

GEOLOGY

Geology

The **Bachelor of Science major in Geology** prepares the student for a professional career and/or graduate study in the geological sciences. Graduates work to understand natural processes on Earth and other planets. They are able to apply their knowledge of forces and factors that shape the Earth to reconstruct past environments and anticipate future problems. Graduates provide essential information for solving problems for resource management, environmental protection, and public health, safety, and welfare. They work as consultants on engineering and environmental problems, explorers for new minerals and hydrocarbon resources, researchers, staff members in state and U.S. geological surveys, government regulators, teachers, writers, editors, and museum curators. Graduates are able to integrate field and laboratory data and to prepare reports. They are able to make presentations that include maps and diagrams that illustrate the results of their studies.

Geology as an Additional Major: Geology as an additional major is available to all students on campus. The Geology program has identified the core of 31 credits of geology courses that can complement a B.S. degree or major in materials engineering, civil engineering, environmental science, meteorology, or biology for students wishing to earn an additional major in geology. This pathway to earning a Geology major allows students in these academic programs with affinity to geology to complete both programs. Students should work closely with their advisors in each department to ensure that all requirements are met. These programs prepare students for careers or graduate study in the geosciences.

Student Learning Outcomes

Upon graduation, students should be able to:

- Demonstrate the ability to think critically.
- Exhibit a broad understanding of Earth systems and processes.
- Demonstrate scientific literacy and its application to scientific inquiry and societal concerns.
- Demonstrate proficiency in data collection, management, and analysis including understanding sources of error and/or uncertainty.
- Demonstrate competency with geoscience-specific techniques and field methods.
- Read and critically evaluate relevant literature and information.
- Use appropriate tools from chemistry, physics, biology, mathematics, and data science to solve discipline-specific problems.
- Present information effectively in written and oral forms.
- Work in a team environment in alignment with the ISU principles of community.
- Work independently.

- Attain employment in the geosciences or related fields or pursue graduate studies.

Combined Degrees: A concurrent program is offered which combines a Bachelor of Science degree in geology and a Master of Science degree in geology.

Geology

Required courses for B.S. in Geology include:

GEOL 1000	How the Earth Works	3
or GEOL 1010	Environmental Geology: Earth in Crisis	
or GEOL 2010	Geology for Engineers and Environmental Scientists	
GEOL 1000L	How the Earth Works: Laboratory	1
GEOL 1020	History of the Earth	3
GEOL 1020L	History of the Earth: Laboratory	1
GEOL 3020	Summer Field Studies	6
GEOL 3150	Mineralogy and Earth Materials	3
GEOL 3150L	Laboratory in Mineralogy and Earth Materials	1
GEOL 3160	Optical Mineralogy	1
GEOL 3560	Structural Geology and Tectonics	4
GEOL 3570	Geological Mapping and Field Methods	1
GEOL 3650	Igneous and Metamorphic Petrology	3
GEOL 3680	Sedimentary Geology	4
GEOL 4790	Surficial Processes	3
And 9 credits of geology electives at the 3000+ level.		9
Total Credits		43

Required supporting courses include:

MATH 1650	Calculus I	4
MATH 1660	Calculus II	4
CHEM 1770	General Chemistry I	4
CHEM 1770L	Laboratory in General Chemistry I	1
CHEM 1780	General Chemistry II	3
CHEM 1780L	Laboratory in College Chemistry II	1
PHYS 1310	General Physics I	4
PHYS 1310L	General Physics I Laboratory	1
PHYS 1320	General Physics II	4
PHYS 1320L	General Physics II Laboratory	1
And 6 additional credits of either geology electives or courses from an approved departmental list of science, engineering, and mathematical disciplines outside of geology.		6
Total Credits		33

Geology as an Additional Major: The requirements for the Geology Additional Major are the same as the requirements for the primary

major listed above, including the required Geology courses and required supporting courses. The additional major is available to all students. For students whose primary B.S. degree or major is materials engineering, civil engineering, environmental science, meteorology, or biology, the 31 credit core below constitutes the additional major. This reduction in requirements is due to the complementary nature of requirements in the primary program of study. The requirements of the 31 credit core are below. Please review information on the department website and contact the current program head for more information and sample four year plans for the Geology as an additional major program.

Required courses in Geology as an Additional Major, for specified primary majors above:

GEOL 1000	How the Earth Works	3
or GEOL 1010	Environmental Geology: Earth in Crisis	
or GEOL 2010	Geology for Engineers and Environmental Scientists	
GEOL 1000L	How the Earth Works: Laboratory	1
GEOL 1020	History of the Earth	3
GEOL 1020L	History of the Earth: Laboratory	1
GEOL 3020	Summer Field Studies	6
GEOL 3150	Mineralogy and Earth Materials	3
GEOL 3150L	Laboratory in Mineralogy and Earth Materials	1
GEOL 3160	Optical Mineralogy	1
GEOL 3560	Structural Geology and Tectonics	4
GEOL 3570	Geological Mapping and Field Methods	1
GEOL 3650	Igneous and Metamorphic Petrology	3
GEOL 3680	Sedimentary Geology	4
Total Credits		31

No more than 9 credits in 4900 may be counted toward a degree in Geology.

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement (<http://catalog.iastate.edu/academics/#communicationproficiencytext>), students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 2500. The department requires a grade of C or better in ENGL 3090 or ENGL 3140.

