

# Geology, B.S.

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## Degree Offered

- Bachelor of Science

## Nature of the Program

The bachelor of science degree in Geology is designed for students interested in geology positions in the private or public sectors or in academia. Qualified students are encouraged to seek a graduate degree; however B.S. geologists who have developed solid technical and communication skills have excellent employment prospects in the energy industry, in environmental and geotechnical firms or in government.

Instructional facilities and equipment include laboratories for mineralogy, petrology, geochemistry, sedimentology, paleontology, hydrogeology, geophysics, geomorphology, structural geology, and excellent computer facilities. We stress field studies in upper-level classes, capped by a six-credit field course examining folded and faulted sedimentary rocks, as well as igneous and metamorphic rocks, in South Dakota, Wyoming, and Montana. Students are encouraged to pursue internships to broaden their learning experience and to enhance employment prospects.

## Minors

All students have the possibility of earning one or more minors; a list of all available minors and their requirements is available at <http://catalog.wvu.edu/undergraduate/minors/>. Please note that students may not earn a minor in their major field.

## FACULTY

### CHAIR

- Brent McCusker - Ph.D. (Michigan State University)

### ASSOCIATE CHAIR

- Jaime Toro - Ph.D. (Stanford University)

## PROFESSORS

- Kathleen Benison - Ph.D. (The University of Kansas)  
Regular Graduate Faculty, Sedimentary Geology - Planetary Geology
- Dengliang Gao - Ph.D. (Duke University)  
Regular Graduate Faculty, Exploration Geophysics, Petroleum and Structural Geology
- Amy Hessler - Ph.D. (University of Arizona)  
Regular Graduate Faculty, Biogeography, Forest Ecosystems, Climate Variability
- Brent McCusker - Ph.D. (Michigan State University)  
Regular Graduate Faculty, Land Use Change, Africa, Policy Making
- Shikha Sharma - Ph.D. (University of Lucknow)  
Regular Graduate Faculty, Isotope Geochemistry
- Jaime Toro - Ph.D. (Stanford University)  
Regular Graduate Faculty, Structure and Tectonics
- Dorothy Vesper - Ph.D. (Pennsylvania State University)  
Regular Graduate Faculty, Aqueous Geochemistry, Hydrogeology

## ASSOCIATE PROFESSOR

- Jamison Conley - Ph.D. (Pennsylvania State University)  
Regular Graduate Faculty, Spatial Analysis, Geocomputation, Health Geography
- Karen Culcasi - Ph.D. (Syracuse University)  
Regular Graduate Faculty, Geopolitics, Identity, Middle East
- Cynthia Gorman - Ph.D. (Rutgers University)  
Regular Graduate Faculty, Gender, Migration, Human Rights, Refugee Communities
- James Lamsdell - Ph.D. (The University of Kansas)  
Regular Graduate Faculty, Paleobiology, Arthropods, Macroevolution, Heterochrony, Paleoecology, Phylogenetics
- Joseph Lebold - Ph.D. (West Virginia University)  
Regular Graduate Faculty, Paleoecology, Paleontology, Regional Geology
- Brenden McNeil - Ph.D. (Syracuse University)  
Regular Graduate Faculty, GIS, Environmental modeling, Forest Ecosystem Services

- Maria Alejandra Perez - Ph.D. (University of Michigan)  
Regular Graduate Faculty, Cultural Geography, Science & Technology Studies, Speleology, Latin America and the Caribbean
- Amy Weislogel - Ph.D. (Stanford University)  
Regular Graduate Faculty, Sedimentology
- Bradley Wilson - Ph.D. (Rutgers University)  
Regular Graduate Faculty, Social Movements, Local/Global Food Systems, Food Justice

