

Bachelor of Science in Geology

Why study geology?

In Geology you get to apply techniques and knowledge from chemistry, physics, biology and math to answer important questions about Earth processes, history and future. Geologists are in demand to evaluate geologic hazards, evaluate natural resources, and understand the environment including water quality and climate change.

The B.S. program (<http://geo.ku.edu/overview/>) provides intensive training in geology and other sciences. B.S. majors may emphasize traditional geology, environmental geology (with a specialized track in hydrogeology), engineering geology, geophysics, or earth and space science licensure. The hydrogeology track, the engineering geology option, and the geophysics option combine basic training in geology with training in mathematics, engineering, physics, and geophysics. The environmental geology option combines training in geology with many different sciences.

Undergraduate Admission

Admission to KU

All students applying for admission must send high school and college transcripts to the Office of Admissions. Prospective first-year students should be aware that KU has qualified admission requirements that all new first-year students must meet to be admitted. Consult the Office of Admissions (<http://admissions.ku.edu/>) for application deadlines and specific admission requirements.

Visit the International Support Services (<http://www.iss.ku.edu/>) for information about international admissions.

Students considering transferring to KU may see how their college-level course work will transfer on the Office of the University Registrar (<https://registrar.ku.edu/credittransfer/>) website.

First- and Second-Year Preparation

Students interested in geology, especially in the B.S. degree, should see a department advisor as soon as possible. They should enroll in mathematics, chemistry, and English in addition to Introduction to Geology and electives. Students should plan to take GEOL 360 or GEOL 370 in the summer after completing the introductory geology course.

Advising

Developing a strong relationship with a faculty advisor helps students get the most out of their educational programs in the shortest time. Most courses for majors are offered in only one semester each year. Advisors can guide the student through complexities of the curriculum or into a specialized program.

Requirements for the B.S. Degree

The B.S. program provides intensive training in geology and other sciences. B.S. majors may choose a concentration in environmental geology, geophysics, or Earth & Space. The the geophysics concentration combines basic training in geology with training in mathematics, engineering, physics, and geophysics. The environmental geology

concentration combines training in geology with many different sciences. The Earth & Space concentration prepares students for apply for secondary education teacher licensure.

Degree requirements may be altered to suit particular needs of a student upon petition to the undergraduate studies committee and in consultation with a geology faculty advisor. Special consideration is given to students with strong backgrounds in supporting sciences and students with superior records who decide to major in geology late in their programs.

Code	Title	Hours
Geology Prerequisite or Co-requisite Knowledge		
Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.		
Calculus I. Satisfied by:		
MATH 125	Calculus I (Prerequisite: MATH 104; or MATH 103; or three years of college preparatory mathematics including trigonometry and a score of 28 or higher on ACT mathematics or 640 or higher on the SAT; or a qualifying score on the mathematics placement test.)	4
Calculus II. Satisfied by:		
MATH 126	Calculus II	4
Chemistry. Satisfied by:		
CHEM 130 & CHEM 135	General Chemistry I and General Chemistry II	10
Physics. Satisfied by:		
PHSX 211 & PHSX 216 or PHSX 213	General Physics I and General Physics I Laboratory or General Physics I Honors	2-5
PHSX 212 & PHSX 236 or PHSX 214	General Physics II and General Physics II Laboratory or General Physics II Honors	2-4
Biology. Satisfied by:		
BIOL 152	Principles of Organismal Biology	3
Information Technology. Satisfied by one of the following:		
EECS 138	Introduction to Computing: _____	3
C&PE 325	Numerical Methods and Statistics for Engineers	3
Geology Core Knowledge and Skills		
Majors must complete the following core courses:		
Introduction to Geology. Satisfied by:		
GEOL 101	The Way The Earth Works	3
Geology Fundamentals Laboratory. Satisfied by:		
GEOL 103	Geology Fundamentals Laboratory	2
Historical Geology. Satisfied by:		
GEOL 304	Historical Geology	3
Mineralogy and Structure of the Earth. Satisfied by:		
GEOL 311	Mineralogy and Structure of the Earth	3
Mineral Structures and Equilibria Laboratory. Satisfied by:		
GEOL 312	Mineral Structures and Equilibria Laboratory	1
Sedimentology and Stratigraphy. Satisfied by:		
GEOL 331	Sedimentology and Stratigraphy	4

Field Investigation. Satisfied by:

GEOL 360	Field Investigation	2-3
or GEOL 370	Study Abroad in Greece: Natural Environment and Civilizations	

Igneous and Metamorphic Petrology. Satisfied by:

GEOL 512	Igneous and Metamorphic Petrology	3
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Petrology Laboratory. Satisfied by:

GEOL 513	Petrology Laboratory	1
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Introductory Field Geology. Satisfied by:

GEOL 561	Field Geology	3
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Structural Geology. Satisfied by:

GEOL 562	Structural Geology	4
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Geology Required Electives 18

At least one course from each of the three categories listed below: Life; Water & Climate; Rocks. Additional elective credit requirements fulfilled by 500 level and above geology courses. Additionally, 3 hours of GEOL 121, if taken before the student has completed 60 hrs, GEOL 391 or GEOL 399 can also count towards these 9 credit hours.

