GEOLOGY

Description
The Department of Earth and Atmospheric Sciences offers both the bachelor of science and the bachelor of arts degrees in geology. The bachelor of science program is designed for those who expect to continue in graduate work and become professional geoscientists. Undergraduate training in geology is also beneficial in many other fields such as teaching at the precollege level, urban planning, law, civil engineering, environmental studies, and museum work. Students preparing for these or similar areas are advised to take the bachelor of arts program, which is strong in fundamental geology but does not emphasize the ancillary courses required for admission to many graduate programs.

Field Trips
Many of the geology courses require field trips that typically include camping and primitive conditions. The number of trips and their duration are a function of the requirements of the particular course. Students seeking information or accommodation should contact the course instructor.

Program Assessment.
In order to assist the department in evaluating the effectiveness of its programs, majors will be required to maintain and submit a portfolio of material produced for the required Summer Field Course, GEOL 460 (for BS students), or for the required Depositional Environments course, GEOL 301 (for BA students). Course instructors will inform students of the required contents, deadlines, and procedures. Results of participation in this assessment activity will in no way affect a student's GPA or graduation.

College Admission
The entrance requirements for the College of Arts and Sciences (CAS), including any of the majors or minors offered through the college, are the same as the UNL General Admission Requirements. In addition to these requirements, the College of Arts and Sciences strongly recommends a third and fourth year of one foreign language in high school. Four years of high school coursework in the same language will fulfill the College of Arts and Sciences' language requirement. It will also allow students to continue language study at a more advanced level at UNL and provide more opportunity to study abroad.

ACADEMIC AND CAREER Advising

Academic and Career Advising Center
The Academic and Career Advising Center in 107 Oldfather Hall is the undergraduate hub for CAS students in all majors. Centrally located and easily accessed, students encounter friendly, knowledgeable people who are eager to help. Students visit the Advising Center in 107 Oldfather Hall to:

- Choose or change their major, minor, or degree program.
- Check in on policies, procedures, and deadlines.
- Get a college approval signature from the Dean's representative, Sr. Director of Advising and Student Success.

While the assigned academic advisor should be the student's primary contact, there are daily walk-ins from 12:30 where a general academic advisor can answer a quick question. In addition, the CAS Career Coaches are located here. They help students explore majors and minors, gain experience, and develop a plan for life after graduation. Not sure where to go or who to ask? The Advising Center team can help.

Assigned Academic Advisors
Academic advisors are critical resources dedicated to students' academic, personal, and professional success. Every CAS student is assigned an academic advisor based on their primary major. Since most CAS students have more than just a single major, it is important to get to know the advisor for any minors or additional majors. Academic advisors work closely with the faculty to provide the best overall support and the discipline-specific expertise.

Assigned advisors are listed in MyRED (https://its.unl.edu/myunl) and their offices may be located in or near the department of the major for which they advise or in the Academic and Career Advising Center. Students who have declared a pre-health or pre-law area of interest will also work with advisors in the Exploratory and Pre-Professional Advising Center (Explore Center) in 127 Love South, who are specially trained to guide students preparing to enter a professional school.

For complete and current information on advisors for majors, minors, or pre-professional areas, contact the Arts and Sciences Academic and Career Advising Center, 107 Oldfather Hall, 402-472-4190, http://cas.unl.edu/advising.

Career Coaching
The College believes that Academics + Experience = Opportunities and encourages students to complement their academic preparation with real-world experience, including internships, research, education abroad, service, and leadership. Arts and sciences students have access to a powerful network of faculty, staff, and advisors dedicated to providing information and support for their goals of meaningful employment or advanced education. Arts and sciences graduates have unlimited career possibilities and carry with them important career competencies—communication, critical thinking, creativity, context, and collaboration. They have the skills and adaptability that employers universally value. Graduates are not only prepared to effectively contribute professionally in the real world, but they have a solid foundation to excel in an increasingly global, technological, and interdisciplinary world.

Students should contact the career coaches in the Arts and Sciences Academic and Career Advising Center in 107 Oldfather, or their assigned advisor, for more information. The CAS career coaches help students explore career options, identify ways to build experience, and prepare to apply for internships, jobs, or graduate school, including help with resumes, applications, and interviewing.

ACE Requirements
Students must complete one course for each of the ACE Student Learning Outcomes below. Certified course choices are published in the degree audit, or visit the ACE website (http://ace.unl.edu) for the most current list of certified courses.

ACE Student Learning Outcomes

ACE 1: Write texts, in various forms, with an identified purpose, that respond to specific audience needs, integrate research or existing knowledge, and use applicable documentation and appropriate conventions of format and structure.

ACE 2: Demonstrate competence in communication skills.
ACE 3: Use mathematical, computational, statistical, logical, or other formal reasoning to solve problems, draw inferences, justify conclusions, and determine reasonableness.