## ASSISTANT PROFESSOR

- Vikas Agrawal - Ph.D. (West Virginia University)  
Associate Graduate Faculty, Chemical Hygiene Officer, Isotopic and Biogeochemical Characterization of Geological Materials, Energy and Environment
- Michael Harman - Ph.D. (West Virginia University)  
3D visualization, modeling complex landforms and processes, GIS
- Aaron Maxwell - Ph.D. (West Virginia University)  
Regular Graduate Faculty, Geospatial Instruction, Remote Sensing, Image Analysis, Spatial Modeling
- Charles Shobe - Ph.D. (University of Colorado - Boulder)  
Regular Graduate Faculty, Geomorphology, Earth Surface Processes, Landscape Evolution, Rivers, Source-to-Sink, Numerical Modeling

## PROFESSOR EMERITI

- Robert Behling - Ph.D. (The Ohio State University)
- Timothy Carr - Ph.D. (University of Wisconsin - Madison)
- Joe Donovan - Ph.D. (Pennsylvania State University)
- Greg Elmes - Ph.D. (Pennsylvania State University)
- Trevor Harris - Ph.D. (University of Hull)
- Thomas Kammer - Ph.D. (Indiana University)
- Steven Kite - Ph.D. (University of Wisconsin)
- Kenneth C. Martis - Ph.D. (Michigan University)
- Henry Rauch - Ph.D. (Pennsylvania State University)
- Robert C. Shumaker - Ph.D. (Cornell University)
- Richard Smosna - Ph.D. (University of Illinois)
- Timothy Warner - Ph.D. (Purdue University)
- Thomas Wilson - Ph.D. (West Virginia University)

## Admissions

- First-Time Freshmen are admitted directly into the Geology major.
- Students transferring from another major within WVU must have a 2.0 overall GPA.
- Students transferring from another institution must have a 2.0 overall GPA.

## ADMISSION REQUIREMENTS 2024-2025

The Admission Requirements above will be the same for the 2024-2025 Academic Year.

Major Code: 1445

[Click here to view the Suggested Plan of Study \(p. 5\)](#)

## General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef/>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
<b>General Education Foundations</b>		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102 or ENGL 103	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research Accelerated Academic Writing	

F2A/F2B - Science & Technology	4-6
F3 - Math & Quantitative Reasoning	3-4
F4 - Society & Connections	3
F5 - Human Inquiry & the Past	3
F6 - The Arts & Creativity	3
F7 - Global Studies & Diversity	3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)	9
Total Hours	31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

## Degree Requirements

Students must complete WVU General Education Foundations requirements, College B.S. requirements, STEM Foundations requirements, major requirements, and electives to total a minimum of 120 hours. For complete details on these requirements, visit the B.S. Degrees tab on the Eberly College of Arts and Sciences (<http://catalog.wvu.edu/undergraduate/eberlycollegeofartsandsciences/#bachelorofsciencetext>) page.

## Departmental Requirements for the B.S. in Geology

- **Capstone Requirement:** The university requires the successful completion of a Capstone course. Geology majors must complete GEOL 403 and one of the following to fulfill this requirement: GEOL 404 or GEOL 491 or GEOL 496.
- **Writing and Communication Requirement:** Geology Bachelor of Science students fulfill the Writing and Communication Skills requirement by completing ENGL 101 and ENGL 102 (or ENGL 103), and two additional **SpeakWrite Certified Courses™**: GEOL 404, and a 2<sup>nd</sup> course selected from GEOL 311 or GEOL 341.
- **Calculation of Major GPA:** A minimum GPA of a 2.0 is required in all courses applied to major requirements, with a minimum grade of a C- in GEOL 101, GEOL 101L, GEOL 103, GEOL 103L, and GEOL 286. If a course is repeated, all attempts will be included in calculation of the GPA, unless the course is eligible for D/F repeat.

We also offer the opportunity to pursue a dual degree in Geology and Mining Engineering.

