

## GEOLOGY BS, MINOR AND CERTIFICATE

### Geology

College of Science, Engineering and Technology  
Department Chemistry & Geology  
241 Ford Hall • 507-389-1963

Website: [cset.mnsu.edu/chemgeol/programs/geol/](http://cset.mnsu.edu/chemgeol/programs/geol/)

Chair: Mary Hadley

Faculty: Bryce Hoppie, Steven Losh, Chad Wittkop

Geology is the study of the Earth, its materials, and its processes. It concerns itself with solving basic scientific problems and utilizing knowledge of the Earth for the benefit of society. Its concerns include but are not limited to soil preservation, water production and quality, hazards mitigation, resource exploration and production, engineering of structures large and small, climate change, and the history of life on Earth and the search for life on other planets.

**Academic Map/Degree Plan at [www.mnsu.edu/programs/#All](http://www.mnsu.edu/programs/#All)**

#### POLICIES/INFORMATION

**Admission to Major** is granted by the department. Minimum university admission requirements are:

- a minimum of 32 earned semester credit hours.
- a minimum cumulative GPA of 2.00 ("C").

Contact the CSET advising office for application procedures.

**P/N Grading Policy.** All courses for a Geology award must be taken for a letter grade.

#### Program-specific admission requirements

Admission to Major is granted by the department. Minimum admission requirements are:

- a minimum of 30 earned semester credit hours.
- a minimum cumulative GPA of 2.00 ("C").

Contact the CSET advising office for application procedures.

#### Other Graduation Requirements

A minimum of two additional upper division (300/400) credits must be completed to meet university graduation requirements. Coursework in a supporting natural science (e.g. BIOL, CHEM, ENVR) is strongly recommended. Consult with your advisor before fulfilling this requirement.

Successful completion of a Research Experience for Undergraduates (REU) can be substituted for GEOL 499 as the Capstone Experience subject to Department approval.

#### GEOLOGY BS

##### Major Common Core

GEOL 121 Physical Geology (4)  
GEOL 122 Earth History (4)  
GEOL 201 Elements of Mineralogy (4)  
GEOL 302 Petrology (4)  
GEOL 320W Sedimentology and Stratigraphy (4)  
GEOL 330 Structural Geology (4)  
Required General Education (13 credits)  
CHEM 201 General Chemistry I (5)  
MATH 121 Calculus I (4)  
PHYS 211 Principles of Physics I (4)

##### Major Restricted Electives

Geology Electives (choose 7 - 8 credits)  
GEOL 401 Field Studies (1-3)  
GEOL 410 Glacial Geology (3)  
GEOL 430 Petroleum and Ore Deposit Geology (3)  
GEOL 449 Applied Soil Science and Surface Hydrology (4)  
GEOL 450 Hydrogeology (3)  
Geomorphology Elective (choose 3 - 4 credits)  
GEOG 315 Geomorphology (3)  
GEOG 411 Soils Geomorphology (3)

GEOG 415 Earth Surface Processes (4)  
Geography Elective (choose 3 - 4 credits)  
GEOG 373 Introduction to Geography Information Systems (4)  
GEOG 416 Fluvial Geomorphology and Hydrology (4)  
GEOG 471 Digital Field Mapping with GPS (4)  
GEOG 474 Introduction to Remote Sensing (4)  
Capstone Experience (choose 4 - 10 credits)  
GEOL 440 Geology Field Camp (4-8)  
GEOL 497 Internship (1-10)  
GEOL 499 Individual Study (1-5)

#### Other Graduation Requirements

Successful completion of a Research Experience for Undergraduates (REU) can be substituted for GEOL 499 as the Capstone Experience subject to Department approval.

#### GEOLOGY MINOR

##### Required for Minor

GEOL 121 Physical Geology (4)  
GEOL 122 Earth History (4)  
GEOL 201 Elements of Mineralogy (4)

##### Required Electives for Minor

(choose a minimum of 6 credits from the following)

GEOL 330 Structural Geology (4)  
GEOL 350 Environmental Geology (4)  
GEOL 370 Geotectonics (2)  
GEOL 401 Field Studies (1-3)  
GEOL 450 Hydrogeology (3)  
GEOL 499 Individual Study (1-5)

#### ENVIRONMENTAL GEOLOGY CERTIFICATE

The Environmental Geology Certificate is designed to develop a core component of skills in geology that are relevant to solving environmental problems. This certificate will complement students of any major who are interested in pursuing employment in environmental science or resource management job sectors. Courses within the certificate place an emphasis on understanding and solving problems associated with our regional geologic environment.

##### Major Common Core

GEOL 121 Physical Geology (4)  
GEOL 201 Elements of Mineralogy (4)  
GEOL 320W Sedimentology and Stratigraphy (4)  
Required Environmental Geology (choose 3 - 4 credits)  
GEOL 350 Environmental Geology (4)  
GEOL 450 Hydrogeology (3)  
Required Environmental Sciences (choose 3 - 4 credits)  
ENVR 440 Environmental Regulations (3)

##### Major Restricted Electives

Choose one course not used to satisfy requirements above.  
ENVR 450 Environmental Pollution & Control (3)  
ENVR 460 Analysis of Pollutants (4)  
ENVR 470 Environmental Assessment (3)  
GEOL 350 Environmental Geology (4)  
GEOL 450 Hydrogeology (3)

#### COURSE DESCRIPTIONS

##### GEOL 100 (3-4) Our Geologic Environment

Earthquakes, volcanic eruptions, and flooding are three examples of naturally recurring events on the Earth that ultimately influence all of our lives. This course introduces the physical features and processes of the Earth that control these events. The course has a laboratory component.

