

# 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 pre-college 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 durations 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. The 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 University of Nebraska–Lincoln 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 the University of Nebraska–Lincoln and provide more opportunity to study abroad.

## Academic and Career Advising

### Academic and Career Advising Center

Not sure where to go or who to ask? The Advising Center team in 107 Oldfather Hall can help. The Academic and Career Advising Center 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 or connect students to partner resources. Students also visit the Advising Center in 107 Oldfather Hall to:

- Choose or change their major, minor, or degree program.
- Check on policies, procedures, and deadlines.
- Get a college approval signature from the Dean's representatives.

CAS Career Coaches are available by appointment (in-person or zoom) and located in the CAS Academic and Career Advising Center, 107

Oldfather Hall. They help students explore majors and minors, gain experience, and develop a plan for life after graduation.

## 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. They are available for appointments (in-person or zoom) and through weekly virtual drop-ins. 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.

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, visit <https://cas.unl.edu/major-advisors> (<https://cas.unl.edu/major-advisors/>), or connect with the Arts and Sciences Academic and Career Advising Center, 107 Oldfather Hall, 402-472-4190, [casadvising@unl.edu](mailto:casadvising@unl.edu).

## 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 prepared to effectively contribute professionally and personally with 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 Hall, 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 Degree 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* 3

Select from courses approved for ACE outcome 1.

*CDR: Natural, Physical, and Mathematical Sciences with Lab* 4

Select from biochemistry, biological sciences, chemistry, computer science, geology, meteorology, mathematics, and physics. 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.<sup>1</sup>

*CDR: Humanities* 3

Select from classics, English, film studies, history, modern languages and literatures, philosophy, and religious studies.<sup>2</sup>

*CDR: Social Science* 3

Select from anthropology, communication studies, geography, national security studies, political science, psychology, or sociology.<sup>3</sup>

*CDR: Human Diversity in U.S. Communities* 0-3

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

*CDR: Language* 0-16

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 languages requirement, but encouraged to continue on in their language study.

**Credit Hours Subtotal:** 13-32

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

<sup>2</sup> Language courses numbered 220 and below do not fulfill the CDR Humanities.

<sup>3</sup> 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

The University of Nebraska–Lincoln and the College of Arts and Sciences place great value on academic exposure and proficiency in a second language. The University of Nebraska–Lincoln 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.

### Experiential Learning Requirement

All undergraduates in the College of Arts and Sciences must complete an Experiential Learning (EL) designated course. This may include 0-credit courses designed to document co-curricular activities recognized as Experiential Learning.

### 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-based 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), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology (excluding MBIO 101), and physics (excluding PHYS 201.)

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 University of Nebraska–Lincoln 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 the 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 the University of Nebraska–Lincoln 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 the University of Nebraska–Lincoln.

## Residency Requirement

Students must complete at least 30 of the 120 total hours for their degree at the University of Nebraska–Lincoln. 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 the University of Nebraska–Lincoln.

## 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 the University of Nebraska–Lincoln. 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 the University of Nebraska–Lincoln 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.

**Transfer Students:** Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with academic advisors, provided the student a) was enrolled in a community college during the catalog year they are utilizing, b) maintained continuous enrollment at the previous institution for 1 academic year or more, and c) continued enrollment at the University of Nebraska-Lincoln within 1 calendar year from their last term at the previous institution. Students must complete all degree requirements from a single catalog year and within the time frame allowable for that catalog year.

## Learning Outcomes

Graduates with a major in geology will be able to:

1. Investigate the natural world using scientific reasoning;
2. Approach and interpret geologic processes and systems using temporal reasoning skills;
3. Approach and interpret geologic processes and systems using spatial reasoning skills;
4. Characterize and interpret earth materials using specialized tools of the trade;
5. Conceptualize and explore Earth environments as interconnected systems;
6. Demonstrate strong skills in communication, teamwork, leadership, and ethical reasoning.

## 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

GEOL 101	Dynamic Earth	4
GEOL 103	Earth Through Time	4
GEOL 200	Mineralogy	2
GEOL 201	Igneous and Metamorphic Petrology	2
GEOL 300	Sedimentology and Stratigraphy	3
GEOL 301	Depositional Environments	3
GEOL 400	Structural Geology	3
GEOL 410	Geochemistry	3
GEOL 460	Summer Field Course	6
Credit Hours Subtotal:		30
<b>Total Credit Hours</b>		<b>30</b>

#### Specific Major Requirements

##### Additional Geology Courses <sup>1</sup>

Select 12 hours of additional GEOL courses at the 200 level or above, with at least one course at the 400 level.	12
Credit Hours Subtotal:	12
<b>Total Credit Hours</b>	<b>12</b>

<sup>1</sup> METR 100 or METR 370 are also allowed to be used.