## Curriculum Requirements

Code	Title	Hours
University Requirements		49
ECAS B.S. Requirements		3
Geology Major Requirements		68
Total Hours		120

## University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 4, 5, 6, and 7		18
GEOL 191	First-Year Seminar	1
General Electives		30
Total Hours		49

## ECAS Bachelor of Science Requirements

Code	Title	Hours
<b>ECAS B.S. Requirements</b>		<b>3</b>
Global Studies & Diversity Requirement		
MATHEMATICS REQUIREMENT		
MATH 150	Applied Calculus	
or MATH 153 & MATH 154	Calculus 1a with Precalculus and Calculus 1b with Precalculus	

or MATH 155	Calculus 1
SCIENCE REQUIREMENT fulfilled by major requirements	
Total Hours	3

## Geology Major Requirements

Code	Title	Hours
<b>STEM FOUNDATIONS</b>		<b>22</b>
CHEM 115 & 115L & CHEM 116 & CHEM 116L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory and Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
GEOL 351 or MATH 156	Geomathematics Calculus 2	
PHYS 101 & 101L & PHYS 102 & PHYS 102L or PHYS 111 & 111L & PHYS 112 & PHYS 112L	Introductory Physics 1 and Introductory Physics 1 Laboratory and Introductory Physics 2 and Introductory Physics 2 Laboratory General Physics 1 and General Physics 1 Laboratory and General Physics 2 and General Physics 2 Laboratory	
STAT 211 or CS 101	Elementary Statistical Inference Intro to Computer Applications	
<b>CORE REQUIREMENTS</b>		<b>25</b>
GEOG 350 & 350L	Geographic Information Systems and Science and Geographic Information Systems and Science Laboratory	
GEOL 101 & 101L	Planet Earth and Planet Earth Laboratory	
GEOL 103 & 103L	Earth Through Time and Earth Through Time Laboratory	
GEOL 286 & 286L	Introduction to Minerals & Rocks and Introduction to Minerals & Rocks Laboratory	
GEOL 311 & 311L	Stratigraphy and Sedimentation and Stratigraphy and Sedimentation Laboratory	
GEOL 341 & 341L	Structural Geology and Structural Geology Laboratory	
GEOL 489	Junior-Senior Seminar	
<b>UPPER-DIVISION ELECTIVES</b>		<b>15</b>
Select five courses from the following two lists. At least two courses must be from the Rocks and Energy list, and two courses from the Surficial Processes and Water list. One additional course must be completed from either list.		
Rocks and Energy:		
GEOL 300	Geology of West Virginia	
GEOL 302	Geology of the National Parks	
GEOL 331	Paleontology	
GEOL 373	Introduction to Petroleum Geology	
GEOL 386	Igneous and Metamorphic Petrology	
GEOL 411	Deep Time Earth Systems	
GEOL 419	Advanced Petroleum Geology	
GEOL 454	Environmental and Exploration of Geophysics 1	
GEOL 460	Physical Volcanology	
GEOL 472	Energy Geology	
GEOL 479	Log Analysis-Reading the Rocks	
Surficial Processes and Water:		
GEOL 321	Geomorphology	

GEOL 365	Environmental Geology
GEOL 388	Introduction to Geochemistry
GEOL 462	Introductory Hydrogeology
GEOL 463	Physical Hydrogeology
GEOL 466	Cave and Karst Geology
GEOL 484	Minerals and the Environment
GEOL 486	Environmental Isotopes
GEOL 488	Environmental Geochemistry
RESM 480	Environmental Regulation

**CAPSTONE EXPERIENCE****6**

GEOL 403	Geological Data Analysis
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And chose one of the following:

GEOL 404	Geology Field Camp
GEOL 491	Professional Field Experience
GEOL 496	Senior Thesis

Total Hours

68

## Suggested Plan of Study

**First Year**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	
GEOL 191		1 ENGL 101 (F1)	3	
CHEM 115		4 GEOL 103	4	
& 115L (F8 Course 1; B.S. Second Area 1)		& 103L		
GEOL 101		4 CHEM 116	4	
& 101L (F2 B; B.S. First Area 1)		& 116L (F8 Course 2; B.S. Second Area 2)		
MATH 150 or 155 (F3)		3 General Elective	4	
General Elective		3 General Elective	1	
		15	16	