ACE 4: Use scientific methods and knowledge to pose questions, frame hypotheses, interpret data, and evaluate whether conclusions about the natural and physical world are reasonable.

ACE 5: Use knowledge, historical perspectives, analysis, interpretation, critical evaluation, and the standards of evidence appropriate to the humanities to address problems and issues.

ACE 6: Use knowledge, theories, and research perspectives such as statistical methods or observational accounts appropriate to the social sciences to understand and evaluate social systems or human behaviors.

ACE 7: Use knowledge, theories, or methods appropriate to the arts to understand their context and significance.

ACE 8: Use knowledge, theories, and analysis to explain ethical principles and their importance in society.

ACE 9: Exhibit global awareness or knowledge of human diversity through analysis of an issue.

ACE 10: Generate a creative or scholarly product that requires broad knowledge, appropriate technical proficiency, information collection, synthesis, interpretation, presentation, and reflection.

College Distribution Requirements

College Distribution Requirements – BA and BS

The College of Arts and Sciences distribution requirements are common to both the bachelor of arts and bachelor of science degrees and are designed to ensure a range of courses. By engaging in study in several different areas within the College, students develop the ability to learn in a variety of ways and apply their knowledge from a variety of perspectives. All requirements are in addition to University ACE requirements, and no course can be used to fulfill both an ACE outcome and a College Distribution Requirement.

- A student may not use a single course to satisfy more than one College Distribution Requirement, with the exception of CDR Diversity. Courses used to meet CDR Diversity may also meet CDR Writing, CDR Humanities, or CDR Social Science.
- Independent study or reading courses and internships cannot be used to satisfy distribution requirements.
- Courses from interdisciplinary programs will be applied in the same area as courses from the home/cross-listed department.

College Distribution Requirements

**CDR: Written Communication**

Select from courses approved for ACE outcome 1.

**CDR: Natural, Physical, and Mathematical Sciences with Lab**

Select from biochemistry, biological sciences, chemistry, computer science, geology, meteorology, mathematics, physics, and statistics. Must include one lab in the natural or physical sciences. Lab courses may be selected from biochemistry, biological sciences, chemistry, geology, meteorology, and physics.

Some courses from geography and anthropology may also be used to satisfy the lab requirement above.  

**CDR: Humanities**

Select from classics, English, history, modern languages and literatures, philosophy, and religious studies.

**CDR: Social Science**

Select from anthropology, communication studies, geography, political science, psychology, or sociology.

**CDR: Human Diversity in U.S. Communities**

Select from a set of approved courses as listed in the degree audit.

**CDR: Language**

Fulfilled by the completion of the 6-credit-hour second-year sequence in a single foreign language in one of the following departments: Classics and religious studies or modern languages and literatures. Instruction is currently available in Arabic, Chinese, Czech, French, German, Greek, Japanese, Latin, Russian, and Spanish.

A student who has completed the fourth-year level of one foreign language in high school is exempt from the language requirement, but encouraged to continue on in their language study.

Credit Hours Subtotal: 13.32

1. See Degree Audit or a College of Arts and Sciences advisor for approved geography and anthropology courses that apply as natural science.

2. Language courses numbered 220 and below do not fulfill the CDR Humanities.

3. See Degree Audit or College of Arts and Sciences advisor for list of natural/physical science courses in anthropology, geography, and psychology that do not apply as social science.

Language Requirement

UNL and the College of Arts and Sciences place great value on academic exposure and proficiency in a second language. The UNL entrance requirement of two years of the same foreign language or the College’s language distribution requirement (CDR: Language) will rarely be waived and only with relevant documentation. See the main College of Arts and Sciences page for more details.

Scientific Base - BS Only

The bachelor of science degree requires students to complete 60 hours in mathematical, physical, and natural sciences. Approved courses for scientific base credit come from the following College of Arts and Sciences disciplines: actuarial science, anthropology (selected courses), astronomy, biochemistry (excluding BIOC 101), biological sciences (excluding BIOS 100 or BIOS 203), chemistry (excluding CHEM 101), computer science (excluding CSCE 10), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology (excluding MBIO 101), and physics.

See your Degree Audit or your assigned academic advisor for a complete list, including individual classes that fall outside of the disciplines listed above. Up to 12 hours of scientific and technical courses offered by other colleges may be accepted toward this requirement with approval of the College of Arts and Sciences. See your assigned academic advisor to start the approval process.
Minimum Hours Required for Graduation
A minimum of 120 semester hours of credit is required for graduation from the College of Arts and Sciences. A cumulative grade point average of at least 2.0 is required.

