

GEOLOGY AND GEOPHYSICS, B.S.

The complementary fields of geology and geophysics are combined in one interdisciplinary department, with graduate degrees offered in both disciplines. The undergraduate degree is in geology and geophysics.

Geology offers unusual opportunities to interweave knowledge from many disciplines in the study of natural Earth phenomena. Those who enjoy the challenge of integrating different kinds of information into a unified interpretation will find geology particularly satisfying. Most geology students enjoy travel and have a strong interest in the natural environment as it is today and as it has developed through the past 4.5 billion years. A natural capacity for historical and sequential thought, inductive reasoning, and three-dimensional perception is helpful, and these skills will be developed. Geological investigations are becoming increasingly quantitative and experimental, and thus require some computer experience and a strong foundation in chemistry, physics, and mathematics.

The student of geophysics is interested in developing a quantitative understanding of the structure and dynamics of the Earth's interior from the shallow crust to deep core. Courses in geophysics apply basic physical laws and processes, such as those governing gravity, magnetism, heat flow, and seismic wave propagation, to the study of the Earth. An undergraduate may choose to concentrate in geophysics, but professional employment in the field often requires an advanced degree. Most students who pursue advanced study and careers in geophysics major in geology, physics, mathematics, or engineering as undergraduates.

HOW TO GET IN

To declare a major, students should meet with the undergraduate advisor.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (<http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext>) section of the *Guide*.

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| General Education | <ul style="list-style-type: none"> • Breadth—Humanities/Literature/Arts: 6 credits • Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits • Breadth—Social Studies: 3 credits • Communication Part A & Part B * • Ethnic Studies * • Quantitative Reasoning Part A & Part B * |
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* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

COLLEGE OF LETTERS & SCIENCE BREADTH AND DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (B.S.)

Students pursuing a bachelor of science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either a bachelor of arts or a bachelor of science curriculum. View a comparison of the degree requirements here. (<https://pubs.wisc.edu/home/archives/ug15/images/babs2009.pdf>)

BACHELOR OF SCIENCE DEGREE REQUIREMENTS

Mathematics	Two (2) 3+ credits of intermediate/advanced level MATH, COMP SCI, STAT Limit one each: COMP SCI, STAT
Foreign Language	Complete the third unit of a foreign language Note: A unit is one year of high school work or one semester/term of college work.
L&S Breadth	<ul style="list-style-type: none"> • Humanities, 12 credits: 6 of the 12 credits must be in literature • Social Sciences, 12 credits • Natural Sciences, 12 credits: must include 6 credits in biological science; and must include 6 credits in physical science
Liberal Arts and Science Coursework	108 credits
Depth of Intermediate/Advanced work	60 intermediate or advanced credits
Major	Declare and complete at least one (1) major
Total Credits	120 credits
UW-Madison Experience	30 credits in residence, overall 30 credits in residence after the 86th credit
Minimum GPAs	2.000 in all coursework at UW–Madison 2.000 in intermediate/advanced coursework at UW–Madison

NON–L&S STUDENTS PURSUING AN L&S MAJOR

Non–L&S students who have permission from their school/college to pursue an additional major within L&S *only need to fulfill the major requirements and do not need to complete the L&S breadth and*

degree requirements above. Please note that the following special degree programs are not considered majors so are not available to non-L&S-degree-seeking candidates:

- Applied Mathematics, Engineering and Physics (Bachelor of Science–Applied Mathematics, Engineering and Physics)
- Journalism (Bachelor of Arts–Journalism; Bachelor of Science–Journalism)
- Music (Bachelor of Music)
- Social Work (Bachelor of Social Work)

REQUIREMENTS FOR THE MAJOR

Prospective majors are strongly encouraged to seek assistance from a faculty advisor in order to choose courses appropriate to their interests and career plans. Advisors can also assist students in choosing a track that is appropriate for their interests and career goals.

