ENVS 101; and MATH 143 with a grade of 'C' or better

GEOL 345 Structural Geology (4 credits)

Investigation of deformed rocks; mechanics of brittle and continuum failure, stress and strain relations, characterization, description, classification of folded and fractured rocks. Three hours of lecture and one 2-hour 45-minute lab per week; one week-long mandatory field trip. (Spring only)

Prereqs: MATH 143 with a grade of 'C' or better; and one semester high-school trigonometry or MATH 144; and GEOL 101/GEOL 101L or GEOL 111/GEOL 111L; and PHYS 111/PHYS 111L or PHYS 211/PHYS 211L.

GEOL 361 Geology and the Environment (3 credits)

This class is constructed to examine the legacy and current generation and disposal of mine waste and how we might best reduce the potential impacts from the mine waste stream. As part of this course, we will explore the production of waste rock (unprocessed mine waste) and tailings (processed mine waste), their potential impact on the environment, and disposal practices for reducing environmental degradation. To assist us in understanding modern mining methods and their ability to reduce environmental impacts from mine waste, we will explore the use of GoldSim, a Monte Carlo simulation software for dynamically modeling complex systems to supports decision-making and risk analysis. GoldSim allows you to create realistic models of mine systems in order to carry out risk analyses, evaluate potential environmental impacts, support strategic planning, and optimize operations.

Prereqs: GEOL 101 and GEOL 101L or GEOL 111 and GEOL 111L or GEOG 100 or ENVS 101; and MATH 143 with a grade of 'C' or better

GEOL 375 Geology of National Parks (3 credits)

Primarily for non-geology majors who want to acquire a better knowledge of geologic concepts and processes through study of geology of national parks. One 6-day field trip.

Prereqs: GEOL 101/GEOL 101L, GEOL 102/GEOL 102L, GEOL 111/GEOL 111L, or GEOG 100/GEOG 100L; and MATH 143 with a grade of 'C' or better

GEOL 398 (s) Internship (1-16 credits)

Credit arranged

GEOL 400 (s) Seminar (1 credit, max arranged)

Participation in departmental colloquium.

Prereqs: MATH 143 with a grade of 'C' or better

GEOL 403 (s) Workshop (1-16 credits)

Credit arranged

GEOL 404 (s) Special Topics (1-16 credits)

Credit arranged

GEOL 405 (s) Professional Development (1-16 credits)

Credit arranged

GEOL 407 Basin Analysis (3 credits)

Joint-listed with GEOL 507

Formation mechanisms and characteristics of sedimentary basins. Modern concepts of tectonics and sedimentary basin analysis, including tectonics of subsidence, detrital mineral provenance, thermal histories, and facies models. Lithofacies distributions and structural styles in a variety of basin types with specific examples from around the world. Additional paper required for graduate credit. One 2-day and one 5-day field trip. Cooperative: open to WSU degree-seeking students. (Spring only)

Prereqs: GEOL 324 and MATH 143 with a grade of C or better

GEOL 410 Groundwater Field Methods (3 credits)

Joint-listed with GEOL 508

Field methods and professional practice in groundwater hydrology. Basic field techniques used in groundwater investigations, including measuring and interpreting depth to water in wells, slug testing, and aquifer pumping tests. Professional skills complementary to field investigations, including logistics, project budgeting, and safety planning. Students are required to participate in a significant amount of work in the field, including performance of a field-based final project. For graduate credit, students must complete a resource evaluation using data gathered in the final project. Cooperative: open to WSU degree-seeking students.

GEOL 411 Advanced Paleontology (3 credits)

Joint-listed with GEOL 511

This class discusses methods used in assessing organisms in the paleontological rock record and what they can tell us about ancient climate, ecology, and geography. Applications include using past organisms' response to a changing earth in discussions on how current organisms will react regarding current and future climate change, sea level fluctuations, and other major events. Additional work required for graduate course. Typically Offered: Fall (Even Years).

Prereqs: GEOL 212 Cooperative: open to WSU degree-seeking students.