Grade Rules
Restrictions on C- and D Grades
The College will accept no more than 15 semester hours of C- and D grades from other domestic institutions except for UNO and UNK. All courses taken at UNO and UNK impact the UNL transcript. No transfer of C- and D grades can be applied toward requirements in a major or a minor. No UNL C- and D grades can be applied toward requirements in a major or a minor. International coursework (including education abroad) with a final grade equivalent to a C- or lower will not be validated by College of Arts and Sciences departments to be degree applicable.

Pass/No Pass Privilege
The College of Arts and Sciences adheres to the University regulations for the Pass/No Pass (P/N) privilege with the following additional regulations:

- Pass/No Pass hours can count toward fulfillment of University ACE requirements and college distribution requirements up to the 24-hour maximum.
- Most arts and sciences departments and programs do not allow courses graded Pass/No Pass to apply to the major or minor. Students should refer to the department's or program's section of the catalog for clarification. By college rule, departments can allow up to 6 hours of Pass/No Pass in the major or minor.
- Departments may specify that certain courses of theirs can be taken only on a P/N basis.
- The college will permit no more than a total of 24 semester hours of P/N grades to be applied toward degree requirements. This total includes all Pass grades earned at UNL and other U.S. schools. NOTE: This 24-hour limit is more restrictive than the University regulation.

Grading Appeals
A student who feels that he/she has been unfairly graded must ordinarily take the following sequential steps in a timely manner, usually by initiating the appeal in the semester following the awarding of the grade:

1. Talk with the instructor concerned. Most problems are resolved at this point.
2. Talk to the instructor's department chairperson.
3. Take the case to the Grading Appeal Committee of the department concerned. The Committee should be contacted through the department chairperson.
4. Take the case to the College Grading Appeals Committee by contacting the Dean's Office, 1223 Oldfather Hall.

Course Level Requirements
Courses Numbered at the 300 or 400 Level
Thirty (30) of the 120 semester hours of credit must be in courses numbered at the 300 or 400 level. Of those 30 hours, 15 hours (1/2) must be completed in residence at UNL.

Residency Requirement
Students must complete at least 30 of the 120 total hours for their degree at UNL. Students must complete at least 1/2 of their major coursework, including 6 hours at the 300 or 400 level in their major and 15 of the 30 hours required at the 300 or 400 level, in residence. Credit earned during education abroad may be used toward the residency requirement only if students register through UNL.

Catalog to Use
Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to and enrolled as a degree-seeking student at UNL. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at UNL in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991, the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Learning Outcomes
Graduates of geology will be able to:

1. Understand basic physical geology, historical geology, stratigraphy, and petrology and their roles in building earth materials.
2. Understand structural geology and geomorphology and their roles in landscape evolution.
3. Make accurate field observations from a variety of landscapes.
4. Present geological data and results as coherent written and oral reports.

Major Requirements
Bachelor of Science
The BS is recommended as a minimum program for the pre-professional geologist. All candidates for this degree are required to attend a field camp.

Core Requirements
Required Courses
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<td>Structural Geology</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 410</td>
<td>Geochemistry</td>
<td>3</td>
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<tr>
<td>GEOL 460</td>
<td>Summer Field Course</td>
<td>6</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 30
Total Credit Hours: 30

Specific Major Requirements
Additional Geology Courses 1 2
Select 12 hours of additional GEOL courses at the 200 level or above, with at least one course at the 400 level.

Credit Hours Subtotal: 12
Total Credit Hours: 12

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Credit Hours Subtotal: 12
Total Credit Hours: 12
Ancillary Requirements

Mathematics

MATH 106 Calculus I 5
MATH 107 Calculus II 4
Credit Hours Subtotal: 9

Chemistry

CHEM 109 General Chemistry I 4
or CHEM 113 Fundamental Chemistry I 4
Credit Hours Subtotal: 4

Physics

PHYS 141 Elementary General Physics I 5
PHYS 142 Elementary General Physics II 5
Credit Hours Subtotal: 10

Additional Science Courses

Select an additional 6 hours from the following: 6
ASTR 204 Introduction to Astronomy and Astrophysics
BIOS 101 General Biology
& BIOS 101L and General Biology Laboratory
BIOS 206 General Genetics
LIFE 120 Fundamentals of Biology I
& LIFE 120L and Fundamentals of Biology I Laboratory
LIFE 121 Fundamentals of Biology II
& LIFE 121L and Fundamentals of Biology II Laboratory
CHEM 110 General Chemistry II
or CHEM 114 Fundamental Chemistry II
CHEM 221 Elementary Quantitative Analysis
CHEM 251 Organic Chemistry I
& CHEM 253 and Organic Chemistry I Laboratory
or CHEM 261 Organic Chemistry
& CHEM 263 and Organic Chemistry Laboratory
CHEM 471 Physical Chemistry
MATH 208 Calculus III
MATH 221 Differential Equations
STAT 218 Introduction to Statistics
STAT 380 Statistics and Applications
PHYS 311 Mechanics
PHYS 343 Physics of Lasers and Modern Optics
Credit Hours Subtotal: 6
Total Credit Hours 29

Bachelor of Arts

Thirty (30) hours of geology courses, plus required chemistry and math.

