

MAJOR IN GEOSCIENCES, HYDROGEOLOGY CONCENTRATION

The Hydrogeology concentration within the Geosciences major provides students with the applied skills and scientific knowledge related to managing groundwater as a resource to meet societal and environmental needs. This concentration combines a strong foundation in geosciences with additional depth in hydrogeology and its application to providing a safe, reliable, and sustainable groundwater supply; protecting and remediating aquifers; understanding the role of groundwater in maintaining ecosystem functions; and modeling groundwater flow and contaminant transport.

Learning Objectives

Upon successful completion of this program, students will be able to:

1. Demonstrate foundational skills and knowledge in all sub-disciplines of geology (physical and historical geology, earth materials, sedimentology and stratigraphy, structural geology)

2. Exhibit valuable skills in scientific reasoning, quantitative data analysis and reasoning; field, analytical, and remote sensing skills; spatial thinking and map use enabling them to contribute effectively to professional work and engage in original research.
3. Use visualization tools, theory, computation, and simulations to explain field observations and experimental results, make interpretations and test hypotheses.
4. Obtain, organize, and critically evaluate geologic information, and effectively present it through oral and written discourse with specialists and non-specialists.
5. Ethically and responsibly engage their knowledge of geology to address current global and scientific challenges.
6. Apply sustainability principles that incorporate complex environmental, economic, and social factors.
7. Describe the origins, behavior and sustainable uses of groundwater.
8. Exhibit valuable professional skills in procedures of assessment, evaluation and monitoring of groundwater resources.

Requirements Effective Fall 2026

Freshman

		AUCC	Credits
CHEM 111	General Chemistry I (GT-SC2)	3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)	3A	1
CO 150	College Composition (GT-CO2)	1A	3
GEOL 150 ¹	Dynamic Earth (GT-SC2)	3A	4
GEOL 154	Earth and Climate Change Through Time		4
GEOL 192	New Student Seminar--Exploring Geosciences		1
MATH 160	Calculus for Physical Scientists I (GT-MA1)	1B	4
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		1C	3
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3B	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
Total Credits			30

Sophomore

CHEM 113	General Chemistry II		3
CHEM 114	General Chemistry Lab II		1
GEOL 310	Earth Materials		4
GEOL 311	Earth's Interior		3
GEOL 312	Earth's Surface		2
GEOL 313	Earth Systems		2
GEOL 314	Earth's Surface Laboratory		1
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	5
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)		3D	3
Total Credits			28

Junior

GEOL 344	Stratigraphy and Sedimentology		3
GEOL 372	Structural Geology	4B	4
GEOL 376	Geologic Field Methods	4A,4C	2
MATH 261	Calculus for Physical Scientists III		4
NR 319	Introduction to Geospatial Science		4
SOCR 470	Soil Physics		3
Select one class from the following:			3
CO 300	Writing Arguments (GT-CO3)	2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)	2	
JTC 300	Strategic Writing and Communication (GT-CO3)	2	
Select one course from the following:			3
STAT 301	Introduction to Applied Statistical Methods		
STAT 305	Sampling Techniques		
Total Credits			26

Summer

GEOL 476	Field Geoscience Capstone	4A,4C	4
Total Credits			4

Senior

GEOL 452	Hydrogeology		4
MATH 340	Intro to Ordinary Differential Equations		4
WR 416	Land Use Hydrology		3
Select one course from the following:			3-4
GEOL 340	Glacial Geology		
GEOL 366	Low-Temperature Geochemistry		
GEOL 415	Critical Zone Science		
GEOL 442	Applied Geophysics		
GEOL 446	Environmental Geology		
GEOL 450	Reservoir Geosciences Fluid Storage Flow		
GEOL 454	Geomorphology		
Select 9 credits from the following Directed Technical Electives not taken elsewhere: ²			9
CIVE 322	Basic Hydrology		
CIVE 440	Nonpoint Source Pollution		
GEOL 340	Glacial Geology		
GEOL 364	Igneous and Metamorphic Petrology		
GEOL 366	Low-Temperature Geochemistry		
GEOL 415	Critical Zone Science		
GEOL 440	Geodetic and Near-Surface Geophysical Methods		
GEOL 442	Applied Geophysics		
GEOL 446	Environmental Geology		
GEOL 447	Mineral Deposits		
GEOL 450	Reservoir Geosciences Fluid Storage Flow		
GEOL 454	Geomorphology		
GEOL 476 ³	Field Geoscience Capstone		
GEOL 477	Isotope Geology and Geochronology		
GEOL 494A ⁴	Independent Study: Environmental/Engineering Geology		
GEOL 498 ⁴	Research		
GEOL 541	Geostatistics		
GEOL 546	Sedimentary Basin Analysis		
GEOL 548	Petroleum Geology		

GEOL 551	Groundwater Modeling	
GEOL 552	Advanced Topics in Hydrogeology	
GEOL 579	Solid Earth Inverse Methods and Practices	
MATH 332	Partial Differential Equations	
MATH 369	Linear Algebra I	
MATH 450	Introduction to Numerical Analysis I	
WR 417	Watershed Measurements	
WR 418	Land Use and Water Quality	
WR 419	Water Quality Analyses	
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		3
Electives ⁵		5-6
Total Credits		32
Program Total Credits:		120

¹ GEOL 110, GEOL 120, GEOL 122, or GEOL 124 in combination with GEOL 121 may be substituted for GEOL 150.

² At least one of the selected courses must be a geology course.

³ Four credits of GEOL 476 must be taken to satisfy the requirements of the major. Additional credits may be taken as electives.

⁴ Only one credit may be used to fulfill the Directed Technical Elective requirement.

⁵ Select enough credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- 400-level).

Major Completion Map

Freshman

Semester 1		Critical	Recommended	AUCC	Credits
CO 150	College Composition (GT-CO2)	X		1A	3
GEOL 150	Dynamic Earth (GT-SC2)	X		3A	4
GEOL 192	New Student Seminar--Exploring Geosciences	X			1
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humaitiies)			X	3B	3
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)			X	3C	3
Total Credits					14
Semester 2		Critical	Recommended	AUCC	Credits
CHEM 111	General Chemistry I (GT-SC2)	X		3A	4
CHEM 112	General Chemistry Lab I (GT-SC1)	X		3A	1
GEOL 154	Earth and Climate Change Through Time	X			4
MATH 160	Calculus for Physical Scientists I (GT-MA1)	X		1B	4
1C (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#aucc)		X		1C	3
CO 150 must be completed by the end of Semester 2.		X			
Total Credits					16

Sophomore

Semester 3		Critical	Recommended	AUCC	Credits
CHEM 113	General Chemistry II	X			3
CHEM 114	General Chemistry Lab II	X			1
GEOL 310	Earth Materials	X			4
GEOL 311	Earth's Interior	X			3
MATH 161	Calculus for Physical Scientists II (GT-MA1)	X		1B	4
Total Credits					15
Semester 4		Critical	Recommended	AUCC	Credits
GEOL 312	Earth's Surface	X			2
GEOL 313	Earth Systems	X			2
GEOL 314	Earth's Surface Laboratory	X			1

PH 141	Physics for Scientists and Engineers I (GT-SC1)	X		3A	5
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
CHEM 113 must be completed by the end of Semester 4.		X			
Total Credits					13
Junior					
Semester 5		Critical	Recommended	AUCC	Credits
GEOL 344	Stratigraphy and Sedimentology	X			3
MATH 261	Calculus for Physical Scientists III	X			4
SOCR 470	Soil Physics	X			3
Select one from the following:		X			3
CO 300	Writing Arguments (GT-CO3)			2	
CO 301B	Writing in the Disciplines: Sciences (GT-CO3)			2	
JTC 300	Strategic Writing and Communication (GT-CO3)			2	
GEOL 344 must be completed by the end of Semester 5.		X			
Total Credits					13
Semester 6		Critical	Recommended	AUCC	Credits
GEOL 372	Structural Geology	X		4B	4
GEOL 376	Geologic Field Methods	X		4A,4C	2
NR 319	Introduction to Geospatial Science	X			4
Select one course from the following:		X			3
STAT 301	Introduction to Applied Statistical Methods				
STAT 315	Intro to Theory and Practice of Statistics				
Total Credits					13
Summer		Critical	Recommended	AUCC	Credits
GEOL 476	Field Geoscience Capstone	X		4A,4C	4
Total Credits					4
Senior					
Semester 8		Critical	Recommended	AUCC	Credits
GEOL 452	Hydrogeology	X			4
MATH 340	Intro to Ordinary Differential Equations	X			4
WR 416	Land Use Hydrology	X			3
Select one course from the following:		X			3-4
GEOL 340	Glacial Geology				
GEOL 366	Low-Temperature Geochemistry				
GEOL 415	Critical Zone Science				
GEOL 442	Applied Geophysics				
GEOL 446	Environmental Geology				
GEOL 450	Reservoir Geosciences Fluid Storage Flow				
GEOL 454	Geomorphology				
Total Credits					14-15
Semester 9		Critical	Recommended	AUCC	Credits
Directed Technical Electives (see list on Concentration Requirements tab)		X			9
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		X		3B	3
Electives		X			5-6
The benchmark courses for the 9th semester are the remaining courses in the entire program of study.		X			
Total Credits					17-18
Program Total Credits:					120