GEOL 413 Environmental Hydrogeology (3 credits)

Cross-listed with HYDR 412

Joint-listed with HYDR 512

This course provides an examination of hydrogeochemical site characterization to evaluate the transport of water-quality contaminants and the impact of the contaminants on water resources, particularly aquifers. The primary goal is an evaluation of the integration of physical and chemical tools available for determining the current state of contamination and predicting future conditions with changes in the hydrogeologic environment. Additional independent research paper required for graduate credit. Typically Offered: Spring (Odd Years).

Prereqs: GEOL 309 Cooperative: open to WSU degree-seeking students.

GEOL 417 Advanced Paleontology (3 credits)

Fossil assemblage analyses and report writing; marine faunal assemblage 1st half of semester; nonmarine floral assemblage 2nd half of semester. Three 2-hour labs per week; one 1-day field trip.

Prereqs: MATH 143 with a grade of 'C' or better and GEOL 212; or Permission

GEOL 422 Principles of Geophysics (4 credits)

Outline of geophysical methods for geological investigations. One 1-day field trip. Course includes 3 hours of lecture and one 2-hour lab per week.

Prereqs: MATH 143 with a grade of 'C' or better

GEOL 423 Principles of Geochemistry (3 credits)

Physiochemical principles applied to geologic processes. Topics covered include atmospheric geochemistry, environmental geochemistry, aqueous geochemistry, crystal chemistry, radiogenic and stable isotopes. These topics provide an overview of the principles of physics and chemistry that define geochemistry and its use to understand Earth's geology. The objective of this course is to learn how geochemical processes control the distribution of elements from the core of the Earth to the atmosphere. Includes one 3-day field trip.

Prereqs: GEOL 249

GEOL 424 Advanced Topics in Sedimentary Rocks (3 credits, max 3)

Joint-listed with GEOL 520

Modern concepts of tectonic sedimentology, depositional environments, facies models, and application of analytical techniques to stratigraphic sequences. GEOL 520 students will have an additional research project. One 5-day field trip. Typically Offered: Spring.

Prereqs: GEOL 324. Cooperative: open to WSU degree-seeking students.

GEOL 427 Paleoclimatology (3 credits)

Joint-listed with GEOL 517

This course will cover the sedimentological, paleontological, geochemical, and numerical methods used to study climate in the Phanerozoic geologic record. The paleoclimate record will be used to assess modern climate change and conditions on future Earth. Students will gain an understanding of how past climates can help us implement sustainable practices in the future. This class will cover how climate change affected Earth and organisms in the past in order to understand how our Earth and organisms will respond in the future. Additional coursework will be required for graduate credit. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

GEOL 428 Geostatistics (3 credits)

Cross-listed with GEOE 428

Joint-listed with GEOL 534

Applications of random variables and probability in geologic and engineering studies; regression, regionalized variables, spatial correlation, variograms, kriging, and simulation. Recommended Preparation: STAT 301. Cooperative: open to WSU degree-seeking students.

GEOL 431 Chemical Hydrogeology (3 credits)

Joint-listed with GEOL 531

An exploration of low temperature, aqueous geochemistry principles through examination of atmospheric, geologic, and biologic influences on water chemistry in surface and near-surface hydrologic environments. For graduate credit, students are required to complete an additional independent research paper or presentation. Recommended preparation: GEOL 423.

Prereqs: CHEM 111/CHEM 111L

GEOL 433 Geodynamics (4 credits)

Joint-listed with GEOL 533

This class focuses on the processes and mechanisms that cause motions within and on the surface of the Earth and other planets. Topics to be covered include plate boundary deformation, plate flexure, planetary heat transfer, convection in the mantle and core, melting and melt transport, magma dynamics, and large-scale lithospheric deformation. For graduate credit, students will be expected to complete a research project and report. Course includes 3 hours of lecture and one 3-hour lab per week. Recommended Preparation: Math 175 or equivalent. Typically Offered: Fall.