Core Requirements

Required Courses

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Credit Hours Subtotal: 21
Total Credit Hours 21

Specific Major Requirements

Additional Geology Courses

Select 9 hours of additional GEOL courses, with no more than 4 hours at the 100 level.
Credit Hours Subtotal: 9
Total Credit Hours 9

Recommended courses for specific interests

- Professional Geologist: GEOL 372, GEOL 450, GEOL 470, GEOL 485, GEOL 488
- Sedimentology: GEOL 421, GEOL 450, GEOL 485
- Paleontology and Earth Systems: GEOL 417, GEOL 423, GEOL 424, GEOL 430, GEOL 431, GEOL 435
- Hydrological Sciences: GEOL 372, GEOL 417, GEOL 450, GEOL 470, GEOL 488

Ancillary Requirements

Chemistry

CHEM 109 General Chemistry I 4
or CHEM 113 Fundamental Chemistry I 4
Credit Hours Subtotal: 4

MATHEMATICS

Select one MATH course from the following or higher: 2-5
- MATH 102 Trigonometry
- MATH 103 College Algebra and Trigonometry
Credit Hours Subtotal: 2-5
Total Credit Hours 6-9

ADDITIONAL MAJOR REQUIREMENTS

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major and minor, including ancillary courses.

Pass/No Pass

No course taken Pass/No Pass will be counted toward the major or the minor.

Requirements for Minor Offered by Department

Twenty-two (22) hours of geology courses with no more than 8 hours at the 100 level.
Grade Rules
C- and D Grades
A grade of C or above is required for all courses in the major and minor.

Pass/No Pass
No course taken Pass/No Pass will be counted toward the major or the minor.

GEOL 100 Introduction to Geology
Notes: Credit toward the degree may be earned in only one of GEOL 100 or GEOL 101 or GEOL 101H
Description: Background in physical geology for non-majors. Topics include rocks and minerals, surficial processes, plate tectonics, and applied geology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 4 Science

GEOL 101 Dynamic Earth
Notes: Credit toward the degree may be earned in only one of GEOL 100 or GEOL 101 or GEOL 101H.
Description: Minerals, rocks, and ores; the surface features and internal character of the earth and the forces that are constantly changing it. Examination of minerals and rocks and investigation of geological processes and their products.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Prerequisite for: AGRO 455, AGRO 855, NRES 455, NRES 855, SOIL 455; GEOG 308, GEOL 308, NRES 308; GEOL 103; GEOL 103H; GEOL 200; GEOL 260; GEOL 372; METR 270
ACE: ACE 4 Science

GEOL 101H Honors: Physical Geology
Prerequisites: Good standing in the University Honors Program or by invitation; GEOL major.
Notes: Credit toward the degree may be earned in only one of: GEOL 100 or 101 or 101H.
Description: Processes that formed the earth and continue to alter it today, from interior forces driving plate tectonics, earthquakes, volcanoes, and mountain building, to surface processes driving the atmosphere, oceans, rivers, glaciers, and landscape formation. Natural resources and their origin.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded
Prerequisite for: GEOG 308, GEOL 308, NRES 308; GEOL 103; GEOL 103H; GEOL 200; GEOL 260; GEOL 372; METR 270

GEOL 103 Evolution of the Earth
Prerequisites: GEOL 101
Description: Physical and biological evolution of the earth. Lab work includes examination of ancient geological terrains through maps and fossils.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
ACE: ACE 4 Science

GEOL 103H Honors: Historical Geology
Prerequisites: Good standing in the University Honors program or by invitation; GEOL 101.
Description: Physical and biological evolution of the earth. Lab work includes examination of ancient geological terrains through maps and fossils.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded

GEOL 105 Fossils and the History of Life
Description: Introduction to the history of life based on the fossil record, evolutionary patterns, and processes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 106 Environmental Geology
Description: Survey of geologic materials and processes with emphasis on those that influence modern societies' adjustment to our environment.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: GEOL 372

GEOL 107 Frontiers of Earth Science
Description: Series of three five-week sessions, each dealing with a geologic topic of current interest and concern. Topics vary from term to term and are listed in the Schedule of Classes.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded with Option

GEOL 109 Oceanography
Description: Introduction to physical oceanography, the geologic aspects of biologic oceanography, and human impact on the oceans.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 110 Deadly Planet
Description: Major geological natural hazards that affect human society and the geological processes that are responsible for them, such as earthquakes, tsunamis, volcanoes, landslides, floods, and meteorite impacts.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 4 Science