ENGL 1500	Critical Thinking and Communication	3
ENGL 2500	Written, Oral, Visual, and Electronic Composition	3
or ENGL 2500H	Written, Oral, Visual, and Electronic Composition: Honors	
One of the following:		3
ENGL 3090	Proposal and Report Writing	

ENGL 3140 Technical Communication

Total Credits

9

As majors in the College of Liberal Arts and Sciences, Geology students must meet College of Liberal Arts and Sciences (<http://catalog.iastate.edu/collegeofliberalartsandsciences/#lascollegerequirementstext>) and University-wide requirements (<http://catalog.iastate.edu/collegescurricula/>) for graduation in addition to those stated above for the major.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 3000/4000 level. At least 8 credits in the major from 3000+ courses must earn grade C or better. The average grade of all courses in the major must be 2.0 or higher. You must also complete the LAS world language requirement and LAS career proficiency requirement.

FOUR YEAR PLAN

Below is a suggested pathway for new majors. This plan is an example only; students should discuss their graduation plan with their advisor.

Geology, B.S.

Freshman

Fall	Credits	Spring	Credits
GEOL 1120	1	GEOL 1130	1
GEOL 1000	3	GEOL 1020	3
or 1010			
GEOL 1000L	1	GEOL 1020L	1
CHEM 1770	4	CHEM 1780	3
CHEM 1770L	1	CHEM 1780L	1
ENGL 1500	3	MATH 1650	4
Social	3	Arts &	3
Science		Humanities	
Choice		Choice	
16		16	

Sophomore

Fall	Credits	Spring	Credits
GEOL 3150	3	GEOL 3650	3
GEOL 3150L	1	PHYS 1310	4
GEOL 3160	1	PHYS 1310L	1

MATH 1660	4 Advanced Geology Elective Choice	3
ENGL 2500	3 LAS 2030	1
LIB 1600	1 U.S. Diversity Choice	3
International Perspectives Choice	3	
16		15

Junior

Fall	Credits	Spring	Credits	Summer	Credits
GEOL 3680		4 GEOL 3560		4 GEOL 3020	6
GEOL 3570		1 Advanced Geology Elective Choice ¹		3	
PHYS 1320		4 ENGL 3090 or 3140		3	
PHYS 1320L		1 Social Science Choice		3	
Advanced Geology Elective Choice ¹		3			
Arts & Humanities Choice		3			
16		13		6	

Senior

Fall	Credits	Spring	Credits
GEOL 4790		3 Advanced Geology Elective Choice ¹	3
Advanced Geology Elective Choice ¹		3 Social Science Choice (3000+ level)	3

Arts & Humanities Choice (3000+ level)	3 Arts & Humanities Choice	3
World Language 1010 Choice	4 World Language 1020 Choice/ Elective	4
13		13

Total Credits: 124

¹ Choose from list of approved courses available from an advisor or the departmental office.

Students may double-count some courses to complete the degree requirements in 120 credits.

Minor - Geology

A minor in Geology may be earned by taking 15 credits of geology coursework, including:

GEOL 1000	How the Earth Works	3
or GEOL 2010	Geology for Engineers and Environmental Scientists	
or GEOL 1010	Environmental Geology: Earth in Crisis	
GEOL 1000L	How the Earth Works: Laboratory	1
GEOL 1020	History of the Earth	3
GEOL 1020L	History of the Earth: Laboratory	1

Although many students will take GEOL 1000 as the first course in this sequence, GEOL 1010 or GEOL 2010 may be taken in place of GEOL 1000. Note: all students must take GEOL 1000L (How the Earth Works: Laboratory). The remainder of the coursework should be at the 3000 level or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

Concurrent Undergraduate and Graduate Programs

A concurrent program is offered which combines a Bachelor of Science degree in geology and a Master of Science degree in geology. This program gives well-qualified Iowa State juniors and seniors the opportunity to begin working on the M.S. degree before completing the B.S. degree, reducing by at least one year the normal time period necessary to complete both degrees separately. Additionally, a concurrent program exists that gives highly motivated and career-focused students the opportunity to receive a Bachelor of Science in geology and an M.B.A. (Master of Business Administration). Review the department

website (<https://ge-at.iastate.edu/>) or contact Dr. Cinzia Cervato for more information regarding these programs.

Graduate Study

The department offers programs leading to the Master of Science and Doctor of Philosophy with majors in Geology, Earth Science, and Meteorology. Students desiring a major in the above fields normally will have a strong undergraduate background in the physical and mathematical sciences. Individuals desiring to enter a graduate program are evaluated by considering their undergraduate preparation and performance along with their expressed goals in the statement of purpose. All prospective students should reach out to individual faculty members who they wish to work with prior to applying.

Programs of study are designed on an individual basis in accordance with requirements of the Graduate College and established requirements for each departmental major. Additional coursework is normally taken in complementary areas such as aerospace engineering, agronomy (soil science), chemistry, civil and construction engineering, computer engineering, computer science, engineering mechanics, environmental science, materials engineering, mathematics, mechanical engineering, microbiology, physics, or statistics. Departmental requirements provide a strong, broad background in the major and allow considerable flexibility in the program of each individual.

A dissertation is required of all Ph.D. candidates.

M.S. students in Geology are required to complete a thesis. The M.S. in Earth Science is available to students electing the non-thesis (Creative Component) option in Geology or Meteorology.

Graduates in Geology specialize in a subdiscipline, but they comprehend and can communicate the basic principles of geology and supporting sciences. They possess the capacity for critical and independent thinking. They are able to write a fundable research proposal, evaluate current relevant literature, carry out the proposed research, and communicate the results of their research to peers at national meetings and to the general public. They work as consultants on engineering and environmental problems, explorers for new minerals and hydrocarbon resources, researchers, teachers, writers, editors, and museum curators.