Earth Sciences (BA/BS)

Students in the Department of Earth Sciences learn about the minerals, rocks, soils, and waters that make up the earth, and the processes that shape the earth from deep in its interior to the atmosphere. Earth science applies the basic sciences of physics, biology, chemistry, and mathematics to understanding processes that have shaped the earth and other planetary bodies. Earth scientists combine field investigations with laboratory experiments and theoretical studies to understand the physical, chemical and biological processes that govern the behavior and interactions of complex earth systems.

Earth science applications include natural hazards such as earthquakes, floods, landslides and volcanic eruptions that affect humans. Other subdisciplines investigate how humans alter the earth's environments, where we pollute rivers and ground water, cause rapid erosion, attempt to re-engineer rivers and shorelines, and alter the earth's atmosphere, oceans, and global climate. Earth science research also includes the study of the deep earth to understand processes that drive the motions of tectonic plates and generate the earth's magnetic field.

Environmental Geoscience Track

Program Learning Outcomes

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

- Demonstrate proficiency with modern quantitative tools that are used in the Earth sciences.
- When confronted with real-world Earth science problems, develop and test hypotheses in a systematic way while stating caveats and assumptions.
- Recognize, describe, and quantify dynamic processes that operate on the Earths surface environments, as well as the interaction of humans with these environments. \

Geology Track

Program Learning Outcomes

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

- Demonstrate proficiency with modern quantitative tools that are used in the Earth sciences.
- When confronted with real-world Earth science problems, develop and test hypotheses in a systematic way while stating caveats and assumptions.
- Use techniques from modern earth science disciplines to solve complex problems across a diversity of scales through time and space that require consistent geological reasoning.

Geophysics Track

Program Learning Outcomes

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

- Demonstrate proficiency with modern quantitative tools that are used in the Earth Sciences.
- When confronted with real-world Earth science problems, develop and test hypotheses in a systematic way while stating caveats and assumptions.
- Develop a foundation in mathematics and physics that enables them to quantitatively describe key aspects of fundamental Earth processes.

Paleontology Track

Program Learning Outcomes

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

- Demonstrate proficiency with modern quantitative tools that are used in the Earth sciences.
- When confronted with real-world Earth science problems, develop and test hypotheses in a systematic way while stating caveats and assumptions.
- Demonstrate proficiency with the tools and techniques necessary to recognize geological evidence and reconstruct geological history for biological processes that have driven the evolution of life, as preserved in fossils extracted from ancient rocks.

Earth Sciences Major - Geology Track

Code	Title	Credits
Core Courses		
ERTH 101 & ERTH 102 & ERTH 103	Exploring Planet Earth and Exploring Earth's Environment and Exploring Earth History [1]	12
or ERTH 201 & ERTH 202 & ERTH 203	Dynamic Planet Earth and Earth's Surface and Environment and History of Life	
PHYS 201–202	General Physics	8
or PHYS 251 & PHYS 252	Foundations of Physics I and Foundations of Physics I	
CH 221–222	General Chemistry	8
or CH 224H–225H	Honors General Chemistry	
MATH 251–252	Calculus I-II	8
ERTH 315	Earth Physics	4
ERTH 316	Introduction to Hydrogeology	4
ERTH 318	Introduction to Field Methods	3
ERTH 418	Earth and Environmental Data Analysis	4
or MATH 253	Calculus III	
or MATH 343	Statistical Models and Methods	
or MATH 425	Statistical Methods I	
ERTH 363	Computational Tools for Earth Sciences	4
or CS 122	Introduction to Programming and Problem Solving	
Additional Requirements		
ERTH 331	Mineralogy	5
ERTH 332	Introduction to Petrology	5
ERTH 334	Sedimentology and Stratigraphy	4

ERTH 350 & ERTH 351 & ERTH 352	Structural Geology and Structural Geology Problems and Structural Geology Laboratory and Field	5
Field Studies:		**12**
ERTH 406	Field Studies: [Topic]	
Electives		
See Electives table for choices		20
Total Credits		**106**

[1] The 200-level sequence is recommended for majors; however, the 100-level sequence may be substituted if the courses are passed with grades of mid-B or better.