Prereqs: MATH 143 with a grade of 'C' or better; and MATH 170 or equivalent Cooperative: open to WSU degree-seeking students.

GEOL 435 Glaciology and the Dynamic Frozen Earth (3 credits)

Joint-listed with GEOL 535

This course examines the physical processes that govern the frozen components of the Earth system. Idaho's changing snowpack, thinning Arctic sea ice, and accelerating glaciers are all evidence of the Earth's dynamic and rapidly changing frozen surface. These landscapes play critical roles in the climate system. Thinning and retreat of glaciers and ice sheets is on track to raise global sea level by up to a meter within student lifetimes. This course covers the mechanics and energy budgets of the frozen earth. Upon completion of this course, students will be able to describe the ways by which glaciers increase or decrease their flow, the controls on the growth and loss of sea ice, the importance of permafrost environments to the climate and landscape evolution, and how ice preserves a record of past global temperatures. Additional work required for graduate credit. Cooperative: open to WSU degree-seeking students.

Prereqs: MATH 160 or MATH 170

GEOL 447 Geochronology and Thermochronology (3 credits)

Joint-listed with GEOL 547

Constraining the timing, rate, and pace of earth processes and events is crucial for geoscience research. This course covers the fundamentals of radiometric dating methods for geologic materials and recent developments in the fields of geochronology and thermochronology. Discussions will focus on principles and assumptions of each technique, novel applications, and interpretation of complex datasets. Additional work required for graduate credit. Typically Offered: Varies.

Prereqs: GEOL 101 or GEOL 111 or Permission Cooperative: open to WSU degree-seeking students.

GEOL 448 Tectonics (3 credits)

Joint-listed with GEOL 548

An investigation into the processes driving the physical evolution of the Earth's crust and mantle and how those processes are reflected at the surface. Discussion of the development of mountain belts, growth of continents and ocean basins, and plate boundary dynamics. A more advanced project/paper required for graduate credit. One or two 1-2 day field trips. Cooperative: open to WSU degree-seeking students.

Prereqs: GEOL 345 or Permission

GEOL 454 Air Quality, Pollution, and Smoke (3 credits)

Cross-listed with FIRE 454

Joint-listed with FIRE 554

Provides details of the controls and drivers of emission processes and impacts on air quality from fires, industry, and natural sources. The course provides an overview of relevant policy and health impacts of various air pollutants on humans. It also includes detail on atmospheric chemistry and physics related to natural and anthropogenic emissions and how these impact atmospheric chemistry and climate. Overview of the combustion and emission process, how these emissions impact air quality, and what models exist to monitor these emissions. Other topics to include: guidelines for smoke management planning, attainment issues, atmospheric transport and deposition processes. Additional work required for graduate credit. Typically Offered: Spring and Summer.

GEOL 462 Petroleum Systems and Energy Transitions (3 credits)

Joint-listed with GEOL 562

Learn the play elements and the science behind the discovery, analytical work, extraction, and economics of a petroleum system; learn how to use cutting-edge software to do geophysical well log and 3D seismic interpretation with key stratigraphic concepts, and subsurface geologic mapping and analysis. Topics include the economics of future resources, and the role of the petroleum industry and alternative energy sources regarding the sustainability of future energy needs and the discussion of climate change. Additional project work will be required for graduate credit. One two-to-four day fieldtrip. Typically Offered: Fall (Even Years). Cooperative: open to WSU degree-seeking students.

GEOL 467 Volcanology (3 credits)

Joint-listed with GEOL 567

Eruption mechanisms, volcanic processes and landforms, and volcanic deposits. Additional projects/assignments required for graduate credit. Two lectures and one 2-hour lab per week; seven days of field trips.

Prereqs: MATH 143 with a grade of 'C' or better

GEOL 471 Ore Deposits and Exploration (3 credits)

Joint-listed with GEOL 572

The geologic origin of metallic ore deposits and the methods used to search for them. Taught in alternating years. One 1-day and one 3-day field trip. For graduate credit, graduate students must complete a research paper describing some aspect of ore deposit formation. Typically Offered: Varies.