GEOL 115 Core Geology
Prerequisites: GEOL 103
Description: A survey of general geology and introductory concepts of earth science. Lab work includes examination of ancient geological terrains through maps and fossils.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
ACE: ACE 4 Science
GEOL 115 The Earth's Energy Resources  
**Description:** The geological controls on the occurrence and distribution of important and potentially important energy resources. The environmental and economic implications of energy resources exploration, development, and production.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option

GEOL 117 Life in the Universe  
**Crosslisted with:** ASTR 117, BIOS 117  
**Description:** Survey of what modern science tells us about the possibilities of life elsewhere in the universe. Topics include how the Earth formed and became suitable for life, how life arose on the Earth, the conditions under which life can thrive, places in the solar system that might support life, the existence of other solar systems that might provide suitable habitats, and attempts to find evidence of life on other planets.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option  
**ACE:** ACE 9 Global/Diversity

GEOL 120 Geology of National Parks and Monuments  
**Description:** Physical and historical geology of selected United States parklands. Geological and geophysical processes that produced the unique features of the parks. Interpretation of fossils, archaeology and geologic history. Environmental park policy issues involving geosciences.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option

GEOL 125 Frontiers in Antarctic Geosciences  
**Description:** Scientific exploration of the modern environment and geological and climate history of the Antarctic continent and Southern Ocean.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option  
**ACE:** ACE 9 Global/Diversity

GEOL 130 The Solar System  
**Description:** Geological survey of the Earth's solar system and evolution of planetary systems.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option

GEOL 197 Geoscience Fundamentals in the Field  
**Notes:** GEOL 197 requires a field trip  
**Description:** Scientific principles and practices illustrated through geological field work in Nebraska and Wyoming.  
**Credit Hours:** 1-4  
**Min credits per semester:** 1  
**Max credits per semester:** 4  
**Max credits per degree:** 4  
**Grading Option:** Graded with Option

GEOL 200 Mineralogy  
**Prerequisites:** GEOL 101; MATH 102, 103, or a qualifying MPE score for 106; CHEM 109.  
**Description:** Crystallography and mineral optics, mineral classes, crystal chemistry, and mineral identification methods. Includes microscope techniques and field methods.  
**Credit Hours:** 2  
**Max credits per semester:** 2  
**Max credits per degree:** 2  
**Grading Option:** Graded with Option  
**Prerequisite for:** GEOL 201

GEOL 201 Igneous and Metamorphic Petrology  
**Prerequisites:** GEOL 200  
**Description:** Introduction to the petrology of common igneous and metamorphic rocks and their identification, occurrence, and formation. Includes microscope techniques, analytical methods, and phase diagrams.  
**Credit Hours:** 2  
**Max credits per semester:** 2  
**Max credits per degree:** 2  
**Grading Option:** Graded with Option  
**Prerequisite for:** GEOL 300; GEOL 400; GEOL 410

GEOL 260 Geology of the Western USA  
**Prerequisites:** GEOL 101  
**Description:** Learn to identify rock types and sedimentary and structural features in the field in the Western United States. Build crucial field skills including the ability to tell a geologic story from a landscape or outcrop.  
**Credit Hours:** 1  
**Max credits per semester:** 1  
**Max credits per degree:** 1  
**Grading Option:** Graded  
**Offered:** SPRING

GEOL 291 Special Topics in Geology  
**Description:** Topics vary.  
**Credit Hours:** 1-6  
**Min credits per semester:** 1  
**Max credits per semester:** 6  
**Max credits per degree:** 6  
**Grading Option:** Graded with Option

GEOL 299 Independent Study in Geology  
**Prerequisites:** Permission.  
**Credit Hours:** 1-3  
**Min credits per semester:** 1  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option

GEOL 300 Sedimentology and Stratigraphy  
**Prerequisites:** GEOL 201  
**Description:** Sedimentary rocks and processes, their descriptive parameters, occurrence, origin, and significance in earth history. Stratified rocks in time and space, and methods of correlating geologic units from different localities.  
**Credit Hours:** 3  
**Max credits per semester:** 3  
**Max credits per degree:** 3  
**Grading Option:** Graded with Option  
**Offered:** FALL  
**Prerequisite for:** GEOL 301; GEOL 400
GEOL 301 Depositional Environments
Prerequisites: GEOL 300
Description: Sedimentological facies analysis and recognition of clastic, carbonate, and evaporite depositional systems in the rock record.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
Prerequisite for: GEOL 460

