**GEOL 812 Volcanology and Igneous Petrology**
**Crosslisted with:** GEOL 412  
**Prerequisites:** GEOL 210, CHEM 113  
**Description:** The study of igneous systems, including an investigation of volcanic processes, mineral equilibria, petrography, and the geochemistry of magmas and minerals.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

**GEOL 815 Geochemical Thermodynamics**  
**Notes:** This course requires command of material covered in MATH 107 and GEOL 201 or equivalent.  
**Description:** Exploration of the fundamentals of geochemistry from thermodynamics, including the laws of thermodynamics, multicomponent analysis, extrapolation to temperatures and pressures of interest, nonideal solution behavior, phase diagrams, volatile fugacities, and redox reactions.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

**GEOL 816 Isotope Geochemistry**  
**Prerequisites:** GEOL 410  
**Description:** Behavior of stable and radiogenic isotopes in geological and cosmochemical systems. Application of isotope geochemistry to determining the age of rocks, as well as the sources of the chemical components in the rocks.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

**GEOL 817 Organic Geochemistry**  
**Crosslisted with:** GEOL 417  
**Prerequisites:** GEOL 410 and CHEM 251.  
**Description:** Origin, preservation and transport of organic compounds found in the rock record. Applications of organic geochemistry to paleoclimatic and paleoenvironmental interpretations as well as discerning the origins of coal, oil and natural gas.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

**GEOL 818 Chemistry of Natural Waters**  
**Crosslisted with:** GEOL 418, NRES 419, NRES 819, WATS 418  
**Prerequisites:** 2 semesters of college chemistry, or CHEM 109 and 110, 113 and 114, or CHEM 111; or permission.  
**Description:** Principles of water chemistry and their use in precipitation, surface water, and groundwater studies. Groundwater applications used to determine the time and source of groundwater recharge, estimate groundwater residence time, identify aquifer mineralogy, examine the degree of mixing between waters of various sources and evaluate what types of biological and chemical processes have occurred during the water’s journey through the aquifer system.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

**GEOL 818L Chemistry of Natural Waters Laboratory**  
**Description:** Basic laboratory techniques used to perform water analysis including various wet chemical techniques, instrument use (AA, IC, UV-Visible) and computer modeling. Techniques for sample collection and preservation, parameter estimation and chemical analysis.  
**Credit Hours:** 1  
**Max credits per semester:** 1  
**Max credits per degree:** 1  
**Format:** LAB

**GEOL 819 Applications of Remote Sensing in Agriculture and Natural Resources**  
**Crosslisted with:** AGRO 419, GEOG 419, GEOL 419, NRES 420, AGRO 819, GEOG 819, NRES 820  
**Prerequisites:** GEOG/NRES 418  
**Description:** Introduction to the practical uses of remote electromagnetic sensing in dealing with agricultural and water-resources issues.  
**Credit Hours:** 4  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Format:** LEC  
**Groups:** Techniques

**GEOL 821 Carbonate Petrology**  
**Crosslisted with:** GEOL 421  
**Prerequisites:** GEOL 310.  
**Notes:** Lab focuses on field, petrographic and geochemical methods.  
**Description:** Depositional settings and processes, petrography, geochemistry, diagenesis and geological significance of modern and ancient carbonate rocks and sediments.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC

**GEOL 823 Quaternary Paleoclimatology and Paleoecology**  
**Crosslisted with:** BIOS 436, BIOS 836, GEOL 423  
**Prerequisites:** 12 hrs GEOL or BIOS.  
**Description:** Analysis and interpretation of the Quaternary period's paleoecological data. Patterns of long-term climate variation. Distribution patterns and responses of organisms and ecosystems to Quaternary environmental change.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Format:** LEC
GEOL 824 Biogeochemical Cycles
Crosslisted with: BIOS 438, BIOS 838, GEOL 424
Prerequisites: CHEM 109 or 113; 12 hrs geology or biological sciences.
Description: Chemical cycling at or near the earth's surface, emphasizing interactions among the atmosphere, biosphere, geosphere and hydrosphere. Modern processes, the geological record, and human impacts on elemental cycles.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 825 Geostatistics
Crosslisted with: NRES 825
Prerequisites: MATH 106 and STAT 218
Notes: Offered fall semester of odd-numbered calendar years.
Description: Practical methods for solving spatial interpolation and related estimation problems with emphasis on geostatistical methods. Introduction to applied statistical simulation and prediction in geology, hydrogeology and environmental studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 828 Stratigraphic Architecture and Sequence Stratigraphy
Prerequisites: GEOL 30
Description: Analysis of stratigraphic stacking patterns in sedimentary basins and sequence stratigraphic methods.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 830 Quantitative Methods in Paleontology
Crosslisted with: GEOL 430
Prerequisites: GEOL 310.
Description: Numerical and statistical analysis of paleontological data including biometry, syn-ecology, and quantitative biostratigraphy.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 831 Micro-paleontology
Crosslisted with: GEOL 431
Prerequisites: GEOL 310.
Description: Morphology, classification, ecology and geological application of common fossil and extant marine, brackish, and freshwater microfossils.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 835 Vertebrate Paleontology
Crosslisted with: GEOL 435
Prerequisites: Permission or graduate standing.
Description: Survey of the evolution of the vertebrates, including the geological and biological factors that influence the pattern of evolution, and laboratory study of fossil materials of the major vertebrate groups.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 836 Evolution of Cenozoic Mammals
Crosslisted with: GEOL 436, NRES 436, NRES 836
Prerequisites: GEOL 103.
Description: Survey of mammalian evolution with emphasis on the origin, radiation, and phylogenetic relationships of Cenozoic fossil mammals. Overview of climatic and ecological changes affecting mammalian adaptations and hands on experience with specimens.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 840 Tectonics
Crosslisted with: GEOL 440
Prerequisites: GEOL 400 or permission
Description: Theory of plate tectonics; tectonic controls on rock assemblages; interpretation of regional structure and tectonic history; origin and tectonic evolution of terrestrial planets.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

GEOL 842 Environmental Geophysics I
Crosslisted with: GEOL 442
Prerequisites: MATH 107; PHYS 211; GEOL 101 or 106; or equivalent or permission.
Description: Introduction to the principles of seismic, ground-penetrating radar, and bore-hole geophysical methods and their application to groundwater, engineering, environmental, and archaeological investigations.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

GEOL 843 Environmental Geophysics II
Crosslisted with: GEOL 443
Prerequisites: MATH 107; PHYS 211; GEOL 101 or 106; or equivalent or permission.
Description: Introduction to principles of magnetic, electromagnetic, resistivity, and gravity methods and their application to ground water, engineering, environmental, and archaeological investigations.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