Electives

Code	Title	Credits
Biology		
Courses numbered 306 or higher		
Chemistry		
CH 223	General Chemistry III	4
CH 226H	Advanced General Chemistry III	4
CH 227–229	General Chemistry Laboratory	6
or CH 237–239	Advanced General Chemistry Laboratory	
CH 331	Organic Chemistry I	4
CH 335	Organic Chemistry II	4
CH 336	Organic Chemistry III	4
CH 411–413	Physical Chemistry	12
CH 431–433	Inorganic Chemistry	12
CH 445	Statistical Mechanics	4
Computer Science		
CS 210–212	Computer Science I-III	12
CS 315	Intermediate Algorithms	4
Geography		
GEOG 321	Climatology	4
GEOG 322	Geomorphology	4
GEOG 323	Biogeography	4
GEOG 360	Watershed Science and Policy	4
GEOG 361	Global Environmental Change	4
GEOG 421		4
GEOG 425	Hydrology and Water Resources	4
GEOG 427	Fluvial Geomorphology	4
GEOG 430	Long-Term Environmental Change	4
GEOG 481–482	GIScience I-II	8
GEOG 485–486	Remote Sensing I-II	8
GEOG 491	Advanced Geographic Information Systems	4
GEOG 495	Geographic Data Analysis	4
Earth Sciences		
Select from GEOL 304–310		4
ERTH 353	Geologic Hazards	4
ERTH 363	Computational Tools for Earth Sciences	4
ERTH 401	Research: [Topic]	1-21
ERTH 403	Thesis	1-6
ERTH 410	Experimental Course: [Topic]	1-5
ERTH 407	Seminar: [Topic]	1-5
Courses higher than 410		
Mathematics		
MATH 256	Introduction to Differential Equations	4
MATH 281–282	Several-Variable Calculus I-II	8
MATH 341–342	Elementary Linear Algebra	8
MATH 411–412	Functions of a Complex Variable I-II	8
MATH 421–422	Partial Differential Equations: Fourier Analysis I-II	8
MATH 425–426	Statistical Methods I-II	8
Physics		
PHYS 203	General Physics	4
or PHYS 253	Foundations of Physics I	
PHYS 204–206	Introductory Physics Laboratory	6
PHYS 290	Foundations of Physics Laboratory	1
PHYS 351–353	Foundations of Physics II	12
PHYS 411–413	Mechanics, Electricity, and Magnetism	12

Earth Sciences Major - Geophysics Track

Code	Title	Credits
ERTH 315	Earth Physics	4
ERTH 363	Computational Tools for Earth Sciences	4
or CS 122	Introduction to Programming and Problem Solving	
PHYS 251–253	Foundations of Physics I	12
MATH 251–253	Calculus I-III	12
CH 221–222	General Chemistry	8
or CH 224H–225H	Honors General Chemistry	
ERTH 455	Mechanical Earth	4
Additional Requirements		
Select two of the following:		7-8
ERTH 441	Hillslope Geomorphology	
ERTH 451	Hydrogeology	
ERTH 452	Neotectonics and Quaternary Geology	
ERTH 453	Tectonics	
ERTH 454	Fluid Dynamics	
ERTH 462	Environmental Geomechanics	
ERTH 463	Computational Earth Science	
ERTH 466	Geodynamics	
ERTH 467	Fault Mechanics	
ERTH 468	Introduction to Seismology	
MATH 256	Introduction to Differential Equations	4
MATH 281–282 & MATH 256	Several-Variable Calculus I-II and Introduction to Differential Equations	12
PHYS 351–353	Foundations of Physics II	12
or PHYS 411–413	Mechanics, Electricity, and Magnetism	
Electives		
See Electives table for choices		28
Total Credits:		**104**