GEOL 308 Biogeography
Crosslisted with: GEOG 308, NRES 308
Prerequisites: GEOG 155 or BIOS 101 and 101L or GEOL 101.
Notes: Biogeography is a highly interdisciplinary science, relying heavily on ecology, geological science, and climatology. It is global in scope and offers the latest knowledge in understanding organism distributions, and the factors that determine those distributions.
Description: Introduction to the basic concepts of biogeography, the study of distributions of plants and animals, both past and present.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Groups: Physical Geography

GEOL 361 Soils, Environment and Water Quality
Crosslisted with: AGRO 361, NRES 361, SOIL 361, WATS 361
Prerequisites: AGRO/HORT/SOIL 153; MATH 102 or 103; two semesters chemistry (CHEM 105, 106 or CHEM 109,110) and WATS/GEOG/ NRES 281
Description: Chemical and physical processes that influence the fate and transport of contaminants (inorganic, organic, microbial) in soil-water environments. Extent, fate, mitigation and impact of various sources of pollution. Remedial technologies used for environmental restoration of contaminated environments.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Groups: Physical Geography

GEOL 400 Structural Geology
Prerequisites: GEOL 301; GEOL 300 or parallel; PHYS 141 or 211.
Description: Folding and faulting of rocks, types of texture and rock structure, cleavage, joints, dikes, and unconformities; structural interpretation of geologic maps; plate tectonics, mountain belts, and regional structures.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: FALL
Prerequisite for: GEOL 460
ACE: ACE 10 Integrated Product

GEOL 410 Geochemistry
Prerequisites: MATH 106; GEOL 201.
Description: Age of the Earth. Origin of the elements, solar system, oceans, atmosphere, and global geochemical cycles. Radioactive isotope geochemistry, stable isotope geochemistry, and equilibrium relationships.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 412 Volcanology and Igneous Petrology
Crosslisted with: GEOL 812
Prerequisites: GEOL 201; and either CHEM 109 or 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
Grading Option: Graded with Option

GEOL 415 Geochemical Thermodynamics
Crosslisted with: GEOL 815
Prerequisites: MATH 107, GEOL 201
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
Grading Option: Graded with Option

GEOL 417 Organic Geochemistry
Crosslisted with: GEOL 817
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
Grading Option: Graded with Option
GEOL 418 Chemistry of Natural Waters  
Crosslisted with: GEOL 818, NRES 419, NRES 819, WATS 418  
Prerequisites: CHEM 109 and 110, 113 and 114, or CHEM 111.  
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  
Grading Option: Graded with Option  
Prerequisite for: GEOL 418L, GEOL 818L, NRES 419L, NRES 819L, WATS 418L; GEOL 917, NRES 917

GEOL 418L Chemistry of Natural Waters Laboratory  
Crosslisted with: GEOL 818L, NRES 419L, NRES 819L, WATS 418L  
Prerequisites: CHEM 109 and 110 or CHEM 113 and 114; GEOL 418 or parallel.  
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  
Grading Option: Graded with Option  

GEOL 419 Applications of Remote Sensing in Agriculture and Natural Resources  
Crosslisted with: AGRO 419, GEOG 419, NRES 420, AGRO 819, GEOG 819, GEOL 819, NRES 820  
Notes: GEOG 418/NRES 418 recommended  
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  
Grading Option: Graded with Option  

GEOL 421 Carbonate Petrology  
Crosslisted with: GEOL 821  
Prerequisites: GEOL 301.  
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  
Grading Option: Graded with Option  

GEOL 423 Quaternary Paleoclimatology and Paleoecology  
Crosslisted with: BIOS 423, BIOS 823, GEOL 823  
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  
Grading Option: Graded with Option  

GEOL 424 Biogeochemical Cycles  
Crosslisted with: BIOS 424, BIOS 824, GEOL 824  
Prerequisites: CHEM 109 or 113; 12 hrs GEOL or BIOS.  
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  
Grading Option: Graded with Option  

GEOL 430 Quantitative Methods in Paleontology  
Crosslisted with: GEOL 830  
Prerequisites: GEOL 301.  
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  
Grading Option: Graded with Option  

GEOL 431 Micro-paleontology  
Crosslisted with: GEOL 831  
Prerequisites: GEOL 301.  
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  
Grading Option: Graded with Option  

GEOL 435 Vertebrate Paleontology  
Crosslisted with: GEOL 835  
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  
Grading Option: Graded with Option
GEOL 436 Evolution of Cenozoic Mammals
Crosslisted with: GEOL 836, 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
Grading Option: Graded with Option
Prerequisite for: GEOL 935

GEOL 440 Tectonics
Crosslisted with: GEOL 840
Prerequisites: GEOL 400.
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
Grading Option: Graded with Option