GEOL 844 Geomicrobiology
Crosslisted with: BIOS 444, BIOS 844, GEOL 444
Prerequisites: 3 hours biological sciences and 3 hours chemistry.
Description: Lectures and discussions of primary literature regarding microorganisms and their role transforming Earth through geologic time.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
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<tr>
<td>GEOL 845</td>
<td>Advanced Geophysics</td>
<td>GEOL 445</td>
<td>GEOL 344</td>
<td>Integrative analysis of geophysical data (gravity, magnetics, seismic) with geological information (well logs, tectonic history, etc.)</td>
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<td>GEOL 850</td>
<td>Surficial Processes and Landscape Evolution</td>
<td>GEOL 450</td>
<td>GEOL 310 or permission.</td>
<td>Fluvial, glacial, eolian, and coastal processes and landforms. Roles of tectonics, climate, and climate change in landscape evolution. Lab stresses description and interpretation of landforms from remotely-sensed, cartographic, and field data.</td>
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<td>GEOL 857</td>
<td>Ecosystem Ecology</td>
<td>BIOS 457, BIOS 857, GEOL 457</td>
<td>BIOS 207 and CHEM 110 and Senior standing.</td>
<td>Processes controlling the cycling of energy and elements in ecosystems and how both plant and animal species influence them. Human-influenced global and local changes that alter these cycles and ecosystem functioning.</td>
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<td>GEOL 861</td>
<td>Soil Physics</td>
<td>AGRO 461, GEOL 461, NRES 461, SOIL 461, WATS 461, AGRO 861, NRES 861</td>
<td>AGRO/SOIL 153; PHYS 141 or equivalent, one semester of calculus.</td>
<td>Principles of soil physics. Movement of water, air, heat, and solutes in soils. Water retention and movement, including infiltration and field water regime. Movement of chemicals in soils.</td>
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<td>GEOL 865</td>
<td>Soil Geomorphology and Paleopedology</td>
<td>GEOL 465, NRES 465, NRES 865</td>
<td>GEOL 450/850 and NRES 477/877; or permission.</td>
<td>Soils and paleosols as evidence in reconstruction landscape evolution and paleoenvironments. Role of paleosols in stratigraphy.</td>
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<td>GEOL 870</td>
<td>Field Techniques in Hydrogeology</td>
<td>GEOL 470</td>
<td>GEOL 488/888</td>
<td>Basic techniques, field procedures, instruments, and software for data interpretation, and characterization of groundwater flow and contaminant transport.</td>
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<td>GEOL 872</td>
<td>Water in Geosciences</td>
<td>GEOL 472</td>
<td>MATH 106 and 107; PHYS 141; and one of the following: GEOL 101 or 106 or METR 100</td>
<td>Quantitative approach to water in geological media, earth surface and atmosphere. Understanding and analysis of physical processes involved in groundwater-surface-atmosphere interactions.</td>
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<td>GEOL 875</td>
<td>Water Quality Strategy</td>
<td>NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 475, AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 475, MSYM 475, MSYM 875, POLS 475, POLS 875</td>
<td>Senior standing or permission.</td>
<td>Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.</td>
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<td>GEOL 880</td>
<td>Economic Geology of the Metals</td>
<td>GEOL 480</td>
<td>12 hrs geology including GEOL 210, 400; CHEM 114, 116.</td>
<td>Occurrence and utilization of the metallic ores. Elementary theory of ore genesis.</td>
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<td>GEOL 884</td>
<td>Water Resources Seminar</td>
<td>AGRO 484, GEOG 484, GEOL 484, NRES 484, WATS 484, AGRO 884, AGRO 884, GEOG 884, WATS 884</td>
<td>Junior or above standing, or permission.</td>
<td>Seminar on current water resources research and issues in Nebraska and the region.</td>
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<td>GEOL 885</td>
<td>Fossil Fuel Geology and Exploration</td>
<td>GEOL 485</td>
<td>12 hrs geology.</td>
<td>Geology of coal, oil and gas, and methods of exploration.</td>
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<td>GEOL 888</td>
<td>Groundwater Geology</td>
<td>GEOL 488, NRES 488, NRES 888</td>
<td>GEOL 100-level course; MATH 106 or equivalent.</td>
<td>Occurrence, movement, and development of water in the geologic environment.</td>
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<td>GEOL 889</td>
<td>Hydrogeology</td>
<td>NRES 887</td>
<td>GEOL 888/NRES 488 and MATH 208</td>
<td>Principles of flow through porous media with emphasis on basic classical solutions, flow-net analysis, and elementary modern numerical solutions that aid in the analysis and development of groundwater supplies.</td>
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<td>GEOL 895</td>
<td>Economic and Exploration Geology</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>E.F. Schramm Course in Economic Geology. Aspects of fossil fuel geology and exploration.</td>