#### Ancillary Requirements

##### Mathematics

MATH 106	Calculus I	5
MATH 107	Calculus II	4

##### Chemistry

CHEM 109A	General Chemistry I	4
& CHEM 109L	and General Chemistry I Laboratory	
or CHEM 113A	Fundamental Chemistry I	
& CHEM 113L	and Fundamental Chemistry I Laboratory	
Credit Hours Subtotal:		13

##### Physics

PHYS 141	Elementary General Physics I	10
& PHYS 142	and Elementary General Physics II	
or PHYS 211	General Physics I	
& PHYS 221	and General Physics Laboratory I	
& PHYS 212	and General Physics II	
& PHYS 222	and General Physics Laboratory II	
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 & BIOS 101L	General Biology and General Biology Laboratory	
BIOS 206	General Genetics	

CHEM 110A	General Chemistry II	
& CHEM 110L	and General Chemistry II Laboratory	
CHEM 114	Fundamental Chemistry II	
CHEM 221A	Elementary Quantitative Analysis	
& CHEM 221L	and Elementary Quantitative Analysis Laboratory	
CHEM 251	Organic Chemistry I	
& CHEM 253	and Organic Chemistry I Laboratory	
or CHEM 261	Organic Chemistry	
& CHEM 263	and Mechanistic Organic Chemistry I Laboratory	
CHEM 471	Physical Chemistry	
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	
MATH 208	Calculus III	
MATH 221	Differential Equations	
PHYS 311	Mechanics	
PHYS 343	Physics of Lasers and Modern Optics	
STAT 218	Introduction to Statistics	
STAT 380	Statistics and Applications	
Credit Hours Subtotal:		6
<b>Total Credit Hours</b>		<b>29</b>

### Bachelor of Arts

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

#### Core Requirements

##### Required Courses

GEOL 101	Dynamic Earth	4
GEOL 103	Earth Through Time	4
GEOL 200	Mineralogy	2
GEOL 201	Igneous and Metamorphic Petrology	2
GEOL 300	Sedimentology and Stratigraphy	3
GEOL 301	Depositional Environments	3
GEOL 400	Structural Geology	3
Credit Hours Subtotal:		21
<b>Total Credit Hours</b>		<b>21</b>

#### Specific Major Requirements

##### Additional Geology Courses

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

#### Ancillary Requirements

<b>Chemistry</b>	<b>4</b>
CHEM 109A    General Chemistry I & CHEM 109L    and General Chemistry I Laboratory or CHEM 113    Fundamental Chemistry I and Fundamental Chemistry I Laboratory & CHEM 113	
<b>MATHEMATICS</b>	<b>2-5</b>

Select one MATH course from the following depending on your placement exam score:

MATH 102 Trigonometry

MATH 103 College Algebra and Trigonometry

MATH 106 Calculus I

**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. Does not fulfill the prerequisite requirement for any course in geology.

**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:** Lab includes field trips. 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:** GEOG 308, GEOL 308, NRES 308; GEOL 103; GEOL 200; GEOL 260; GEOL 372; METR 270; PLAS 455, AGRO 855, NRES 455, NRES 855, SOIL 455

**ACE:** ACE 4 Science

**Course and Laboratory Fee:** \$25

#### 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. One afternoon field trip and one overnight field trip required.

**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 200; GEOL 260; METR 270

**Course and Laboratory Fee:** \$25

#### GEOL 103 Earth Through Time

**Prerequisites:** GEOL 101

**Description:** An examination of the evolution of life on earth through time in the context of changing continents, oceans, and climate. Lab work includes the study of earth processes affecting the sedimentary rock record and provides an overview of common fossils.

**Credit Hours:** 4

**Max credits per semester:** 4

**Max credits per degree:** 4

**Grading Option:** Graded with Option

**Offered:** SPRING

**ACE:** ACE 4 Science

**Course and Laboratory Fee:** \$30

#### 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

**Offered:** FALL/SPR

**ACE:** ACE 4 Science



**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 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

**ACE:** ACE 4 Science

**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 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

**Offered:** SPRING

**ACE:** ACE 4 Science

**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 4 Science ACE 9 Global/Diversity

**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 MATH 106; CHEM 109A and 109L.

**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

**Course and Laboratory Fee:** \$60

**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

**Course and Laboratory Fee:** \$50

**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

**Experiential Learning:** Fieldwork

**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 296 Independent Study in Geology**

**Prerequisites:** Permission.

**Description:** Independent study under direction of a faculty member.

**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**Course and Laboratory Fee:** \$25**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**Course and Laboratory Fee:** \$25**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**GEOL 361 Soils, Environment and Water Quality****Crosslisted with:** PLAS 361, NRES 361, SOIL 361, WATS 361**Prerequisites:** PLAS/SOIL 153; MATH 102 or 103; two semesters chemistry (CHEM 105A and 105L, CHEM 106A and 106L, CHEM 109A and 109L, CHEM 110A and 110L) 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**Prerequisite for:** PLAS 458, AGRO 858, NRES 458, NRES 858, SOIL 458**GEOL 372 Water & Earth Connections****Prerequisites:** GEOL 101, or GEOL 106, or METR 100, and MATH 106, or instructor permission**Description:** Quantitative understanding of water-related processes in the earth sciences.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**GEOL 400 Structural Geology****Prerequisites:** GEOL 201; 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**Course and Laboratory Fee:** \$75**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 109A and 109L or CHEM 113A and 113L**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**Course and Laboratory Fee:** \$35**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**Offered:** FALL/SPR