**Second Year**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	
ENGL 102 (F1)		3 F5	3	
F4		3 GEOL Physics	4	
		Requirement 2 (B.S. Third Area 2)		
GEOL Physics		4 GEOL 286	4	
Requirement 1 (B.S. Third Area 1)		& 286L		
STAT 211 or CS 101		3 GEOL Rocks and Energy Requirement 1	3	
General Elective		2 General Elective	2	
		15	16	

**Third Year**

<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	<b>Summer</b>	<b>Hours</b>	
F6		3 GEOL 311		4 GEOL 404, 491, or 496		3
		& 311L				
ECAS Global Studies & Diversity Requirement (F 7)		3 GEOL 351		3		
GEOL 341		4 GEOL 403		3		
& 341L						
GEOG 350		4 GEOL 489		1		
& 350L						

		GEOL Surficial Processes & Water Req. 1	3	
	14		14	3
<b>Fourth Year</b>				
<b>Fall</b>	<b>Hours</b>	<b>Spring</b>	<b>Hours</b>	
GEOL Rocks & Energy Requirement 2		3 GEOL Rocks & Energy OR Surficial Processes & Water Requirement	3	
GEOL Surficial Processes & Water Requirement 2		3 General Elective	3	
General Elective		3 General Elective	3	
General Elective		3 General Elective	3	
General Elective		3		
	15		12	

Total credit hours: 120

## Departmental Requirements for BSMine

Students must meet the following criteria to qualify for a Bachelor of Science in Mining Engineering degree and Bachelor of Science in Geology:

- Complete a minimum of 157 credit hours
- Satisfy WVU's undergraduate degree requirements
- Satisfy Statler College's undergraduate degree requirements (<http://catalog.wvu.edu/undergraduate/collegeofengineeringandmineralresources/#policies>)
- Complete all courses listed in the curriculum requirements with the required minimum grades
- Attain an overall grade point average of 2.00 or better
- Attain a WVU grade point average of 2.00 or better
- Attain a Statler grade point average of 2.00 or better
- A maximum of one math or science courses with a grade of D+, D, or D- may apply towards a Statler College degree
- Complete a survey regarding their academic and professional experiences at WVU, as well as post-graduation job placement or continuing education plans.

The Statler GPA is computed based on all work taken at WVU with a subject code within Statler College (BIOM, BMEG, CE, CHE, CPE, CS, CSEE, CYBE, EE, ENGR, ENVE, ETEC, IENG, IH&S, MAE, MINE, PDA, PNGE, SAFM, SENG) excluding ENGR 140, ENGR 150, and CS 101. The WVU GPA is computed based on all work taken at WVU. The Overall GPA is computed based on all work taken at WVU and transfer work.

## Departmental Requirements for the B.S. in Geology

- **Capstone Requirement:** The university requires the successful completion of a Capstone course. Geology majors must complete GEOL 403 and one of the following to fulfill this requirement: GEOL 404 or GEOL 491 or GEOL 496.
- **Writing and Communication Requirement:** Geology Bachelor of Science students fulfill the Writing and Communication Skills requirement by completing ENGL 101 and ENGL 102 (or ENGL 103), and two additional SpeakWrite Certified Courses: GEOL 404 and a 2nd course selected from GEOL 311 or GEOL 341.
- **Calculation of the GPA in the Major:** An average of at least 2.0 must be attained in all Geology Major Requirements coursework. A minimum grade of C- is required in all GEOL 101, GEOL 101L, GEOL 103, GEOL 103L and GEOL 286. If a course is repeated, all attempts will be included in the calculation of the GPA unless the course is eligible for D/F repeat.
- **Benchmark Expectations:** For details, go to the Geology Degree Progress Tab.