Electives

Code	Title	Credits
Chemistry		
CH 223	General Chemistry III	4
CH 226H	Advanced General Chemistry III	4
CH 411	Physical Chemistry	4
Earth Sciences		
Select from GEOL 101–310		8
ERTH 311	Earth Materials	5
ERTH 316	Introduction to Hydrogeology	4
ERTH 318	Introduction to Field Methods	3
ERTH 334	Sedimentology and Stratigraphy	4
ERTH 350	Structural Geology	3
ERTH 351	Structural Geology Problems	1
ERTH 352	Structural Geology Laboratory and Field	1
ERTH 353	Geologic Hazards	4
ERTH 363	Computational Tools for Earth Sciences	4
ERTH 401	Research: [Topic]	1-21
ERTH 403	Thesis	1-6
ERTH 407	Seminar: [Topic]	1-5
Courses numbered 408 or higher		
Mathematics		
MATH 341–342	Elementary Linear Algebra	8
or MATH 421–422	Partial Differential Equations: Fourier Analysis I-II	

Earth Sciences Major - Environmental Geoscience Track

Code	Title	Credits
Core Requirements (60 or 65 credits)		
ERTH 101 & ERTH 102 & ERTH 103	Exploring Planet Earth and Exploring Earth's Environment and Exploring Earth History [1]	12
or ERTH 201 & ERTH 202 & ERTH 203	Dynamic Planet Earth and Earth's Surface and Environment and History of Life	
ERTH 311	Earth Materials	5
or ERTH 331 & ERTH 332	Mineralogy and Introduction to Petrology	
ERTH 315	Earth Physics	4
ERTH 316	Introduction to Hydrogeology	4
ERTH 318	Introduction to Field Methods	3
ERTH 363	Computational Tools for Earth Sciences	4
or CS 122	Introduction to Programming and Problem Solving	
PHYS 201 & PHYS 202	General Physics and General Physics	8
or PHYS 251 & PHYS 252	Foundations of Physics I and Foundations of Physics I	
CH 221–222	General Chemistry	8
or CH 224H & CH 225H	Advanced General Chemistry I and Advanced General Chemistry II	
MATH 251–252	Calculus I-II	8
or MATH 246 & MATH 247	Calculus for the Biological Sciences I and Calculus for the Biological Sciences II	
ERTH 418	Earth and Environmental Data Analysis	4
or MATH 253	Calculus III	
or MATH 343	Statistical Models and Methods	
or MATH 425	Statistical Methods I	
Electives		
See Electives table for choices		44
Total Credits		**104**

[1] The 200-level sequence is recommended for majors; however, the 100-level sequence may be substituted if the courses are passed with grades of mid-B or better.

Electives

Code	Title	Credits
Group A		**24**
ERTH 310	Earth Resources and the Environment	4
ERTH 334	Sedimentology and Stratigraphy	4
ERTH 353	Geologic Hazards	4
ERTH 410	Experimental Course: [Topic] (Physical Oceanography)	1-5
ERTH 410	Experimental Course: [Topic] (Soil and Environmental Chemistry)	1-5
ERTH 438	Geobiology	4
ERTH 441	Hillslope Geomorphology	4
ERTH 451	Hydrogeology	4
ERTH 455	Mechanical Earth	4
ERTH 462	Environmental Geomechanics	4
ENVS 477	Soil Science	4
Group B		**20**
Group A elective courses beyond 24 credits		
Earth Sciences		
ERTH 301 to ERTH 309 (up to 4 credits)		4
ERTH 350	Structural Geology	3
ERTH 351	Structural Geology Problems	1
ERTH 352	Structural Geology Laboratory and Field	1
ERTH 401	Research: [Topic]	1-21
ERTH 403	Thesis	1-6
ERTH 406	Field Studies: [Topic]	1-6
ERTH 407	Seminar: [Topic]	1-5
ERTH 410 and above if not taken as a Group A elective		4
Biology		
BI 212	General Biology II: Organisms	5
BI 213	General Biology III: Ecology and Evolution	5
BI 214	General Biology IV: Biochemistry and Genetics	5
Chemistry		
CH 223	General Chemistry III	4
CH 227	General Chemistry Laboratory	2
CH 228	General Chemistry Laboratory	2
CH 229	General Chemistry Laboratory	2
CH 237	Advanced General Chemistry Laboratory	2