Prereqs: GEOL 249 and MATH 143 with a grade of 'C' or better
Cooperative: open to WSU degree-seeking students.

GEOL 474 Stable Isotopes in the Environment (3 credits)

Joint-listed with GEOL 584

Learn the theory and application of stable isotopes to a range of topics in earth sciences, environmental science, and related disciplines. Topics include the kinetic and equilibrium fractionation of stable isotopes in natural systems, the processes that drive those fractionations, and the use of isotope mass spectrometry to measure and understand those processes. Students will work with and interpret real datasets. Additional work is required for graduate credit. Typically Offered: Spring.

Prereqs: GEOL 101 or GEOL 102 or GEOL 111; CHEM 111. Cooperative: open to WSU degree-seeking students.

GEOL 489 Virtual Field Camp (3 credits)

Advanced field problems and methods; interpretation of field data, preparation of reports based on geological observations and interpretations. Virtual Field camp provides the necessary support for students with physical challenges to meet the requirements of the BS degree in geology. Typically Offered: Summer.

Prereqs: GEOL 302, GEOL 345, and MATH 143 with a grade of 'C' or better
Cooperative: open to WSU degree-seeking students.

GEOL 490 Geology Field Camp (3 credits)

General Education: Senior Experience

Prereqs: GEOL 345; and MATH 143 with a grade of 'C' or better.
Cooperative: open to WSU degree-seeking students.

GEOL 497 (s) Practicum In Tutoring (1 credit, max 2)

Tutorial services performed by advanced students under faculty supervision. Graded P/F.

Prereqs: MATH 143 with a grade of 'C' or better and Permission of department

GEOL 498 Senior Thesis (3 credits)

Cross-listed with ESS 498

Completion of original research and report. Course is taken over two semesters; first semester is graded IP until completion of second semester. Typically Offered: Varies.

Prereqs: MATH 143 with a grade of 'C' or better and Senior standing and Permission

GEOL 499 (s) Directed Study (1-16 credits)

Credit arranged

Prereqs: MATH 143 with a grade of 'C' or better

GEOL 500 Master's Research and Thesis (1-16 credits)

Credit arranged

GEOL 501 (s) Seminar (1 credit, max arranged)

Participation in departmental colloquium.

GEOL 502 (s) Directed Study (1-16 credits)

Credit arranged

GEOL 503 (s) Workshop (1-16 credits)

Credit arranged

GEOL 504 (s) Special Topics (1-16 credits)

Credit arranged

GEOL 505 (s) Professional Development (1-16 credits)

Credit arranged

GEOL 507 Basin Analysis (3 credits)

Joint-listed with GEOL 407

Formation mechanisms and characteristics of sedimentary basins. Modern concepts of tectonics and sedimentary basin analysis, including tectonics of subsidence, detrital mineral provenance, thermal histories, and facies models. Lithofacies distributions and structural styles in a variety of basin types with specific examples from around the world. Additional paper required for graduate credit. One 2-day and one 5-day field trip. Cooperative: open to WSU degree-seeking students. (Spring only)

Prereqs: GEOL 324 and MATH 143 with a grade of C or better

GEOL 508 Groundwater Field Methods (3 credits)

Joint-listed with GEOL 410

Field methods and professional practice in groundwater hydrology. Basic field techniques used in groundwater investigations, including measuring and interpreting depth to water in wells, slug testing, and aquifer pumping tests. Professional skills complementary to field investigations, including logistics, project budgeting, and safety planning. Students are required to participate in a significant amount of work in the field, including performance of a field-based final project. For graduate credit, students must complete a resource evaluation using data gathered in the final project. Cooperative: open to WSU degree-seeking students.

GEOL 510 (s) Geosystems (3 credits, max 6)

Interdisciplinary core graduate course in earth sciences. Course will involve multiple instructors and modules framed around a common theme. Specific focus may vary from year to year. Cooperative: open to WSU degree-seeking students.

GEOL 511 Advanced Topics in Paleontology (3 credits)

Joint-listed with GEOL 411

This class discusses methods used in assessing organisms in the paleontological rock record and what they can tell us about ancient climate, ecology, and geography. Applications include using past organisms' response to a changing earth in discussions on how current organisms will react regarding current and future climate change, sea level fluctuations, and other major events. Additional work required for graduate course. Typically Offered: Fall (Even Years). Cooperative: open to WSU degree-seeking students.

GEOL 517 Paleoclimatology (3 credits)

Joint-listed with GEOL 427

This course will cover the sedimentological, paleontological, geochemical, and numerical methods used to study climate in the Phanerozoic geologic record. The paleoclimate record will be used to assess modern climate change and conditions on future Earth. Students will gain an understanding of how past climates can help us implement sustainable practices in the future. This class will cover how climate change affected Earth and organisms in the past in order to understand how our Earth and organisms will respond in the future. Additional coursework will be required for graduate credit. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

GEOL 520 Advanced Topics in Sedimentary Rocks (3 credits, max 3)

Joint-listed with GEOL 520

Modern concepts of tectonic sedimentology, depositional environments, facies models, and application of analytical techniques to stratigraphic sequences. GEOL 520 students will have an additional research project. One 5-day field trip. Typically Offered: Spring.

Prereqs: GEOL 324. Cooperative: open to WSU degree-seeking students.

GEOL 531 Chemical Hydrogeology (3 credits)

Joint-listed with GEOL 431

An exploration of low temperature, aqueous geochemistry principles through examination of atmospheric, geologic, and biologic influences on water chemistry in surface and near-surface hydrologic environments. For graduate credit, students are required to complete an additional independent research paper or presentation. Recommended preparation: GEOL 423.

Prereqs: CHEM 111/CHEM 111L

GEOL 533 Geodynamics (4 credits)

Joint-listed with GEOL 433

This class focuses on the processes and mechanisms that cause motions within and on the surface of the Earth and other planets. Topics to be covered include plate boundary deformation, plate flexure, planetary heat transfer, convection in the mantle and core, melting and melt transport, magma dynamics, and large-scale lithospheric deformation. For graduate credit, students will be expected to complete a research project and report. Course includes 3 hours of lecture and one 3-hour lab per week. Recommended Preparation: Math 175 or equivalent. Typically Offered: Fall. Cooperative: open to WSU degree-seeking students.

GEOL 534 Geostatistics (3 credits)

Joint-listed with GEOL 428 and GEOE 428

Applications of random variables and probability in geologic and engineering studies; regression, regionalized variables, spatial correlation, variograms, kriging, and simulation. Recommended Preparation: STAT 301. Cooperative: open to WSU degree-seeking students.

GEOL 535 Glaciology and the Dynamic Frozen Earth (3 credits)

Joint-listed with GEOL 435

This course examines the physical processes that govern the frozen components of the Earth system. Idaho's changing snowpack, thinning Arctic sea ice, and accelerating glaciers are all evidence of the Earth's dynamic and rapidly changing frozen surface. These landscapes play critical roles in the climate system. Thinning and retreat of glaciers and ice sheets is on track to raise global sea level by up to a meter within student lifetimes. This course covers the mechanics and energy budgets of the frozen earth. Upon completion of this course, students will be able to describe the ways by which glaciers increase or decrease their flow, the controls on the growth and loss of sea ice, the importance of permafrost environments to the climate and landscape evolution, and how ice preserves a record of past global temperatures. Additional work required for graduate credit. Cooperative: open to WSU degree-seeking students.

Prereqs: MATH 160 or MATH 170

GEOL 547 Geochronology and Thermochronology (3 credits)

Joint-listed with GEOL 447

Constraining the timing, rate, and pace of earth processes and events is crucial for geoscience research. This course covers the fundamentals of radiometric dating methods for geologic materials and recent developments in the fields of geochronology and thermochronology. Discussions will focus on principles and assumptions of each technique, novel applications, and interpretation of complex datasets. Additional work required for graduate credit. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

GEOL 548 Tectonics (3 credits)

Joint-listed with GEOL 448

An investigation of the processes driving the physical evolution of the Earth's crust and mantle and how those processes are reflected at the surface. Discussion of the development of mountain belts, growth of continents and ocean basins, and plate boundary dynamics. A more advanced project/paper required for graduate-level credit. One or two 1-2 day field trips. Cooperative: open to WSU degree-seeking students.

Prereqs: GEOL 345 or Permission

GEOL 549 Principles of Electron Microscopy (3 credits)

Theory and principles of scanning and transmission electron microscopy as an investigative tool; includes physical principles of electron microscopy, operation and maintenance of the electron microscope, specimen preparation, and digital image capture. Lab section involves hands-on use of SEM and TEM. Students registering are required to complete a research project. One 1. 5-hour lecture and one 2-hour lab per week. Cooperative: open to WSU degree-seeking students. Typically Offered: Fall.

GEOL 562 Petroleum Systems and Energy Transitions (3 credits)

Joint-listed with GEOL 462

Learn the play elements and the science behind the discovery, analytical work, extraction, and economics of a petroleum system; learn how to use cutting-edge software to do geophysical well log and 3D seismic interpretation with key stratigraphic concepts, and subsurface geologic mapping and analysis. Topics include the economics of future resources, and the role of the petroleum industry and alternative energy sources regarding the sustainability of future energy needs and the discussion of climate change. Additional project work will be required for graduate credit. One two-to-four day fieldtrip. Typically Offered: Fall (Even Years). Cooperative: open to WSU degree-seeking students.

GEOL 567 Volcanology (3 credits)

Joint-listed with GEOL 467

Eruption mechanisms, volcanic processes and landforms, and volcanic deposits. Additional projects/assignments required for graduate credit. Two lectures and one 2-hour lab per week; seven days of field trips. Cooperative: open to WSU degree-seeking students.

Prereqs: MATH 143 with a grade of 'C' or better

GEOL 572 Ore Deposits and Exploration (3 credits)

Joint-listed with GEOL 471

The geologic origin of metallic ore deposits and the methods used to search for them. Taught in alternating years. One 1-day and one 3-day field trip. For graduate credit, graduate students must complete a research paper describing some aspect of ore deposit formation. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

GEOL 582 Planetary Surfaces and Interiors (3 credits)

Joint-listed with ESS 482, PHYS 482

, PHYS 582. Planetary geology is an integrated field that applies knowledge from several areas of science to understand the origin and evolution of the Sun, planets, and minor bodies (asteroids, comets, etc). This course will primarily focus on the geological and physical processes that create and modify planetary surfaces. Topics will include economic exploration in space, volcanology, tectonics, impact cratering, geomorphological modifications, and how those processes change when applied to physical parameters outside the natural range for Earth. Due to the inaccessible nature of space, the methods used to explore its secrets are widespread, creative, complex, and often underutilized in purely terrestrial studies. Graduate students will have extra responsibilities running group discussions and giving presentations. Typically Offered: Varies. Cooperative: open to WSU degree-seeking students.

GEOL 584 Stable Isotopes in the Environment (3 credits)

Joint-listed with GEOL 474

Learn the theory and application of stable isotopes to a range of topics in earth sciences, environmental science, and related disciplines. Topics include the kinetic and equilibrium fractionation of stable isotopes in natural systems, the processes that drive those fractionations, and the use of isotope mass spectrometry to measure and understand those processes. Students will work with and interpret real datasets. Additional work is required for graduate credit. Typically Offered: Spring. Cooperative: open to WSU degree-seeking students.

GEOL 597 (s) Practicum (1-16 credits)

Credit arranged

GEOL 598 (s) Internship (1-16 credits)

Credit arranged

GEOL 599 (s) Research (1-16 credits)

Credit arranged. Research not directly related to a thesis or dissertation.

GEOL 600 Doctoral Research and Dissertation (1-45 credits)

Credit arranged