GEOL 441 Geophysics
Crosslisted with: GEOL 841
Prerequisites: PHYS 142 or PHYS 212
Description: Geophysical techniques to study the Earth: seismology, gravity, magnetics and heat flow.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 442 Environmental Geophysics I
Crosslisted with: GEOL 842
Prerequisites: MATH 107; PHYS 211; GEOL 101 or 106; or equivalent/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
Grading Option: Graded with Option

GEOL 443 Environmental Geophysics II
Crosslisted with: GEOL 843
Prerequisites: MATH 107; PHYS 211; GEOL 101 or 106.
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
Grading Option: Graded with Option

GEOL 444 Earth and Environmental Microbiology
Crosslisted with: BIOS 444, BIOS 844, GEOL 844
Prerequisites: 3 hours of BIOS or 3 hours of LIFE; 3 hours of CHEM
Description: An introduction into the role that microorganisms play and have played in natural and man-made environments. Topics covered include microbial diversity and physiology in soil, sediment, and water; microbes in Earth history; biogeochemical cycling; mineral formation and dissolution; biodegradation and bioremediation; biotechnology.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 445 Advanced Geophysics
Crosslisted with: GEOL 845
Prerequisites: GEOL 344
Description: Integrative analysis of geophysical data (gravity, magnetics, seismic) with geological information (well logs, tectonic history, etc.)
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 446 Exploration Geophysics
Crosslisted with: GEOL 846
Prerequisites: GEOL 485
Description: Geophysical methods used for petroleum exploration: potential fields, seismology, electrical and electromagnetic surveying.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 450 Surficial Processes and Landscape Evolution
Crosslisted with: GEOL 850
Prerequisites: GEOL 301.
Description: 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.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: GEOL 465, GEOL 865, NRES 465, NRES 865

GEOL 451 Invertebrate Paleobiology
Crosslisted with: BIOS 451, BIOS 851, GEOL 851
Prerequisites: At least one of: GEOL 103, GEOL 105, LIFE 121
Description: Overview of the key traits, relationships and evolutionary dynamics of invertebrate animals over Earth's history, particularly over the Phanerozoic (i.e., the last 540 million years). Emphasis on the use of invertebrate fossil record to test ideas about long term evolutionary patterns as well as learning the histories and basic anatomies of major invertebrate taxa.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Offered: SPRING
GEOL 453 GIS in Earth and Atmospheric Sciences
Crosslisted with: GEOL 853, METR 453, METR 853
Prerequisites: Junior or above standing; and one of the following: GEOL 100 or 101, or METR 100
Description: Basic concepts of GIS, hands-on experience with various case studies from geology, meteorology, climatology and environmental applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Groups: Introductory

GEOL 457 Ecosystem Ecology
Crosslisted with: BIOS 457, BIOS 857, GEOL 857
Prerequisites: BIOS 207 and CHEM 110 and Senior standing
Description: 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.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option

GEOL 460 Summer Field Course
Prerequisites: GEOL 301 and GEOL 400.
Notes: Students must sign up with the department during the Fall semester prior to the camp.
Description: Six weeks advanced study of selected field problems. Conducted in a geologically classic area where all major rock types are studied in a variety of geologic situations.
Credit Hours: 6
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded with Option
Offered: SUMMER
ACE: ACE 10 Integrated Product

GEOL 461 Soil Physics
Crosslisted with: AGRO 461, NRES 461, SOIL 461, WATS 461, AGRO 861, GEOL 861, NRES 861
Prerequisites: AGRO/SOIL 153; PHYS 141 or equivalent, one semester of calculus.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
Prerequisite for: AGEN 955, AGRO 955, CIVE 955, GEOL 985

GEOL 465 Field Techniques in Hydrogeology
Crosslisted with: GEOL 870
Prerequisites: GEOL 488/888.
Description: Basic techniques, field procedures, instruments, and software for data interpretation, and characterization of groundwater flow and contaminant transport.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 470 Water in Geosciences
Crosslisted with: GEOL 872
Prerequisites: MATH 106 and 107; PHYS 141; and one of the following: GEOL 101 or 106 or METR 100.
Description: Quantitative approach to water in geological media, earth surface and atmosphere. Understanding and analysis of physical processes involved in groundwater-surface-atmosphere interactions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 472 Water Quality Strategy
Crosslisted with: 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 875, MSYM 475, MSYM 875, POLS 475, POLS 875
Prerequisites: Senior standing.
Notes: Capstone course.
Description: 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.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Groups: American Government & Public Pol

GEOL 475 Water Resources Seminar
Crosslisted with: AGRO 484, GEOG 484, NRES 484, WATS 484, NRES 884, AGRO 884, GEOG 884, GEOL 884, WATS 884
Prerequisites: Junior or above standing
Description: Seminar on current water resources research and issues in Nebraska and the region.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Graded with Option
GEOL 485 Fossil Fuel Geology and Exploration
Crosslisted with: GEOL 885
Prerequisites: GEOL 301.
Description: Geology of coal, oil and gas, and methods of exploration.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded with Option