Life

GEOL 316	Geochemistry
GEOL 521	Paleontology
GEOL 591	Topics in Geology: _____ (Geobiology)

Rocks

GEOL 501	Simple Error Analysis for Earth Scientists
GEOL 502	Linear Algebra for Earth Scientists
GEOL 503	Numerical Methods in the Earth Sciences
GEOL 511	Raman Spectroscopy of Crystalline Solids
GEOL 533	Shales and Other Mudstones
GEOL 535	Petroleum and Subsurface Geology
GEOL 536	Geological Log Analysis
GEOL 538	Basin Analysis
GEOL 539	Sequence Stratigraphy
GEOL 572	Geophysics

Water and Climate

GEOL 552	Introduction to Hydrogeology
GEOL 554	Contaminants in Groundwater
GEOL 555	Climate Science
GEOL 558	Applied Groundwater Modeling
GEOL 591	Topics in Geology: _____ (Climate: Past, Present and Future)

Capstone

Field Geology. Satisfied by:

GEOL 560	Introductory Field Geology	3
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Total Hours 50-51

Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

Major Junior/Senior Hours

Satisfied by a minimum of 18 hours from junior/senior courses (300+) in the major.

Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (<https://sis.ku.edu/gpa-calculator/>).

Environmental Geology Concentration

Code	Title	Hours
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Geology Prerequisite or Co-requisite Knowledge

Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.

Calculus I. Satisfied by:

MATH 125	Calculus I	4
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Calculus II. Satisfied by:

MATH 126	Calculus II	4
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Chemistry. Satisfied by:

CHEM 130 & CHEM 135	General Chemistry I and General Chemistry II	10
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Physics. Satisfied by:

PHSX 211 & PHSX 216 or PHSX 213	General Physics I and General Physics I Laboratory or General Physics I Honors	2-5
PHSX 212 & PHSX 236 or PHSX 214	General Physics II and General Physics II Laboratory or General Physics II Honors	2-4
PHSX 114 & PHSX 115	College Physics I and College Physics II	2-8

Biology. Satisfied by:

BIOL 150 & BIOL 152	Principles of Molecular and Cellular Biology and Principles of Organismal Biology	6
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Information Technology. Satisfied by one of the following:

EECS 138	Introduction to Computing: _____	3
C&PE 325	Numerical Methods and Statistics for Engineers	3

Code	Title	Hours
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Geology Core Knowledge and Skills

Majors must complete the following core courses:

Introduction to Geology. Satisfied by:

GEOL 101	The Way The Earth Works	3
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Geology Fundamentals Laboratory. Satisfied by:

GEOL 103	Geology Fundamentals Laboratory	2
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Historical Geology. Satisfied by:

GEOL 304	Historical Geology	3
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Mineralogy and Structure of the Earth. Satisfied by:

GEOL 311	Mineralogy and Structure of the Earth	3
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Sedimentology and Stratigraphy. Satisfied by:

GEOL 331	Sedimentology and Stratigraphy	4
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Environmental Geology. Satisfied by:

GEOL 151	Environmental Geology	3
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Field Investigation. Satisfied by:

GEOL 360	Field Investigation	2
Paleontology. Satisfied by:		
GEOL 521	Paleontology	3
Geomorphology. Satisfied by:		
GEOL 541	Geomorphology	4
Introduction to Hydrogeology. Satisfied by:		
GEOL 552	Introduction to Hydrogeology	3
Introductory Field Geology. Satisfied by:		
GEOL 560	Introductory Field Geology	3
Structural Geology. Satisfied by:		
GEOL 562	Structural Geology	4
Geophysics. Satisfied by:		
GEOL 572	Geophysics	3
Geology Required Electives		
Majors must complete additional courses to total at least nine hours numbered 500 or above. The following are recommended:		9
GEOL 391	Special Studies in Geology	
GEOL 535	Petroleum and Subsurface Geology	
GEOL 715	Geochemistry	
GEOL 751	Physical Hydrogeology	
CE 770	Concepts of Environmental Chemistry	
& CE 771	and Environmental Engineering Laboratory	
GEOG 558	Spatial Data Analysis	
GEOL 753	Chemical and Microbial Hydrogeology	
BIOL 400	Fundamentals of Microbiology	

Total Hours **49**

Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

Major Junior/Senior Hours

Satisfied by a minimum of 45 hours from junior/senior courses (300+) in the major.

Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (<https://sis.ku.edu/gpa-calculator/>).