CH 238	Advanced General Chemistry Laboratory	2
CH 239	Advanced General Chemistry Laboratory	2
CH 331	Organic Chemistry I	4
Any Chemistry course from 331 to 499		
Computer Science		
CS 210	Computer Science I	4
CS 211	Computer Science II	4
CS 212	Computer Science III	4
Environmental Science		
ENVS 350	Ecological Footprint of Energy Generation	4
ENVS 465	Wetland Ecology and Management	4
Geography		
GEOG 321	Climatology	4
GEOG 322	Geomorphology	4
GEOG 323	Biogeography	4
GEOG 360	Watershed Science and Policy	4
GEOG 361	Global Environmental Change	4
GEOG 421		4
GEOG 425	Hydrology and Water Resources	4
GEOG 427	Fluvial Geomorphology	4
GEOG 430	Long-Term Environmental Change	4
GEOG 433	Fire and Natural Disturbances	4
GEOG 481	GIScience I	4
GEOG 482	GIScience II	4
GEOG 485	Remote Sensing I	4
GEOG 486	Remote Sensing II	4
GEOG 490	GIScience: [Topic]	4
GEOG 491	Advanced Geographic Information Systems	4
GEOG 494	Spatial Analysis	4
GEOG 495	Geographic Data Analysis	4
Mathematics		
MATH 256	Introduction to Differential Equations	4
MATH 282	Several-Variable Calculus II	4
MATH 341	Elementary Linear Algebra	4
MATH 342	Elementary Linear Algebra	4
MATH 411	Functions of a Complex Variable I	4
MATH 412	Functions of a Complex Variable II	4
MATH 422	Partial Differential Equations: Fourier Analysis II	4

Earth Sciences - Paleontology Track

Code	Title	Credits
ERTH 101 & ERTH 102 & ERTH 103	Exploring Planet Earth and Exploring Earth's Environment and Exploring Earth History [1]	12
or ERTH 201 & ERTH 202 & ERTH 203	Dynamic Planet Earth and Earth's Surface and Environment and History of Life	
ERTH 311	Earth Materials	5
or ERTH 331	Mineralogy	
or ERTH 332	Introduction to Petrology	
ERTH 315	Earth Physics	4
or ERTH 316	Introduction to Hydrogeology	
ERTH 318	Introduction to Field Methods	3
ERTH 363	Computational Tools for Earth Sciences	4
or CS 122	Introduction to Programming and Problem Solving	
ERTH 418	Earth and Environmental Data Analysis	4
or MATH 253	Calculus III	
or MATH 343	Statistical Models and Methods	
or MATH 425	Statistical Methods I	
BI 211	General Biology I: Cells	5
BI 212	General Biology II: Organisms	5
or BI 213	General Biology III: Ecology and Evolution	
CH 221–222	General Chemistry	8
or CH 224H & CH 225H	Advanced General Chemistry I and Advanced General Chemistry II	
MATH 246–247	Calculus for the Biological Sciences I-II	8
or MATH 251–252	Calculus I-II	
PHYS 201	General Physics	4
or PHYS 251	Foundations of Physics I	
Additional Requirements		
ERTH 334	Sedimentology and Stratigraphy	4
ERTH 350 & ERTH 351 & ERTH 352	Structural Geology and Structural Geology Problems and Structural Geology Laboratory and Field	5
Field Studies:		**12**
ERTH 406	Field Studies: [Topic]	
Select two of the following:		8
ERTH 433	Paleobotany	
ERTH 434	Vertebrate Paleontology	
ERTH 435	Paleopedology	
Electives		
See Electives table for choices		16
Total Credits		**107**

[1] The 200-level sequence is recommended for majors; however, the 100-level sequence may be substituted if the courses are passed with grades of mid-B or better.