## Curriculum Requirements

Code	Title	Hours
	University Requirements	16
	Fundamentals of Engineering Requirements	5
	Math and Science Requirements	42

Mining Engineering and Geology Program Requirements	94
Total Hours	157

## University Requirements

Code	Title	Hours
General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)		
Outstanding GEF Requirements 1, 5, 6, and 7		15
ENGR 191	First-Year Seminar	1
Total Hours		16

## Fundamentals of Engineering Requirements

Code	Title	Hours
A minimum grade of C- is required in all Fundamentals of Engineering courses.		
ENGR 101	Engineering Problem Solving 1	2
Engineering Problem Solving (Select one of the following):		3
CHE 102	Introduction to Chemical Engineering	
ENGR 102	Engineering Problem-Solving 2	
ENGR 103	Introduction to Nanotechnology Design	
MAE 102	Introduction to Mechanical and Aerospace Engineering Design	
Total Hours		5

## Math and Science Requirements

Code	Title	Hours
A minimum grade of C- is required in all Math and Science courses.		
CHEM 115 & 115L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory	4
CHEM 116 & 116L	Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	4
GEOL 101 & 101L	Planet Earth and Planet Earth Laboratory	4
GEOL 342	Structural Geology for Engineers	3
Calculus I (GEF 3):		4
MATH 155	Calculus 1	
MATH 153 & MATH 154	Calculus 1a with Precalculus and Calculus 1b with Precalculus	
MATH 156	Calculus 2	4
MATH 251	Multivariable Calculus	4
MATH 261	Elementary Differential Equations	4
PHYS 111 & 111L	General Physics 1 and General Physics 1 Laboratory	4
PHYS 112 & 112L	General Physics 2 and General Physics 2 Laboratory	4
STAT 215	Introduction to Probability and Statistics	3
Total Hours		42

## Mining Engineering and Geology Program Requirements

Code	Title	Hours
ECON 201	Principles of Microeconomics	3
ESWS 455	Reclamation of Disturbed Soils	3
GEOL 103 & 103L	Earth Through Time and Earth Through Time Laboratory	4

GEOL 286 & 286L	Introduction to Minerals & Rocks and Introduction to Minerals & Rocks Laboratory	4
GEOL 311 & 311L	Stratigraphy and Sedimentation and Stratigraphy and Sedimentation Laboratory	4
GEOL 341 & 341L	Structural Geology and Structural Geology Laboratory	4
GEOL 403	Geological Data Analysis	3
GEOL 404	Geology Field Camp	3
Geology Elective (select three of the following):		9
GEOL 300	Geology of West Virginia	
GEOL 331	Paleontology	
GEOL 321	Geomorphology	
GEOL 365	Environmental Geology	
GEOL 373	Introduction to Petroleum Geology	
GEOL 386	Igneous and Metamorphic Petrology	
GEOL 454	Environmental and Exploration of Geophysics 1	
GEOL 463	Physical Hydrogeology	
GEOG 350 & 350L	Geographic Information Systems and Science and Geographic Information Systems and Science Laboratory	
GEOG 455 & 455L	Introduction to Remote Sensing and Introduction to Remote Sensing Laboratory	
MAE 241	Statics	3
MAE 242	Dynamics	3
MAE 243	Mechanics of Materials	3
MAE 320	Thermodynamics	3
MAE 331	Fluid Mechanics	3
MINE 201 & 201L	Mine Surveying and Mine Surveying Laboratory	3
MINE 205	Underground Mining Systems	3
MINE 206	Surface Mining Systems	4
MINE 261	Engineering Computer Aided Design	2
MINE 306	Mineral Property Evaluation	3
MINE 331	Mine Ventilation	3
MINE 382	Mine Power Systems	3
MINE 411 & 411L	Rock Mechanics/Ground Control and Rock Mechanics/Ground Control Laboratory	4
MINE 427 & 427L	Coal Preparation and Coal Preparation Laboratory	4
or MINE 425 & 425L	Mineral Processing and Mineral Processing Laboratory	
MINE 461	Applied Mineral Computer Methods	3
MINE 471	Mine and Safety Management	3
MINE 483S	Mine Design-Exploration Mapping	3
MINE 484	Mine Design-Report Capstone	4
Total Hours		94