Geophysics Concentration

Code	Title	Hours
Geology Prerequisite or Co-requisite Knowledge		
Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.		
Calculus I. Satisfied by:		
MATH 125	Calculus I	
Calculus II. Satisfied by:		
MATH 126	Calculus II	
Vector Calculus and Elementary Linear Algebra. Satisfied by:		

MATH 127	Calculus III	
MATH 290	Elementary Linear Algebra	
or MATH 291	Elementary Linear Algebra, Honors	
Elementary Differential Equations. Satisfied by:		
MATH 320	Elementary Differential Equations	
Chemistry. Satisfied by:		
CHEM 130	General Chemistry I	
& CHEM 135	and General Chemistry II	
Physics. Satisfied by:		
PHSX 211	General Physics I	
& PHSX 216	and General Physics I Laboratory	
or PHSX 213	General Physics I Honors	
PHSX 212	General Physics II	
& PHSX 236	and General Physics II Laboratory	
or PHSX 214	General Physics II Honors	
PHSX 313	General Physics III	
PHSX 521	Mechanics I	
PHSX 531	Electricity and Magnetism	
or EECS 220	Electromagnetics I	
Intro to Computing. Satisfied by one of the following:		
EECS 138	Introduction to Computing: _____	
Demonstrate equivalent programming skills		

Geology Core Knowledge and Skills

Majors must complete the following core courses:

Introduction to Geology. Satisfied by:		
GEOL 101	The Way The Earth Works	3
Geology Fundamentals Laboratory. Satisfied by:		
GEOL 103	Geology Fundamentals Laboratory	2
Historical Geology. Satisfied by:		
GEOL 304	Historical Geology	3
Mineralogy and Structure of the Earth. Satisfied by:		
GEOL 311	Mineralogy and Structure of the Earth	3
Sedimentology and Stratigraphy. Satisfied by:		
GEOL 331	Sedimentology and Stratigraphy	4
Field Investigation. Satisfied by:		
GEOL 360	Field Investigation	2
Igneous and Metamorphic Petrology. Satisfied by:		
GEOL 512	Igneous and Metamorphic Petrology	3
Introductory Field Geology. Satisfied by:		
GEOL 560	Introductory Field Geology	3
Structural Geology. Satisfied by:		
GEOL 562	Structural Geology	4
Geophysics. Satisfied by one of the following:		
GEOL 572	Geophysics	3

Additional Geology Courses

Geophysics elective 500 and above (at least 9 hours)		9
GEOL 578	Seismic Data Analysis and Interpretation	

Technical Required Electives

At least 6 hours from the list below or other 500 and above Geology, Physics, Mathematics, Engineering, or Computer Science.		6
GEOL 535	Petroleum and Subsurface Geology	
GEOL 536	Geological Log Analysis	
GEOL 552	Introduction to Hydrogeology	

MATH 581 Numerical Methods

Total Hours 45

Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

Major Hours

Satisfied by 45 hours of major courses.

Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

Major Junior/Senior Hours

Satisfied by a minimum of 12 hours from junior/senior courses (300+) in the major.

Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (<https://sis.ku.edu/gpa-calculator/>).

Earth and Space Science Licensure Concentration

This program fulfills the requirements for a Bachelor of Science degree in geology. The program also meets course requirements necessary to gain state licensure eligibility in earth and space science to become a secondary teacher in Kansas, but completion of the program does not guarantee the student's licensure. This list is a guideline. Contact the geology department for further information about meeting degree and additional licensure requirements. You may also contact the STEMTeach Office for information about similar tracks resulting in eligibility for licensure in this and other science and mathematics fields.

Code	Title	Hours
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Geology Prerequisite or Co-requisite Knowledge

Majors must complete courses as specified in each of the following areas. Majors are advised to take honors courses when eligible. These hours do not contribute to the minimum number of hours required for the major.

Calculus I. Satisfied by:

MATH 125	Calculus I
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Calculus II. Satisfied by:

MATH 126	Calculus II
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Chemistry. Satisfied by:

CHEM 130 & CHEM 135	General Chemistry I and General Chemistry II
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Physics. Satisfied by:

PHSX 211 & PHSX 216	General Physics I and General Physics I Laboratory
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PHSX 212 & PHSX 236	General Physics II and General Physics II Laboratory
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Biology. Satisfied by:

BIOL 152	Principles of Organismal Biology
	or BIOL 153 Principles of Organismal Biology, Honors

Geology Core Knowledge and Skills

Majors must complete the following core courses:

Introduction to Geology. Satisfied by:

GEOL 101	The Way The Earth Works	3
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Geology Fundamentals Laboratory. Satisfied by:

GEOL 103	Geology Fundamentals Laboratory	2
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Historical Geology. Satisfied by:

GEOL 304	Historical Geology	3
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Mineralogy and Structure of the Earth. Satisfied by:

GEOL 311	Mineralogy and Structure of the Earth	3
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Sedimentology and Stratigraphy. Satisfied by:

GEOL 331	Sedimentology and Stratigraphy	4
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Field Investigation. Satisfied by:

GEOL 360	Field Investigation	2
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or GEOG 370 Introduction to Cultural Geography

Paleontology. Satisfied by:

GEOL 521 & GEOL 523	Paleontology and Paleontology Laboratory	4
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Introduction to Hydrogeology. Satisfied by:

GEOL 552	Introduction to Hydrogeology	3
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Introductory Field Geology. Satisfied by:

GEOL 560	Introductory Field Geology	3
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Structural Geology. Satisfied by:

GEOL 562	Structural Geology	4
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Space Science Core Knowledge and Skills

Majors must complete the following core courses:

Introductory Meteorology. Satisfied by:

ATMO 105	Introductory Meteorology	5
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Contemporary Astronomy. Satisfied by:

ASTR 191	Contemporary Astronomy	3
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Earth and Space Required Electives

Majors must complete one of the areas below: 4

Geology Focus. Satisfied by 4 hours in a geology course numbered 300 or above.

Astronomy Focus. Satisfied by 4 hours in astronomy courses numbered 300 or above. This can include three hours of GEOL 121 (if taken before the completion of 60 hours), or ASTR 390 or GEOL 399.

Research Methods

Satisfied by:

CHEM 598	Research Methods	3
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Professional Development Course Work

A minimum grade of C is required in all courses.

Liberal Arts and Sciences. Satisfied by:

C&T 290	Introduction to Secondary Science and Mathematics Teaching	1
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C&T 291	Introduction to Science and Mathematics Teaching 2 (STEM Teach 2)	1
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Curriculum and Teaching (19 hours). Satisfied by:

C&T 448	Reading and Writing Across the Curriculum	3
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16 credit hours chosen from the following courses: 16

C&T 290	Introduction to Secondary Science and Mathematics Teaching
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C&T 291	Introduction to Science and Mathematics Teaching 2 (STEM Teach 2)
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C&T 360	Knowing and Learning in Mathematics and Science
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C&T 366	Classroom Interactions in Mathematics and Science
HIST 363	Perspectives on Science, Engineering and Mathematics
C&T 460	Project Based Instruction in Mathematics and Science
CHEM 598	Research Methods
C&T 490	Student Teaching
C&T 495	Seminar: Developing the Teaching Portfolio
Total Hours	67

Completion and successful defense of an honor's thesis. Additional requirements and more information may be obtained from the Department of Geology honors coordinator and web site.

Major Hours & Major GPA

While completing all required courses, majors must also meet each of the following hour and grade-point average minimum standards:

Major Hours in Residence

Satisfied by a minimum of 15 hours of KU resident credit in the major.

Major Junior/Senior Hours

Satisfied by a minimum of 34 hours from junior/senior courses (300+) in the major.

Major Junior/Senior Graduation GPA

Satisfied by a minimum of a 2.0 KU GPA in junior/senior courses (300+) in the major. GPA calculations include all junior/senior courses in the field of study including F's and repeated courses. See the Semester/Cumulative GPA Calculator (<https://sis.ku.edu/gpa-calculator/>).

Sample 4-year plans for the BS degree in Geology with the following concentrations can be found here: BS in Geology (<https://catalog.ku.edu/liberal-arts-sciences/geology/bs/geology/>) (no concentration), concentration in Earth & Space Science (<https://catalog.ku.edu/liberal-arts-sciences/geology/bs/earth-space-conc/>), concentration in Environmental Geology (<https://catalog.ku.edu/liberal-arts-sciences/geology/bs/environmental-geology-conc/>), concentration in Geophysics (<https://catalog.ku.edu/liberal-arts-sciences/geology/bs/geophysics/>) or by using the left-side navigation.

At the completion of this program, students will be able to:

- Understand the hazards posed by geologic processes for human lives and communities as well as the impact of humans on the Earth System. (Hazards and Human Impacts)
- Apply concepts from physics, chemistry, biology, mathematics, and spatial reasoning to understand Earth's systems, cycles, and evolution. (Interdisciplinary Thinking)
- Formulate hypotheses, qualify results by stating assumptions and caveats, and test hypotheses using modern techniques. (Geologic Inquiry)
- Critically evaluate Earth Science literature and spatial data (e.g., maps, remote sensing, 3D models). (Evaluating Geologic Data)
- Present, formally and extemporaneously, geological information in written form, graphically, and orally. (Communication Skills)

Departmental Honors

Pursuit of departmental honors in Geology is by invitation from the Department of Geology honors coordinator.

Requirements include:

3.50 or higher KU geology-courses GPA at graduation.

Completion of at least 2 credit hours of GEOL 399.