BACKGROUND REQUIREMENTS

Code	Title	Credits
Calculus (complete one sequence):		9-14
MATH 221 & MATH 222	Calculus and Analytic Geometry 1 and Calculus and Analytic Geometry 2 (recommended)	
MATH 211 & MATH 222	Calculus and Calculus and Analytic Geometry 2	
MATH 171 & MATH 217 & MATH 222	Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II and Calculus and Analytic Geometry 2	
Chemistry (complete one sequence)		5-10
CHEM 109	Advanced General Chemistry	
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	
CHEM 115 & CHEM 116	Chemical Principles I and Chemical Principles II	
Physics (complete one sequence):		10-11
PHYSICS 207 & PHYSICS 208	General Physics and General Physics (recommended)	
PHYSICS 201 & PHYSICS 202	General Physics and General Physics	
PHYSICS 247 & PHYSICS 248	A Modern Introduction to Physics and A Modern Introduction to Physics	
<i>Geophysics and Engineering Geology Track option (complete all):</i>		
E M A 201 & E M A 202	Statics and Dynamics	
PHYSICS 208	General Physics	
	or PHYSICS 202 General Physics	
	or PHYSICS 248 A Modern Introduction to Physics	
Total Credits		24-35

GEOLOGY & GEOPHYSICS CORE COURSE WORK

Code	Title	Credits
Complete all of the following:		
GEOSCI 100	Introductory Geology: How the Earth Works	3
or GEOSCI/ ENVIR ST 106	Environmental Geology	
GEOSCI 202	Introduction to Geologic Structures	4
GEOSCI 204	Geologic Evolution of the Earth	4
GEOSCI/G L E 360	Principles of Mineralogy	3
GEOSCI/G L E 370	Elementary Petrology	3
Total Credits		17

GEOLOGY & GEOPHYSICS TRACKS

Complete one of the following:

Geology Track

Code	Title	Credits
GEOSCI/G L E 350	Introduction to Geophysics: The Dynamic Earth	3
GEOSCI 375	Principles of Geochemistry	3
GEOSCI 430	Sedimentology and Stratigraphy	3
GEOSCI/G L E 455	Structural Geology	4
4 credits of GEOSCI 300-699 ¹		4
Total Credits		17

¹ Except GEOSCI 331.

Geophysics and Engineering Geology Track

Code	Title	Credits
GEOSCI/G L E 431	Sedimentary & Stratigraphy Lab	1
GEOSCI/G L E 455	Structural Geology	4
GEOSCI/G L E 474	Rock Mechanics	3
or GEOSCI/ G L E 350	Introduction to Geophysics: The Dynamic Earth	
GEOSCI/G L E 594	Introduction to Applied Geophysics	3
GEOSCI/G L E 595	Field Methods in Applied and Engineering Geophysics	1
GEOSCI/G L E 627	Hydrogeology	3-4
or GEOSCI/ G L E 350	Introduction to Geophysics: The Dynamic Earth	
E M A 303	Mechanics of Materials	3
or M E 306	Mechanics of Materials	
or PHYSICS 311	Mechanics	
or PHYSICS 322	Electromagnetic Fields	
MATH 234	Calculus–Functions of Several Variables	3-4
or MATH 319	Techniques in Ordinary Differential Equations	
or MATH 320	Linear Algebra and Differential Equations	
or MATH 340	Elementary Matrix and Linear Algebra	
Total Credits		21-23

Environmental Geoscience Track

Code	Title	Credits
GEOSCI/GEOG 320 or GEOSCI/ GEOG 420 or GEOSCI 430 or GEOSCI/ G L E 627	Geomorphology Glacial and Pleistocene Geology Sedimentology and Stratigraphy Hydrogeology	3-4
GEOSCI 375 or GEOSCI 610 or GEOSCI/ G L E 629	Principles of Geochemistry Geochronology, Timescales, and Rates of Geologic Processes Contaminant Hydrogeology	3
GEOSCI 304 or GEOSCI/ ZOOLOGY 541 or GEOSCI/ ZOOLOGY 542	Geobiology Paleobiology Invertebrate Paleontology	3
GEOSCI/ ENVIR ST 411 or GEOSCI/ G L E 455 or GEOSCI 515 or GEOSCI/ G L E 594	Energy Resources Structural Geology Principles of Economic Geology Introduction to Applied Geophysics	3-4
Electives		3-5
Total Credits		17-19

¹ Except GEOSCI 331.