## Suggested Plan of Study

### First Year

Fall	Hours	Spring	Hours
MATH 155 (GEF 3)		4 GEOL 103 & 103L	4
ENGR 101		2 MATH 156 (GEF 8)	4
ENGR 191		1 ENGR 102	3



CHEM 115 & 115L (GEF 2)		4 PHYS 111 & 111L (GEF 8)		4	
ENGL 101 (GEF 1)		3 GEF 5		3	
GEOL 101 & 101L		4			
		18			18
Second Year					
Fall	Hours	Spring	Hours		
MAE 241		3 CHEM 116 & 116L		4	
MATH 251		4 GEOL 286 & 286L		4	
MINE 201 & 201L		3 MINE 206		4	
MINE 205		3 MAE 242		3	
MINE 261		2 PHYS 112 & 112L (GEF 8)		4	
		15			19
Third Year					
Fall	Hours	Spring	Hours	Summer	Hours
GEOL 341 & 341L		4 MINE 331		3 GEOL 404	3
ECON 201		3 ENGL 102 (GEF 1)		3	
MATH 261		4 MAE 243		3	
MINE 461		3 MAE 331		3	
STAT 215		3 GEOL 311 & 311L		4	
		GEOL 403		3	
		17			19
Fourth Year					
Fall	Hours	Spring	Hours		
MAE 320		3 MINE 484		4	
Geology Elective		3 ESWS 455		3	
MINE 382		3 MINE 427 & 427L		4	
MINE 306		3 GEF 6		3	
MINE 483S		3 Geology Elective		3	
MINE 411 & 411L		4			
		19			17
Fifth Year					
Fall	Hours				
GEF 7		3			
MINE 471		3			
Geology Elective		3			
GEOL 342		3			
		12			

Total credit hours: 157

## Degree Progress

- By the 4th semester in the major students will have a mid-semester review and should be progressing through calculus, chemistry, physics, and GEOL 286 with an adviser-approved plan and maintain a 2.0 GPA in Geology.
- All majors must meet with a G&G department adviser each semester.

Students who do not meet these benchmarks may be removed from their major.

## Major Learning Outcomes

### GEOLOGY

Upon successful completion of the B.S. degree, **Geology** majors will be able to:

1. Show competence in the identification of minerals, rocks, and fossils using various field and lab techniques.
2. Demonstrate the application of geological principles in solving problems needed for entry-level employment in Earth Science-related professions or for admission to graduate school.
3. Demonstrate competence in the use of quantitative methods for geological problem solving.
4. Demonstrate understanding of the Earth as a complex system of interacting rock, water, air, and life in the context of Deep Time.
5. Understand the origin of energy, mineral, and hydrological resources and the impact of their use on Earth environments and human life.
6. Characterize and determine the history of a geological site using the appropriate methods.
7. Generate 2D and 3D representations of geologic data collected by the student in the field and the laboratory.
8. Communicate geological knowledge through effective written and oral presentation skills.

### WVUTeach: Earth and Space Science

Code	Title	Hours
ARSC 120	Inquiry Approaches to Teaching	1
ARSC 220	Inquiry-Based Lesson Design	1
GEOL 376L	Research Methods Laboratory	3
MATH 318	Perspectives on Mathematics and Science	3
UTCH 221	Knowing and Learning in Mathematics and Science	3
UTCH 322	Classroom Interactions in Math and Science	3
UTCH 420	Project-Based Instruction in Mathematics and Science	3
UTCH 430	Apprentice Teaching in Math and Science	10
Total Hours		27