

Geology (GEO)

Major and Minor in Geology

Department of Geosciences, College of Arts and Sciences

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Minors of particular interest to students majoring in Geology and Earth and Space Sciences: Environmental Studies (ENS), Marine Sciences (MAR), engineering minors

Faculty

Daniel M. Davis, *Professor, Ph.D., Massachusetts Institute of Technology:* Geophysics.

Robert T. Dodd, Jr., *Professor Emeritus, Ph.D., Princeton University:* Geochemistry.

Steven C. Englebright, *M.S., Curator, Stony Brook University:* Geology.

Gilbert N. Hanson, *Professor, Ph.D., University of Minnesota:* Geochemistry.

William E. Holt, *Professor, Ph.D., University of Arizona:* Geophysics.

Robert C. Liebermann, *Professor and Distinguished Service Professor, Ph.D., Columbia University:* Geophysics.

Donald H. Lindsley, *Distinguished Professor Emeritus, Ph.D., Johns Hopkins University:* Geochemistry; petrology.

Scott M. McLennan, *Professor, Ph.D., Australian National University:* Geochemistry.

William J. Meyers, *Professor Emeritus, Ph.D., Rice University:* Sedimentology.

Hanna Nekvasil, *Professor, Ph.D., Pennsylvania State University:* Geochemistry; petrology.

John B. Parise, *Professor, Ph.D., James Cook University:* Crystallography; mineral physics.

Brian L. Phillips, *Assistant Professor, Ph.D., University of Illinois:* Geochemistry, mineralogy.

Troy Rasbury, *Assistant Professor, Ph.D., Stony Brook University:* Geochemistry; sedimentology.

Richard J. Reeder, *Professor, Ph.D., University of California, Berkeley:* Geochemistry; sedimentology.

Martin A. Schoonen, *Professor, Ph.D., Pennsylvania State University:* Geochemistry.

Donald J. Weidner, *Distinguished Professor, Ph.D., Massachusetts Institute of Technology:* Geophysics.

Lianxing Wen, *Assistant Professor, Ph.D., California Institute of Technology:* Global geophysics.

Teng-fong Wong, *Professor, Ph.D., Massachusetts Institute of Technology:* Geophysics.

Affiliated Faculty

Robert C. Aller, *MSRC*

Henry J. Bokuniewicz, *MSRC*

J. Kirk Cochran, *MSRC*

Marvin Geller, *MSRC*

David W. Krause, *Anatomical Sciences*

Charles Nittrouer, *MSRC*

Teaching Assistants

Estimated number: 12

The Department of Geosciences offers two undergraduate programs: the Geology major, leading to a Bachelor of Science degree, and the Earth and Space Sciences major, leading to a Bachelor of Arts degree. Minimum course requirements for the B.S. program in Geology are detailed below. For requirements for the B.A. program in Earth and Space Sciences, see the entry in the alphabetical listing of Approved Majors, Minors, and Programs. Upon declaring the major, the student is assigned a faculty advisor who will assist in the selection of a course sequence leading to the degree. Students should consult frequently with their faculty advisors regarding their progress and regarding appropriate science courses. Because the position of the scientist in society is responsible and complex, the student is cautioned to pay careful attention to general education in the arts, humanities, and social sciences.

Geology

The science of geology is concerned with the physical and chemical nature of the earth (and other planets) and the evolution of the earth over the vast expanse of geological time. The B.S. program in Geology includes four specializations: Geology, Environmental Geoscience, Engineering Geology, and Geological Oceanography. The major aims at providing the student with maximum preparation to carry out graduate and professional work in each of these fields. Students graduating with a B.S. in Geology typically go on to graduate school or obtain professional employment with environmental consulting firms or various government organizations.

Courses in Geology

See the Course Descriptions listing in this Bulletin for complete information.

GEO 101-E Environmental Geology

GEO 102-E The Earth

GEO 103-E The Earth Through Time

GEO 107-E Natural Hazards

GEO 109-E Life Through Time

GEO 112 Physical Geology Laboratory

GEO 113 Historical Geology Laboratory

GEO 121 Principles of Geology

GEO 122-E Physical Geology

GEO 287 Introductory Research in Geology

GEO 302 GIS For Geologists

GEO 304-H Energy, Mineral Resources, and the Environment

GEO 305 Field Geology

GEO 306 Mineralogy and Petrology I

GEO 309 Structural Geology

GEO 310 Introduction to Geophysics

GEO 311-H Geoscience and Global Concerns

GEO 315 Groundwater Hydrology

GEO 316 Geochemistry of Surficial Processes

GEO 318 Engineering Geology and Coastal Processes

GEO 320-E Glacial Geology

GEO 327 Computerized Modeling of Geological Phenomena

GEO 353 Marine Ecology

GEO 401 Optical Mineralogy

GEO 403 Stratigraphy

GEO 405 Field Camp

GEO 407 Mineralogy and Petrology II

GEO 420 Environmental Analysis Using Remote Sensing and Geographic Information Systems

GEO 447 Senior Tutorial in Geology

GEO 452 Seismology

Independent research, teaching practica, and internship courses

Requirements for the Major in Geology (GEO)

The major in Geology leads to the Bachelor of Science degree. All courses offered for the major must be passed with a letter grade of C or higher.

Completion of the major requires 66 to 68 credits.

Geology and Environmental Geoscience Specializations

A. Required departmental courses

Geology Specialization

GEO 103 The Earth Through Time
 GEO 113 Historical Geology Laboratory
 GEO 122 Physical Geology
or GEO 102 The Earth *and* GEO 112 Physical Geology Laboratory
 GEO 306 Mineralogy and Petrology I
 GEO 309 Structural Geology
 GEO 310 Introduction to Geophysics
 GEO 401 Optical Mineralogy
 GEO 403 Stratigraphy
 GEO 405 Field Camp
 GEO 407 Mineralogy and Petrology II

Environmental Geoscience Specialization

GEO 101 Environmental Geology
 GEO 122 Physical Geology
or GEO 102 The Earth *and* GEO 112 Physical Geology Laboratory
 GEO 305 Field Geology
 GEO 306 Mineralogy and Petrology I
 GEO 315 Groundwater Hydrology
 GEO 316 Geochemistry of Surficial Processes
 GEO 401 Optical Mineralogy
 GEO 403 Stratigraphy
 One of the following:
 GEO 309, 310, 407, ATM 397, AMS 210, 321

B. Required courses in the related sciences

MAT 131, 132 Calculus I, II
 (See Note 1 below)
 CHE 131, 132 General Chemistry
or CHE 141, 142 Honors Chemistry
 PHY 131/133, 132/134 Classical Physics I, II and labs (See Note 2 below)

C. Related science electives

A coherent set of upper-division science courses, totaling 12 credits, that has been approved by the department.

D. Upper-Division Writing Requirement

All students majoring in Geology must submit two papers (term papers, laboratory reports, or independent research papers) to the director of undergraduate studies for Department evaluation by the end of the junior year. If this evaluation is satisfactory, the student will have fulfilled the upper-division writing requirement. If it is not, the student must fulfill the requirement before graduation.

Engineering Geology Specialization

A. Required courses

GEO 101 Environmental Geology
 GEO 122 Physical Geology
or GEO 102 The Earth *and* GEO 112 Physical Geology Laboratory
 GEO 306 Mineralogy and Petrology I
 GEO 309 Structural Geology
 GEO 315 Groundwater Hydrology
 GEO/MAR 318 Engineering Geology and Coastal Processes
 GEO 401 Optical Mineralogy
 GEO 403 Stratigraphy
 MEC 260 Engineering Statics
 MEC 363 Mechanics of Solids

B. Required courses in the related sciences

MAT 131, 132 Calculus I, II
 (See Note 1 below)
 MAT 203 Calculus III with Applications
or AMS 261 Applied Calculus III
 CHE 131, 132 General Chemistry
or CHE 141, 142 Honors Chemistry
 PHY 131/133, 132/134 Classical Physics I, II and labs
 (See Note 2 below)

C. Related science and engineering electives

A coherent set of science and engineering courses, totaling at least six credits, approved by the Department.

D. Upper-Division Writing Requirement

See D under "Geology and Environmental Geoscience Specializations," above.

Geological Oceanography Specialization

A. Required courses

GEO 122 Physical Geology
or GEO 102 The Earth *and* GEO 112 Physical Geology Laboratory
 GEO 306 Mineralogy and Petrology I
 GEO/BIO 353 Marine Ecology
 GEO 401 Optical Mineralogy
 GEO 403 Stratigraphy
 MAR 104 Oceanography
 MAR 304 Waves, Tides, and Beaches
 MAR 333 Coastal Oceanography
 MAR 346 Marine Sedimentology
 MAR 350 Intro. to Ocean Physics

B. Required Courses in the related sciences

MAT 131, 132 Calculus I, II (see Note 1 below)
 AMS 361 Applied Calculus IV: Differential Equations
 BIO 150 The Living World
 BIO 201 Fundamentals of Biology: Organisms to Ecosystems
 CHE 131, 132 General Chemistry
or CHE 141, 142 Honors Chemistry
 PHY 131/133, 132/134 Classical Physics I, II and labs
or PHY 125, 126, 127 Physics A,B,C
or PHY 141, 142 Classical Physics I, II: Honors

C. Upper-Division Writing Requirement

See D under "Geology and Environmental Geoscience Specializations" at left.

Notes:

- The following alternate beginning calculus sequences may be substituted for MAT 131, 132 in major requirements or prerequisites: MAT 125, 126, 127 or 141, 142 or 171. Equivalency for MAT courses achieved by earning the appropriate score on a University mathematics placement examination will be accepted as fulfillment of the requirement without the necessity of substituting other credits. For detailed information about the various calculus sequences, see "Beginning Mathematics Courses" under the entry for the Department of Mathematics and the individual course descriptions.
- In the Geology, Environmental Geoscience, and Engineering Geology specializations, the following physics

Sample Course Sequences for the Major in Geology

	Geology	Environmental Geoscience	Engineering Geology	Geological Oceanography
Freshman				
Fall:	FYS 101 (1cr)	FYS 101 (1cr)	FYS 101 (1 cr)	FYS 101 (1 cr)
	D.E.C. A (3cr)	D.E.C. A (3cr)	D.E.C. A (3cr)	D.E.C. A (3cr)
	CHE 131 (4cr)	CHE 131 (4cr)	CHE 131 (4cr)	BIO 150 (3cr)
	GEO 102 (3cr)	GEO 102 (3cr)	GEO 102 (3cr)	CHE 131 (4cr)
	GEO 112 (1cr)	GEO 112 (1cr)	GEO 112 (1cr)	GEO 102 (3cr)
	D.E.C. (3cr)	D.E.C. (3cr)	D.E.C. (3cr)	GEO 112 (1cr)
Credits	15	15	15	15
Spring:	FYS 102 (1cr)	FYS 102 (1cr)	FYS 102 (1cr)	FYS 102 (1cr)
	D.E.C. A (3cr)	D.E.C. A (3cr)	D.E.C. A (3cr)	D.E.C. A (3cr)
	CHE 132 (4cr)	CHE 132 (4cr)	CHE 132 (4cr)	CHE 132 (4cr)
	MAT 131 (4cr)	MAT 131 (4cr)	MAT 131 (4cr)	MAT 131 (4cr)
	GEO 103 (3cr)	GEO 101 (3cr)	GEO 101 (3cr)	MAR 104 (3cr)
	GEO 113 (1cr)			D.E.C. (3cr)
Credits	16	15	15	18
Sophomore				
Fall:	MAT 132 (4cr)	GEO Elec (3cr)	MAT 132 (4cr)	BIO 201 (4cr)
	PHY 131/133 (4cr)	MAT 132 (4cr)	PHY 131/133 (4cr)	MAT 132 (4cr)
	D.E.C. (3cr)	PHY 131/133 (4cr)	D.E.C. (3cr)	PHY 131/133 (4cr)
	D.E.C. (3cr)	D.E.C. (3cr)	D.E.C. (3cr)	D.E.C. (3cr)
		D.E.C. (3cr)		
Credits	14	17	14	15
Spring:	GEO 306 (4cr)	GEO Elec (3cr)	AMS 261 (4cr) or	GEO 306 (4cr)
	PHY 132/134 (4cr)	GEO 306 (4cr)	MAT 203 (4cr)	PHY 132/134 (4cr)
	D.E.C. (3cr)	PHY 132/134 (4cr)	GEO 306 (4cr)	D.E.C. (3cr)
	D.E.C. (3cr)	D.E.C. (3cr)	PHY 132/134 (4cr)	D.E.C. (3cr)
	D.E.C. (3cr)		D.E.C. (3cr)	
Credits	17	14	15	14
Junior				
Fall:	GEO 401 (1cr)	GEO 401 (1cr)	MEC 260 (3cr)	AMS 361 (4cr)
	GEO 407 (3cr)	GEO 403 (4cr)	GEO 401 (1cr)	GEO 401 1cr)
	GEO 403 (4cr)	GEO 316 (4cr)	GEO 403 (4cr)	GEO 403 (4cr)
	D.E.C. (3cr)	D.E.C. (3cr)	D.E.C. (3cr)	D.E.C. (3cr)
	D.E.C. (3cr)	D.E.C. (3cr)	D.E.C. (3cr)	UpperDiv Elec (3cr)
			UpperDiv Elec (3cr)	
Credits	17	15	17	15
Spring:	GEO 309 (4cr)	ATM 397 (3cr) or	MEC 363 (4cr)	MAR 333 (3cr)
	GEO Elec (3cr)	GEO 309 (3cr)	GEO 315 (3cr)	D.E.C. (3cr)
	D.E.C. (3cr)	GEO 315 (3cr)	D.E.C. (3cr)	D.E.C. (3cr)
		D.E.C. (3cr)	D.E.C. (3cr)	UpperDiv Elec (3cr)
	D.E.C. (3cr)	D.E.C. (3cr)	UpperDiv Elec (3cr)	UpperDiv Elec (3cr)
	GEO xxx (3cr)	UpperDiv Elec (3cr)		
Summer:	GEO 405 (3cr)			
Credits	16 (+3 Summer)	15	16	15
Senior				
Fall:	GEO 310 (3cr)	AMS 210 (3cr) or	GEO 318 (3cr)	MAR 304 (3cr)
	GEO Elec (3cr)	GEO 310 (3cr)	GEO 310 (3cr)	MAR 346 (3cr)
	D.E.C. (3cr)	GEO 305 (3cr)	D.E.C. (3cr)	MAR 350 (2cr)
	UpperDiv Elec (3cr)	D.E.C. (3cr)	UpperDiv Elec (3cr)	D.E.C. (3cr)
	UpperDiv Elec (3cr)	UpperDiv Elec (3cr)	UpperDiv Elec (3cr)	UpperDiv Elec (3cr)
	UpperDiv Elec (3cr)			
Credits	18	15	15	14
Spring:	GEO Elec (3cr)	GEO Elec (3cr)	GEO 309 (4cr)	GEO/MAR 353 (3cr)
	UpperDiv Elec (3cr)	UpperDiv Elec (3cr)	GEO/MEC Elec (3)	D.E.C. (3cr)
	UpperDiv Elec (3cr)	UpperDiv Elec (3cr)	D.E.C. (3cr)	UpperDiv Elec (3cr)
	UpperDiv Elec (3cr)	Elective (3cr)	UpperDiv Elec (3cr)	Elective (3cr)
	D.E.C. (3cr)	Elective (3cr)	UpperDiv Elec (3cr)	Elective (3cr)
Credits	15	15	16	15

courses are alternatives to PHY 131/133, 132/134: PHY 121/123, 122/124 or PHY 125, 126, 127 or PHY 141, 142.

Honors Program in Geology

Students in the Geology major who have maintained a grade point average of 3.50 in natural sciences and mathematics through the junior year may become candidates for Departmental honors in Geology by applying to the Department.

In addition to the academic program, the student must complete an honors thesis, which is evaluated by a committee composed of the student's advisor and two other science faculty members including one from outside of the Department. If the honors program is completed with distinction and the student has maintained a minimum 3.50 grade point average in all coursework in natural sciences and mathematics, honors are conferred.

Requirements for the Minor in Geology (GEO)

For students majoring in other areas who are interested in obtaining a fundamental understanding of the earth sciences, a minor concentration in Geology with two distinct specializations—Geology and Environmental Geoscience—is available. The Geology specialization acquaints students with earth materials, the origin and evolution of life on earth, and physical processes that have shaped the earth through time. The Environmental Geoscience specialization acquaints students with the fundamental environmental problems that are dealt with by geoscientists.

All courses offered for the minor must be passed with a letter grade of C or higher. Completion of the minor requires 20 credits.

Geology Specialization

- GEO 103 and 113
- GEO 122 Physical Geology
or GEO 102 The Earth and GEO 112 Physical Geology Laboratory
- Twelve additional credits from among GEO courses numbered 300 or higher

Environmental Geoscience Specialization

- GEO 101
- GEO 122 Physical Geology
or GEO 102 The Earth and GEO 112 Physical Geology Laboratory
- GEO 315 Groundwater Hydrology
- Nine additional credits chosen from GEO 304, 306, 307, 309, 310, 311, 316, 318, 401, 403