General Geology Track

Code	Title	Credits
Any GEOSCI 300-699 ¹		17
Total Credits		17

¹ Except GEOSCI 331.

RESIDENCE AND QUALITY OF WORK

- 2.000 GPA in all GEOSCI and major courses
- 2.000 on 15 upper-level major credits, taken in residence ¹
- 15 credits in GEOSCI, taken on campus

¹ GEOSCI 300-699, excluding GEOSCI 331, are considered Upper Level in the Major

HONORS IN THE MAJOR

Students may declare Honors in the Geology and Geophysics Major in consultation with the departmental undergraduate advisor.

HONORS IN THE MAJOR IN GEOLOGY AND GEOPHYSICS: REQUIREMENTS

To earn Honors in the Geology and Geophysics Major, students must satisfy both the requirements for the major (above) and the following additional requirements:

- Earn a 3.300 University GPA
- Earn a 3.400 GPA in all GEOSCI and major courses

- Complete GEOSCI 681 and GEOSCI 682, for a total of 6 credits, with a grade of B or better.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.

Residency Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.

Quality of Work Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

1. Acquire quantitative and spatial reasoning skills and the ability to apply those skills to problems in geoscience.
2. Be able to explicate key biological, chemical and physical Earth structures, processes, the interactions between them, and the roles that they play in determining the state of the Earth system.
3. Utilize geological observations and measurements to solve problems involving the timing of geological events in Earth history.
4. Combine data and lab/field-based observations into a novel synthesis and/or description/model of how Earth systems operate.
5. Be able to critique published scientific data, results, and interpretations thereof, as well as identify and assess related work in the scientific literature.
6. Be able to effectively communicate scientific concepts, methods, and results.

FOUR-YEAR PLAN**SAMPLE FOUR-YEAR PLAN**

This Sample Four-Year Plan is a tool to assist students and their advisor(s). Students should use it—along with their DARS report, the Degree Planner, and Course Search & Enroll tools—to make their own four-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests. As students become involved in athletics, honors, research, student organizations, study abroad, volunteer experiences, and/or work, they might adjust the order of their courses to accommodate these experiences. Students will likely revise their own four-year plan several times during college.

First Year

Fall	Credits	Spring	Credits
MATH 221 (Quantitative Reasoning B)		5 MATH 222	4
GEOSCI 100 or 106		3 PHYSICS 207 or 201	5
L&S Breadth		3 Ethnic Studies (take within first 60 credits)	3
Foreign Language		4 Comm A (take during first year)	3
	15		15

Second Year

Fall	Credits	Spring	Credits
PHYSICS 208 or 202		5 GEOSCI/G L E 370	3
GEOSCI 202		4 GEOSCI 204	4
GEOSCI/G L E 360		3 L&S Breadth	3
Comm B		3 CHEM 103	4
		Elective	2
	15		16

Third Year

Fall	Credits	Spring	Credits
CHEM 104		5 L&S Breadth	3
L&S Breadth		3 GEOSCI Elective 300 level and above	3
L&S Breadth		3 L&S Breadth	3
GEOSCI Elective 300 level and above		4 Elective	3
		GEOSCI Elective 300 level and above	3
	15		15

Fourth Year

Fall	Credits	Spring	Credits
GEOSCI elective 300 level and above		4 GEOSCI elective 300 level and above	4
GEOSCI elective 300 level and above		3 L&S Breadth	3
Elective		5 Elective	4
L&S Breadth		3 L&S Breadth	3
	15		14

Total Credits 120

ADVISING AND CAREERS**ADVISING**

Contact the Department of Geoscience for general information about advising.