**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 109A/L and CHEM 110A/L, CHEM 113A/L and CHEM 114.**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**Course and Laboratory Fee:** \$25**GEOL 419 Applications of Remote Sensing in Agriculture and Natural Resources****Crosslisted with:** PLAS 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**Course and Laboratory Fee:** \$35**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**Course and Laboratory Fee:** \$25**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 109A and 109L or CHEM 113A and 113L; 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:** At least one of GEOL 103, GEOL 105, or LIFE 121.**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**Course and Laboratory Fee:** \$20**GEOL 436 Cenozoic Mammal Evolution****Crosslisted with:** GEOL 836, NRES 436, NRES 836**Prerequisites:** Junior or Senior Standing**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 fossil specimens.

**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** SPRING



**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**Course and Laboratory Fee:** \$10**GEOL 441 Geophysics****Crosslisted with:** GEOL 841**Prerequisites:** PHYS 142 or PHYS 212**Description:** Geophysical techniques to study the Earth: seismology, gravity, magnetism and heat flow.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Offered:** FALL**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**Course and Laboratory Fee:** \$10**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 441**Description:** Integrative analysis of geophysical data (gravity, magnetism, 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**Course and Laboratory Fee:** \$25**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**Course and Laboratory Fee:** \$35**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

**GEOL 455 Computational Methods for Modeling Earth Systems****Crosslisted with:** GEOL 855**Prerequisites:** GEOL 200; MATH 107**Description:** A practical introduction to modeling and computational techniques that bridges subdisciplines of geology, with a focus on fluid transport modeling.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Offered:** FALL/SPR**GEOL 457 Ecosystem Ecology****Crosslisted with:** BIOS 457, BIOS 857, GEOL 857**Prerequisites:** BIOS 207 and CHEM 110A and 110L 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**Prerequisite for:** BSEN 954, NRES 954**ACE:** ACE 10 Integrated Product**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**Course and Laboratory Fee:** \$100**Experiential Learning:** Fieldwork**GEOL 470 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**Course and Laboratory Fee:** \$15**GEOL 472 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 475 Water Quality Strategy****Crosslisted with:** NRES 475, NRES 875, SOIL 475, WATS 475, PLAS 475,

AGRO 875, CIVE 475, CIVE 875, CRPL 475, CRPL 875, GEOL 875,

AGST 475, AGST 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**GEOL 480 Economic Geology of the Metals****Crosslisted with:** GEOL 880**Prerequisites:** GEOL 400; CHEM 114, CHEM 221A & CHEM 221L.**Description:** Occurrence and utilization of the metallic ores. Elementary theory of ore genesis.**Credit Hours:** 2**Max credits per semester:** 2**Max credits per degree:** 2**Grading Option:** Graded with Option**Course and Laboratory Fee:** \$10**GEOL 484 Water Resources Seminar****Crosslisted with:** PLAS 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**Course and Laboratory Fee:** \$35

**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:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** GEOL 470, GEOL 870; GEOL 986; NRES 918**Course and Laboratory Fee:** \$10**GEOL 491 Special Topics in Geology****Crosslisted with:** GEOL 891**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 496 Independent Study in Geology****Prerequisites:** Permission.**Description:** Independent study under direction of a faculty member.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 6**Grading Option:** Graded with Option**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**GEOL 499 Undergraduate Thesis****Prerequisites:** Permission.**Description:** Independent research leading to a thesis.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 6**Grading Option:** Graded with Option**GEOL 499H Honors Undergraduate Thesis****Prerequisites:** Permission.**Description:** Independent research leading to a thesis.**Credit Hours:** 1-3**Min credits per semester:** 1**Max credits per semester:** 3**Max credits per degree:** 6**Grading Option:** Graded with Option

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

- Drafter, Manilli Wagner – Lincoln, NE
- ESL English Teacher, Lenzkids – Jinan, China
- Geochemist, SGS – Muscat, Oman

### 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
- 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, Material Science, University of Dayton – Dayton, OH
- Master's Degree, STEM Education, University of Iowa – Iowa City, IA
- Master's Degree, Geology, University of Nebraska - Lincoln – Lincoln, NE
- Juris Doctor Degree, University of Maryland School of Law – Baltimore, MD