

MAJOR IN GEOSCIENCES, GEOPHYSICS CONCENTRATION

The Geophysics concentration within the Geosciences major provides students with the applied skills needed to explore Earth's interior, and the theoretical knowledge needed to understand the process that shape the planets' chemical and mechanical structures and behaviors. The concentration combines a strong foundation in geology with additional depth in geophysics, physics, mathematics, and associated computer skills.

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. Demonstrate knowledge of Earth's physical and chemical structure and how that has evolved through Earth's four and a half billion year history.
8. Demonstrate understanding of the physical and chemical processes that shape and govern evolution and behavior of Earth's interior.
9. Demonstrate knowledge of the tools used to probe Earth's interior for knowledge of its' composition and physical state. Describe how these tools are useful for understanding earth structure on all scales, and how these are used in an academic environment, governmental labs, and private businesses.
10. Differentiate between what is known vs. what is hypothesized regarding Earth's interior composition and behavior, and understand what methods and data are used to test and refine our modern hypotheses.

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
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioral-sciences)		3C	3
Elective			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 151	Mathematical Algorithms in Matlab I		1
MATH 161	Calculus for Physical Scientists II (GT-MA1)	1B	4
MATH 261	Calculus for Physical Scientists III		4

PH 141	Physics for Scientists and Engineers I (GT-SC1)	3A	5
Total Credits			30
Junior			
GEOL 344	Stratigraphy and Sedimentology	4A	3
GEOL 372	Structural Geology	4B	4
GEOL 376	Geologic Field Methods	4A,4C	2
MATH 340	Intro to Ordinary Differential Equations		4
PH 142	Physics for Scientists and Engineers II (GT-SC1)	3A	5
Select one course 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	
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			3
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			3
Total Credits			27
Summer			
GEOL 476	Field Geoscience Capstone	4A,4C	4
Total Credits			4
Senior			
Select one course from the following			4
GEOL 440	Geodetic and Near-Surface Geophysical Methods		
GEOL 442	Applied Geophysics		
GEOL 3XX - 5XX ²			6
Directed Technical Electives (see list below)			6
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			3
Electives ³			10
Total Credits			29
Program Total Credits:			120

Directed Technical Electives List

Code	Title	Credits			
GEOL 440	Geodetic and Near-Surface Geophysical Methods ⁴	4	MATH 530	Mathematics for Scientists and Engineers	3
GEOL 442	Applied Geophysics ⁴	4	PH 245	Introduction to Electronics	3
GEOL 452	Hydrogeology	4	PH 314	Introduction to Modern Physics	4
GEOL 476	Field Geoscience Capstone ⁵	1-6	PH 341	Mechanics	4
GEOL 541	Geostatistics	2	PH 351	Electricity and Magnetism	4
GEOL 570	Plate Tectonics	3	PH 353	Optics and Waves	4
GEOL 574	Geodynamics	3	PH 361	Physical Thermodynamics	3
GEOL 578	Global Seismology	4	STAT 301	Introduction to Applied Statistical Methods	3
GEOL 579	Solid Earth Inverse Methods and Practices	3	STAT 315	Intro to Theory and Practice of Statistics	3
MATH 317	Advanced Calculus of One Variable	3			
MATH 332	Partial Differential Equations	3			
MATH 369	Linear Algebra I	3			
MATH 417	Advanced Calculus I	3			
MATH 419	Introduction to Complex Variables	3			
MATH 450	Introduction to Numerical Analysis I	3			
MATH 469	Linear Algebra II	3			

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

² Select 6 credits in 300- to 500-level GEOL courses not taken elsewhere, excluding GEOL 384, GEOL 401, GEOL 492, GEOL 494A-I.

³ Select enough elective credits to bring the program total to a minimum of 120 credits, of which at least 42 must be upper-division (300- to 400-level).

⁴ GEOL 440 or GEOL 442 may be taken as a Technical Elective if not taken to satisfy other requirements in the program.

⁵ Additional credits of GEOL 476 may be taken as elective credits in addition to the four credits required to satisfy major requirements.

Major Completion Map

Freshman

Semester 1		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
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
Social and Behavioral Sciences (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#social-behavioural-sciences)			X	3C	3
Total Credits					16

Semester 2		Critical	Recommended	AUCC	Credits
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
Elective			X		3
CO 150 and 1B must be completed by the end of Semester 2.		X			
Total Credits					14

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
MATH 151	Mathematical Algorithms in Matlab I	X			1
MATH 261	Calculus for Physical Scientists III	X			4
PH 141	Physics for Scientists and Engineers I (GT-SC1)	X		3A	5
CHEM 113 must be completed by the end of Semester 4.		X			
Total Credits					15

Junior

Semester 5		Critical	Recommended	AUCC	Credits
GEOL 344	Stratigraphy and Sedimentology	X		4A	3
PH 142	Physics for Scientists and Engineers II (GT-SC1)	X		3A	5
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)			X	3B	3
Historical Perspectives (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#historical-perspectives)			X	3D	3
MATH 261 must be completed by the end of Semester 5.		X			
Total Credits					14

Semester 6		Critical	Recommended	AUCC	Credits
GEOL 372	Structural Geology	X		4B	4
GEOL 376	Geologic Field Methods	X		4A,4C	2

MATH 340	Intro to Ordinary Differential Equations	X			4
Select one course 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	
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
Select one course from the following		X			4
GEOL 440	Geodetic and Near-Surface Geophysical Methods				
GEOL 442	Applied Geophysics				
Directed Technical Electives (See list on Concentration Requirements tab)		X			6
Electives			X		5
Total Credits					15
Semester 9		Critical	Recommended	AUCC	Credits
GEOL 3XX - 5XX		X			6
Arts and Humanities (https://catalog.colostate.edu/general-catalog/all-university-core-curriculum/aucc/#arts-humanities)		X		3B	3
Electives					5
The benchmark courses for the 9th semester are the remaining courses in the entire program of study.		X			
Total Credits					14
Program Total Credits:					120