GEOL 488 Groundwater Geology
Crosslisted with: GEOL 888, NRES 488, NRES 888
Prerequisites: GEOL 100-level course; MATH 106 or equivalent.
Description: Occurrence, movement, and development of water in the geologic environment.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 6
Grading Option: Graded with Option
Prerequisite for: GEOL 885

GEOL 497 Economic and Exploration Geology
Crosslisted with: GEOL 897
Prerequisites: GEOL 301.
Notes: A required parallel course will be indicated by the instructor. Field trips which are required and supported by alumni endowment may be scheduled during semester breaks. Course content will vary on a 3-year rotational basis. Combined lectures, seminars, weekend short courses, and field trips.
Description: E.F. Schramm Course in Economic Geology. Aspects of fossil fuel geology and exploration.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 6
Grading Option: Graded with Option
Prerequisite for: AGEN 955, AGRO 955, CIVE 955, GEOL 985; GEOL 470, GEOL 870; GEOL 889, NRES 887; GEOL 986; NRES 918

GEOL 498 Special Topics in Geology
Prerequisites: Permission.
Notes: Full titles will appear on students’ transcripts.
Description: Reviews of specialized subject areas.
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 24
Grading Option: Graded with Option

GEOL 499 Independent Study in Geology
Prerequisites: Permission.
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 24
Grading Option: Graded with Option

GEOL 499H Honors Course
Prerequisites: Permission.
Credit Hours: 1-4
Min credits per semester: 1
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded

PLEASE NOTE
This document represents a sample 4-year plan for degree completion with this major. Actual course selection and sequence may vary and should be discussed individually with your college or department academic advisor. Advisors also can help you plan other experiences to enrich your undergraduate education such as internships, education abroad, undergraduate research, learning communities, and service learning and community-based learning.

Geology (B.A.)
Geology (B.S.)

Career Information
The following represents a sample of the internships, jobs and graduate school programs that current students and recent graduates have reported.

Transferable Skills
• Read, understand, and critically review scientific information
• Use quantitative analysis techniques
• Analyze and explain data
• Understand and operate within ethical framework for professional work in the field
• Demonstrate ethical conduct in research activities
• Communicate results of scientific experiments to scientific and non-scientific audiences
• Make predictions using mathematical, statistical, and scientific modeling methods
• Understand and use proper laboratory and technical skills and instruments
• Understand and utilize a variety of research methodologies
• Conduct and present research to large and small groups
• Integrate information and perspectives from multiple disciplines to solve problems
• Design and implement research experiments
• Apply mathematical and scientific skills to solve real-world problems
• Comprehend and critically evaluate complex information
• Define problems and identifying causes

Jobs of Recent Graduates
• Geologist, Marathon Oil Company - Houston TX
• Well Site Geologist, Columbine Logging - Denver CO
• Hydrogeologist, United States Geologic Survey - Northborough MA
• Geotechnician, Whiting Petroleum Corporation - Denver CO
• Researcher, University of Nebraska-Lincoln - Lincoln NE
• Geologist, GSI Engineering - Grand Island NE
• Geologist, GSI Engineering - Grand Island NE
• Mud-logger, Selman and Associates - Midland TX
• Geologist, Fulbright - La Plata BA
• Geologist, NioCorp - NE

Internships
• Geologist, Shell Inc. - Houston TX
• Integrated Water Management Specialist Assistant, Nebraska Department of Natural Resources - Lincoln NE
• Student Intern - Hydrology, United States Geological Survey - Lincoln NE
• Geology Intern, Twin Rivers Testing & Environmental - North Platte NE

Geology
• Integrated Water Management Technical Assistant, Nebraska Department of Natural Resources - Lincoln NE
• Integrated Water Management Intern, State of Nebraska Department of Natural Resources - Lincoln NE

Graduate & Professional Schools
• Master’s Degree, Geology, University of Nebraska-Lincoln - Lincoln NE
• Master’s Degree, Geosciences, University of Nebraska-Lincoln - Lincoln NE
• Master’s Degree, Education, University of Nebraska-Lincoln - Lincoln NE
• Master’s Degree, Geophysics, California Institute of Technology - Pasadena CA
• Master’s Degree, Hydrogeology, University of Nebraska-Lincoln - Lincoln NE
• Master’s Degree, Geology, University of Missouri-Columbia - Columbia MO
• Ph.D., Geology, University of Michigan - MI
• Master’s Degree, Geology, University of Kansas - Lawrence KS
• Master’s Degree, Geophysics, California Institute of Technology - Pasadena CA
• Master’s Degree, Geology, University of Arizona - Tucson AZ