Philip Brown, undergraduate advisor in the major: economic geology, mineralogy, geochemistry

pbrown@geology.wisc.edu
608-262-5954
365 Weeks Hall

Kurt Feigl, undergraduate advisor in the major: tectonic applications of geodesy

feigl@geology.wisc.edu

608-262-0176
A248 Weeks Hall

Clay Kelly, undergraduate advisor in the major: micropaleontology and paleoceanography

ckelly@geology.wisc.edu
608-262-1698
463 Weeks Hall

Basil Tikoff, Undergraduate advisor in the major: structural geology

basil@geology.wisc.edu
608-262-4678
176 Weeks Hall

Huifang Xu, Undergraduate advisor in the major: mineral science, nanogeoscience, and electron microscopy

hfxu@geology.wisc.edu
608-265-5887
A352 Weeks Hall

Lucas Zoet, Undergraduate advisor in the major: glaciology and glacial geomorphology

lzoet@wisc.edu
608-262-1921
256B Weeks Hall

Eric Schueffner, Undergraduate advisor

elschueffner@wisc.edu
608-890-3231
230 Weeks Hall

CAREERS

More than half of all professional geologists and geophysicists work in hydrogeology or the petroleum and mining industries. Such jobs involve an unusual breadth of training and personal adaptability, and the M.S. degree is generally required. About one fifth of all geoscientists work in state and federal geological surveys, and in government research activities such as oceanographic programs. These positions largely involve problems in geologic mapping, mineral resources, groundwater, and engineering. Geophysics offers opportunities in earthquake studies, seismic verification of nuclear test bans, and crustal rock characterization techniques for waste disposal and groundwater modeling. Many geology students continue on to obtain a Ph.D. degree and become faculty members at a college or university. A geology and geophysics major is also appropriate for those interested in careers in elementary or secondary education, environmental policy, or environmental law. Faculty advisors can provide additional information on career opportunities.

The College of Letters & Science encourages majors to begin working on their career exploration and preparation soon after arriving on campus. Our department partners with SuccessWorks at the College of Letters & Science. L&S graduates are in high demand by employers and graduate programs. It is important that students are career ready at the time of graduation, and we are committed to their success.

L&S CAREER RESOURCES

SuccessWorks at the College of Letters & Science helps students leverage the academic skills learned in their major, certificates, and liberal arts degree; explore and try out different career paths; participate in internships; prepare for the job search and/or graduate school applications; and network with professionals in the field (alumni and

employers). In short, SuccessWorks helps students in the College of Letters & Science discover themselves, find opportunities, and develop the skills they need for success after graduation.

SuccessWorks can also assist students in career advising, résumé and cover letter writing, networking opportunities, and interview skills, as well as course offerings for undergraduates to begin their career exploration early in their undergraduate career.

Students should set up their profiles in Handshake (<https://careers.ls.wisc.edu/handshake/>) to take care of everything they need to explore career events, manage their campus interviews, and **apply to jobs and internships from 200,000+ employers around the country.**

- SuccessWorks (<https://careers.ls.wisc.edu/>)
- Set up a career advising appointment (<https://careers.ls.wisc.edu/make-an-appointment/>)
- INTER-LS 210 L&S Career Development: Taking Initiative (1 credit, targeted to first- and second-year students)—for more information, see Inter-LS 210: Career Development, Taking Initiative (<https://careers.ls.wisc.edu/inter-ls-210-career-development-taking-initiative/>)
- INTER-LS 215 Communicating About Careers (3 credits, fulfills Com B General Education Requirement)
- Handshake (<https://careers.ls.wisc.edu/handshake/>)
- Learn how we're transforming career preparation: L&S Career Initiative (<http://ls.wisc.edu/lsci/>)

PEOPLE

Professors Carroll, DeMets, Feigl, Goodwin, Johnson, Kelly, Meyers, Peters, Roden, Singer, Thurber, Tikoff, Xu

Associate Professors Cardiff, Dutton

Assistant Professors Bauer, Bonamici, Ferrier, Marcott, Zahasky, Zoet