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## GEOLOGY MINOR

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### 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

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Geology is the study of the earth. It concerns itself with the materials that constitute the earth, their disposition and structure, the processes at work on and within the earth, and both the physical and biological history of the earth.

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

GEOLOGY MAJOR - See Earth Science Major

#### 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)

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#### 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  
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##### 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 350 (4) Environmental Geology

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 351 (2) Engineering Geology

This course focuses on the application of geologic data and principles created by human occupancy and use of the physical environment. This course meets concurrently with GEOL 350 Environmental Geology through the last eight weeks of the semester. It is intended for civil engineering students that previously completed Geotechnical Engineering, CIVE 360.

Prerequisite: GEOL 121, CIVE 360, or instructor permission  
ALT-Spring

##### GEOL 370 (2) Geotectonics

Expanded discussions of several topics introduced in Physical Geology and Structural Geology. Topics include plate tectonics, deep earth structure, seismicity, mountain building, and continental growth.

Prerequisite: GEOL 121 and GEOL 330  
Variable

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## GEOLOGY CONTINUED

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### **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 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 479 (4) Teaching Earth Sciences**

Material and methods of earth science study directed toward future teachers of students in junior high and high schools.

Prerequisite: GEOL 121, GEOG 217 or instructor permission

Variable

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

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