Fall, Spring  
GE-3, GE-10

##### GEOL 108 (3) Oceans of the World

An introduction to the world's oceans: how they work, what they contain, how they impact everything on Earth, and how humans impact them.

Fall, Spring  
GE-3, GE-10

### **GEOL 121 (4) Physical Geology**

Physical geology is the study of how the earth works. From mountain building to soil erosion, this course provides an introduction to all the main areas of geologic study. Lecture discussions and laboratory exercises are designed for students seeking a major or minor in one of the natural sciences.

Fall  
GE-3, GE-10

### **GEOL 122 (4) Earth History**

An examination of the development and evolution of life on earth. In addition to reviewing the range of life forms and global climates existing on earth during various times in its geologic past, we will also look at how global industrialization could lead to the earth's next period of mass extinction. Weekly laboratory assignments illustrate principles discussed in lectures.

Spring  
GE-3

### **GEOL 201 (4) Elements of Mineralogy**

Examination of the elemental composition and crystal structure of various common minerals. Laboratory time is spent practicing techniques of identifying crystals and minerals. The importance and occurrence of many economic minerals is also covered thoroughly in this course.

Prerequisite: GEOL 100 or GEOL 121  
Fall

### **GEOL 302 (4) Petrology**

Study of the compositions and origins of igneous, sedimentary, and metamorphic rocks in a plate tectonic context. Topics include mineral optics and geochemistry. Lab portion of course emphasizes identification and study of rocks.

Prerequisite: GEOL 201  
Spring

### **GEOL 305 (2) Earth Science for Elementary Educators**

An integrated, multi-disciplinary study of the Earth and the solar system. The course establishes basic concepts of astronomy, physical geography, and geology to give students a thorough understanding of the Earth and its place in the solar system. Learning outcomes partially fulfill licensure requirements for elementary educators. This course is focused on content.

Prerequisite: BIOL 100, PHYS 101  
Fall, Spring

### **GEOL 310 (3) Earth and Space Systems**

An integrated, multi-disciplinary study of the Earth and the solar system. The course builds on basic concepts of astronomy, chemistry and geology to give students an enhanced understanding of the nature and relationship among the forces that control the Earth's evolution. Learning outcomes partially fulfill licensure requirements for secondary science educators.

Prerequisite: AST 101, CHEM 201, GEOL 121  
Fall

### **GEOL 320W (4) Sedimentology and Stratigraphy**

Focused studies of the origins and processes of transportation, deposition, burial and diagenesis of sedimentary materials. Lab assignments focus on sedimentary material identification and analysis. Field trips required.

Prerequisite: GEOL 121  
Fall  
WI

### **GEOL 330 (4) Structural Geology**

Study of processes and results of rock deformation at scales ranging from microscopic to plate tectonic, and at conditions ranging from the Earth's surface to the deep interior.

Prerequisite: GEOL 121

### **GEOL 401 (1-3) Field Studies**

This course is devoted to the study and practice of geological field investigations. Students will first learn basic field investigative methods. Students will then be appropriately versed in the geological history and importance of a region selected for in-depth study. Finally, students will participate in a field trip to a regional site of geologic importance over an extended weekend (4-6 days). Potential study sites may include Minnesota's North Shore and Iron Range, the Badlands and Black Hills of South Dakota, the Ozarks, or the Rocky Mountains.

Prerequisite: GEOL 100 or GEOL 121 and GEOL 122  
Variable

### **GEOL 410 (3) Glacial Geology**

Study of the origin, composition, texture, morphology, and stratigraphy of glacial deposits. Topics include the geologic record of glaciation, techniques used to reconstruct histories of glaciation, glacial depositional systems, provenance of glacial sediments, influence of glaciation on soil texture, and interpretation of glacial geologic maps. Emphasis will be placed on description and interpretation of glacial features in southern Minnesota. Field trips required.

Prerequisite: GEOL 121  
On Demand: Fall, Spring, Summer

### **GEOL 430 (3) Petroleum and Ore Deposit Geology**

Comprehensive survey of ore deposit and petroleum geology, including exploration and production technologies. Course emphasizes projects using industry data.

Prerequisite: GEOL 121, GEOL 201, GEOL 122  
Corequisite: GEOL 320W, GEOL 302, GEOL 330  
Variable

### **GEOL 440 (4-8) Geology Field Camp**

Geologic field mapping and interpretation in diverse settings. Course is offered by universities throughout the U.S. and elsewhere.

Prerequisite: GEOL 121, GEOL 122, GEOL 201, GEOL 320W, GEOL 330  
Summer

### **GEOL 449 (4) Applied Soil Science and Surface Hydrology**

The application of geologic data and principles to problems created by human occupancy and use of the physical environment. Lecture and laboratory topics include soil classification and conservation, hazardous waste site evaluation and remediation, and living with geologic hazards.

Prerequisite: GEOL 121  
ALT-Spring

### **GEOL 450 (3) Hydrogeology**

This course introduces physical and chemical studies of hydrogeology. The main areas of discussion will include the physical and chemical attributes of aquifers, movement of ground-water and solute through soils and rocks, and reactions between earth materials and pollutants in ground-water systems. The class includes extensive use of MODFLOW and MT3D, the two most commonly used groundwater modeling programs currently available.

Prerequisite: CHEM 201, GEOL 121  
ALT-Spring

### **GEOL 490 (1-4) Workshop**

### **GEOL 497 (1-10) Internship**

Internships allow students to apply knowledge and skills learned through undergraduate geoscience classes to real-world problems. Students will work with faculty to secure suitable employment and when finished, students will develop a written report of professional practicum that explores the relationships that exist among collegiate lessons and workplace tasks. Evaluation will be based on the content and presentation of the report as well as consultations with the internship supervisor.

Fall, Spring, Summer

### **GEOL 499 (1-5) Individual Study**