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<td>GEOL 917</td>
<td>Environmental Isotope Hydrology</td>
<td>NRES 917</td>
<td>NRES 819 or equivalent or permission</td>
<td>Theory and use of stable, radiogenic and radioactive isotopes in hydrologic studies.</td>
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<td>GEOL 918</td>
<td>Seminar in Geochemistry</td>
<td>GEOL 485</td>
<td>GEOL 100-level course; MATH 106 or equivalent.</td>
<td>Seminar in the study of geochemistry. Topics will vary.</td>
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<td>GEOL 919</td>
<td>Seminar in Mineralogy and Petrology</td>
<td>GEOL 485</td>
<td>GEOL 100-level course; MATH 106 or equivalent.</td>
<td>Advanced seminar on the study of mineralogy and petrology. Topics will vary.</td>
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<td>GEOL 920</td>
<td>Seminar in Stratigraphy</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>Seminar in the study of sedimentary rocks under the microscope, including origin, composition, texture, and diagenesis.</td>
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<td>GEOL 921</td>
<td>Sedimentary Petrography and Diagenesis</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>Study of fossil fuel geology and exploration.</td>
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<td>GEOL 922</td>
<td>Seminar in Sedimentary Environments</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>Seminar in the study of sedimentary rocks under the microscope, including origin, composition, texture, and diagenesis.</td>
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<td>GEOL 925</td>
<td>Seminar in Sedimentology</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>Seminar in the study of sedimentary rocks under the microscope, including origin, composition, texture, and diagenesis.</td>
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<td>GEOL 926</td>
<td>Marine Geology and Paleoeceanography</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>Seminar in the study of sedimentary rocks under the microscope, including origin, composition, texture, and diagenesis.</td>
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<td>GEOL 929</td>
<td>Mesozoic and Cenozoic Stratigraphy</td>
<td>GEOL 495</td>
<td>GEOL 310 and GEOL 320; or equivalent.</td>
<td>Seminar in the study of sedimentary rocks under the microscope, including origin, composition, texture, and diagenesis.</td>
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<td>GEOL 935</td>
<td>Cenozoic Vertebrate Paleoecology</td>
<td>Terrestrial vertebrate history during the Cenozoic Era with emphasis on the fossil record of Great Plains mammalian communities within the last fifteen million years.</td>
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<td>GEOL 936</td>
<td>Siliceous Phytoplankton Paleontology</td>
<td>Biostratigraphy, paleoecology, and paleobiogeography of fossil diatoms, silicoflagellates and ebridians.</td>
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<td>GEOL 937</td>
<td>Mesozoic Calcareous Nannofossil Paleontology</td>
<td>Biostratigraphy, paleoecology, and paleobiogeography of Mesozoic calcareous nannofossils.</td>
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<td>GEOL 938</td>
<td>Cenozoic Calcareous Microfossil Paleontology</td>
<td>Biostratigraphy, paleoecology, and paleobiogeography of Cenozoic calcareous nannofossils.</td>
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<td>GEOL 939</td>
<td>Seminar in Paleontology</td>
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<td>GEOL 940</td>
<td>Advanced Structural Geology</td>
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<td>GEOL 945</td>
<td>Seminar in Structural Geology and Tectonics</td>
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<td>GEOL 956</td>
<td>Seminar in Quaternary Geology</td>
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<td>GEOL 957</td>
<td>Modeling Vadose Zone Hydrology</td>
<td>Crosslisted with: AGEN 957, BSEN 957, CIVE 957</td>
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<td>GEOL 985</td>
<td>Solute Movement in Soils</td>
<td>Crosslisted with: AGEN 955, AGRO 955, CIVE 955</td>
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<td>GEOL 986</td>
<td>Contaminant Hydrogeology</td>
<td>Prerequisites: GEOL 888, MATH 208 or equivalent, or permission</td>
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GEOL 988 Introduction to Groundwater Modeling

Prerequisites: GEOL 889, MATH 208 or equivalent, programming language, or permission

Description: Application of fundamentals of modeling techniques (analytical, semi-analytical, finite-difference and finite elements) to the solution of hydrogeological problems. Emphasis on development of model concepts for specific groundwater flow and transport conditions, selection of solution methods, including computer software and hardware, performance of computer modeling, and interpretation of results.

Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC