

Geology B.S. and Minor



Contact Information

Dr. Maribeth H. Price

Department of Geology and Geological Engineering
Mineral Industries 307
(605) 394-2461
E-mail: Maribeth.Price@sdsmt.edu

Faculty

Professors Duke, Paterson, Price (Chair); Associate Professor Uzunlar; Assistant Professors Pagnac, Terry; Professors Emeritus Fox, Lisenbee, Redden; Haslem Post-doctoral Fellow (vacant).

Supporting Faculty

Professors Davis and Stetler. Assistant Professors Katzenstein and Sawyer. Professor Emeritus Rahn. Adjunct Professors Benton and McCormick.

Geology and Paleontology

The program in geology and paleontology fully utilizes the magnificent geologic setting of the Black Hills and Badlands, and the extensive fossil and mineral specimens in the Museum of Geology. We train students for careers in the geosciences including environmental applications, mineral and petroleum exploration, governmental agencies, museums, academic fields, teaching,

and entrepreneurship. Both undergraduate and graduate programs are available.

Choosing a career focus

Many different types of career opportunities are open to students in the geosciences. Students complete a core of geology courses to solidly prepare them for one of the many potential careers in the geosciences. Additional electives are chosen to focus on a particular career path and best prepare the student for employment or graduate school. Students may focus in one of four career paths or select electives from two or more foci depending on their career interests. Students are strongly encouraged to consult with their advisor in selecting a focus and electives.

Resource Geology

This focus prepares students for careers with the traditional employers of geologists--the mining and petroleum industries. Graduates may work to find oil or mineral resources, assist with extracting them, or develop new types of resources such as coal bed methane or oil shales. Recommended electives for resource geology include:

MEM 201	Mine Surveying
MEM 433	Geoscience Modeling
GEOE 324	Eng Geophysics I [#]
GEOE 425	Eng Geophysics II
GEOE 451	Economic Geology
GEOE 452	Geochemical Exploration
GEOE 462	Drilling Engineering
GEOE 461	Petroleum Production
GEOL 351	Earth Resources
GEOL 413	Ore Microscopy
GEOL 442	Optical Petrology

Paleontology

This focus area trains students for careers studying ancient organisms and their environments. Graduates will often go to graduate school to develop research careers, but opportunities are also available to work in museums, parks, or with consulting firms that survey and preserve fossil resources prior to construction projects. Paleontology students will work closely with Museum of Geology facilities

and personnel. Recommended electives for paleontology include:

BIOL 121/L	Anatomy
BIOL 151	Gen Biology I
BIOL 123	Physiology
BIOL 153	Gen Biology II
BIOL 311	Principles of Ecology
GEOL 371	Field Paleontology
GEOL 372	Dinosaurs
GEOL 472	Museum Conservation & Curation
GEOL 473	Museum Prep and Exhibit Design

Environmental Geology

This focus prepares students for work developing and preserving natural resources including ground water and soils. Students may work for environmental firms, or could do environmental work for petroleum and mineral companies. Many government agencies also hire graduates with these skills. Recommended electives for environmental geology include:

GEOL 351	Earth Resources
GEOE 425	Engineering Geophysics II
GEOE 466	Eng/Environmental Geol
GEOE 462	Drilling Engineering
GEOE 468	Geohazards
GEOE 475	Ground Water
GEOE 482	Applied Geomorphology

Geospatial Technology

This focus supplies additional training for students interested in careers that involve remote sensing and Geographic Information Systems. Most geoscience careers require basic knowledge of GIS, but additional training opens new career options for students who enjoy mapping and computers. Graduates may work in traditional petroleum, mining, or environmental companies, for government agencies, or within the geospatial industry that provides and manages maps and imagery to the world. Recommended electives for geospatial technology include:

MEM 201	Mine Surveying
GEOE 475	Ground Water
GEOL 376	Geospatial Field Methods
GEOL 417	Geospatial Databases

GEOL 419	Adv Geospatial Analysis
GEOL 420	Remote Sensing

Geology majors can simultaneously satisfy elective requirements for the Geology B.S. and a Minor in Geospatial Technology by taking GEOL 417, GEOL 419, GEOL 420, and two courses from: MEM 201, MATH 281, GEOE 475*, or GEOL 376. Students considering the geospatial minor should take GEOL 316 Intro to GIS by their junior fall.

Advanced Degrees

This B.S. in Geology can provide a pathway to professional careers in teaching, law, or medicine. For careers in science education, students should consult teaching programs at other colleges for auxiliary education courses that would be needed for teacher certification. With some adaptation, this degree can provide a foundation for professional graduate degrees such as medicine or law.

Graduate programs, both master's and doctoral, are available and involve additional specialization in geology or paleontology. They commonly include research on regional or local problems. Analytical and computational facilities in the department and related departments include the electron microprobe, heating-cooling fluid inclusion stage, AA-ICP, XRD, SEM, TEM, the Geographic Information Systems/ Remote Sensing Laboratory. The Museum of Geology holds over 300,000 fossil and mineral specimens that are available for educational and research use. Completion of graduate degrees leads to higher-level professional employment including college-level instruction.

Professional Development

The senior year culminates in an individual research project in which the student practices the professional accomplishments of project planning, organization, time management, and oral/written communication. Students are strongly encouraged to participate in professional societies active on campus, including the Tech Geological

Association, the Society of Economic Geologists and the Paleontology Club. Paleontology students will have opportunities to volunteer or work on archival and research projects at the Museum of Geology. Internships in industry and government are commonly available and highly recommended.

Minor In Geology

Other science and engineering majors may pursue a minor in geology by completing eighteen (18) credit hours of geology courses including the following: GEOL 201, 201L, 212, 321, 341, and GEOE 322. GEOL 331 may be substituted for GEOL 321 with the permission of the chair of the Department of Geology and Geological Engineering. Students pursuing a degree in Mining Engineering may take GEOL 214L and GEOE 451 in place of GEOL 212.

Minor in Geospatial Technology

Geospatial Technology is a rapidly expanding field that covers the management and analysis of spatial data from many sources, such as satellites, airborne remote sensing, geographic information systems (GIS), global positioning systems (GPS), surveying, and more. It has many applications in the sciences, engineering, business, planning, and transportation. Other science and engineering majors may pursue a Minor in Geospatial Technology by completing eighteen (18) credit hours of courses, including GEOL 316, GEOL 417, GEOL 419, and GEOL 420. Six additional credits taken from any of the groups below complete the minor. Up to three credits of a senior capstone, research, or design project with a significant proportion of geospatial content may be substituted for one course, with permission of the program director.

ONE of these surveying courses may be applied to the minor:

- CEE 206 Civil Engineering Practice and Engineering Surveys (4 cr)
- MEM 201 Surveying for Mining Eng. (2 cr)

ONE of these statistics courses may be applied to the minor:

- ENVE 307 Environmental Geostatistics (2 cr)
- MEM 307 Mineral Exploration and Geostatistics (3 cr)
- MATH 281 Intro to Statistics (3 cr)
- MATH 381 Probability and Statistics (3 cr)
- MATH 441 Engineering Statistics (4 cr)

ONE of these programming courses may be applied to the minor:

- CHE 117 Professional Practices in Chemical Engineering (2 cr)
- GEOE 211 Earth Systems Engineering Analysis (2 cr)
- CEE 284 Digital Computation Applications in Civil Engineering (4 cr)
- CSC 150 Computer Science I (3 cr)

ANY of these courses may be applied to the minor:

- GEOE 475 Ground Water Modeling (3 cr)
- CEE 437 Watershed and Flood Plain Modeling (3 cr)
- CSC 250 Computer Science II (3 cr)
- CSC 284 Database Processing (3 cr)
- GEOL 376 Geospatial Field Methods (3 cr)

Geology/Paleontology Curriculum/Checklist

It is the student's responsibility to check with his or her advisor for any program modifications that may occur after the publication of this catalog. When planning course work, students are advised that the courses GEOL 212, GEOL 341, GEOE 322 and GEOL 410 form a critical sequence that must be taken in the order listed.

Freshman Year

First Semester		
MATH 123	Calculus I	4
CHEM 112	General Chemistry I	3
CHEM 112L	General Chemistry I Lab	1
ENGL 101	Composition I	3
GEOL 201	Physical Geology	3
GEOL 201L	Physical Geology Lab	1
IS 110	Explorations ¹	2
TOTAL		17

Second Semester		
CHEM 114	General Chemistry II	3
CHEM 114L	General Chemistry II Lab	1
MATH 125	Calculus II	4
GEOE 211	Earth Sys Eng Analysis	2
Gen. Ed. Goal 3 and Goal 4 Electives ²		6
TOTAL		16

Sophomore Year

First Semester		
PHYS 211	University Physics I	3
One of ³		3-4
MATH 225	Calculus III (4 cr)	
MATH 281	Intro to Statistics (3 cr)	
GEOL 321	Search for Our Past	3
Sophomore Electives ⁴		3
Gen. Ed. Goal 3 and Goal 4 Electives ²		3
TOTAL		15-16

Second Semester		
PHYS 213	University Physics II	3
ENGL 279	Technical Comm I	3
GEOL 212	Mineralogy/Crystallography	3
Sophomore Electives ⁴		3
Gen. Ed. Goal 3 and Goal 4 Electives ²		3
PE	Physical Education	1
TOTAL		16

Junior Year

First Semester		
ENGL 289	Technical Comm II ¹	3
GEOL 331	Stratigraphy/Sedimentation	3
GEOL 341	Igneous/Metamorphic Petrol	3
GEOL 316	Intro to GIS	3
Geology Electives ⁴		3
TOTAL		15

Second Semester		
GEOE 322	Structural Geology	3
GEOL 403	Regional Field Geology ⁵	1
GEOL 461	Invertebrate Paleo ^{**}	3
One of:		3
GEOE 324	Engr. Geophysics I	
GEOE 482	Applied Geomorph ^{**}	
Geology Electives ⁴		3
Humanities/Social Science electives		1
PE	Physical Education	1
TOTAL		15

Summer		
GEOL 410	Field Geology	6

Senior Year

First Semester		
GEOL 464	Senior Research I	1
Geology Electives ⁴		6
Free Elective(s) ³		3
Humanities/Social Science electives		3
TOTAL		13

Second Semester		
GEOL 465	Senior Research II ⁶	3
Geology Electives		6
Free electives		5-6
TOTAL		14-15

128 credits required for graduation

** Course offered in alternate years.

Curriculum Notes

¹Transfer students may substitute 2 credits of free electives for IS 110.

²Students must complete 27 credits of the general education core in their first 64 credit hours, including 6 credits of science, 3 cr math, 6 cr English/Technical Communication, 6 cr humanities, and 6 cr social science. ENGL 289 yields an addition 3 general education credits, for a total of 30.

³Students should consult an advisor when choosing math.

⁴Sophomore and Geology electives must be selected from the approved lists. At least 9 credits must be taken from 400-level courses.

Substitutions must be approved by dept head.

⁵Students may substitute Geol 371 Field Paleontology (0-2) for Geol 403; the extra credit is a geology elective.

⁶Under exceptional circumstances, a student may petition the department head to substitute geology electives for senior research.

Additional course work in mathematics and statistics is recommended. Students planning to go to graduate school are advised take three semesters of calculus. MATH 381 and MATH 382 are recommended statistics courses; MATH 432 is recommended for students interested in

numerical modeling of partial differential equations.

The Black Hills Natural Sciences Field Station

The Black Hills Natural Sciences Field Station functions in cooperation with universities from South Dakota, North Dakota, Mississippi, and Wisconsin with the purpose of providing summer field courses in the Black Hills and nearby areas, as well as overseas. Field courses in geology, geological engineering and environmental science and engineering are offered. For descriptions of all courses offered, see the listings of the Department of Geology and Geological Engineering in this catalog.

The Field Station operates from five sites: School of Mines campus, Ranch A in the northern Black Hills of Wyoming, Taskesti in the country of Turkey, and the city of Chennai and the Andaman Islands in India, and the Himalayas of Nepal.

Geology and Geological Engineering Field Camps:

GEOL 410 Field Geology — five (5) weeks (six (6) semester hours) — Ranch A, Wyoming

GEOL 410 Field Geology — five (5) weeks (six (6) semester hours) --- Taskesti, Turkey

GEOE 410 Engineering Field Geology five (5) weeks (six (6) semester hours) — Rapid City, SD

GEOE 410 Engineering Field Geology five (5) weeks (six (6) semester hours) – Taskesti, Turkey

GEOL/GEOE 412/512 Science and Engineering Applications (3 to 6 semester hours), Rapid City - SD, Taskesti – Turkey, Chennai/Andaman Islands,-- India, and Himalayas, Nepal.

Paleontology Field Camps:

GEOL 371: Field Paleontology – two (2) weeks two (2) semester hours – held at one of several ongoing paleontology sites throughout South Dakota, Wyoming, Oregon, and the western United States with department and Museum of Geology faculty and personnel

BHNSFS also offers youth and freshman geology field camps and field trips.

Further information may be obtained by calling (605) 394-2494, or go to the website:

<http://geologyfieldcamp.sdsmt.edu>.

Online registration or applications (available from the web page) should be received by March 1st. All deposit fees are non-refundable upon acceptance into the course.

Geographic Information Systems (GIS) and Remote Sensing Lab

The Geographic Information Systems (GIS) and Remote Sensing Laboratory is a facility for generating and analyzing spatially-referenced digital information, including maps and remotely-sensed data. Undergraduate and graduate courses in GIS are offered through the Department of Geology and Geological Engineering. (See section on Research Centers and Related Activities for a full description.)