Electives

Code	Title	Credits
Anthropology		
ANTH 361	Human Evolution	4
ANTH 366	Human Osteology Laboratory	4
ANTH 462	Primate Evolution	4
ANTH 467	Paleoecology and Human Evolution	4
ANTH 471	Zooarchaeology: [Topic]	4
ANTH 479	Taphonomy: Bones, Bugs, and Burials	4
Biology		
Courses numbered 306 or higher		
Chemistry		
CH 227–229	General Chemistry Laboratory	6
or CH 237–239	Advanced General Chemistry Laboratory	

CH 223	General Chemistry III	4
CH 331	Organic Chemistry I	4
CH 335	Organic Chemistry II	4
CH 336	Organic Chemistry III	4
CH 411–413	Physical Chemistry	12
CH 431–433	Inorganic Chemistry	12
CH 445	Statistical Mechanics	4
Computer Science		
CS 210–212	Computer Science I-III	12
CS 315	Intermediate Algorithms	4
Geography		
GEOG 321	Climatology	4
GEOG 322	Geomorphology	4
GEOG 323	Biogeography	4
GEOG 360	Watershed Science and Policy	4
GEOG 361	Global Environmental Change	4
GEOG 421		4
GEOG 425	Hydrology and Water Resources	4
GEOG 427	Fluvial Geomorphology	4
GEOG 430	Long-Term Environmental Change	4
GEOG 481–482	GIScience I-II	8
GEOG 495	Geographic Data Analysis	4
Earth Sciences		
One from ERTH 304 - ERTH 310		4
ERTH 315	Earth Physics	4
ERTH 316	Introduction to Hydrogeology	4
ERTH 353	Geologic Hazards	4
ERTH 401	Research: [Topic]	1-21
ERTH 403	Thesis	1-6
ERTH 407	Seminar: [Topic]	1-5
ERTH 410	Experimental Course: [Topic]	1-5
Courses higher than 410		
Mathematics		
MATH 256	Introduction to Differential Equations	4
MATH 281–282	Several-Variable Calculus I-II	8
MATH 341–342	Elementary Linear Algebra	8
MATH 411–412	Functions of a Complex Variable I-II	8
MATH 425–426	Statistical Methods I-II	8
Physics		
PHYS 202	General Physics	4
PHYS 203	General Physics	4
PHYS 204	Introductory Physics Laboratory	2
PHYS 205	Introductory Physics Laboratory	2
PHYS 206	Introductory Physics Laboratory	2
PHYS 253	Foundations of Physics I	4
PHYS 290	Foundations of Physics Laboratory	1
PHYS 351–353	Foundations of Physics II	12
PHYS 411–413	Mechanics, Electricity, and Magnetism	12

Undergraduate Research

As many as 4 credits of research can be counted toward electives in any of the tracks. To receive such credit, students must

- submit a short letter, approved by the faculty research advisor and addressed to the head undergraduate advisor in earth sciences, stating the nature of the research and asserting that there is faculty supervision
- submit a final written report to the faculty advisor describing the results of the research

Students may earn credit in this category by registering for any of the following:

Code	Title	Credits
ERTH 401	Research: [Topic]	1-21
ERTH 406	Field Studies: [Topic]	1-6
ERTH 408	Laboratory Projects: [Topic]	1-6

Students who complete an honors thesis may not apply this option toward elective credits.

Grade Options and Standards

Undergraduate majors must take for letter grades (the pass/no pass option is not acceptable) all the courses required in their degree program. Required courses must be completed with grades of C– or better. Exceptions for honors students are noted under Honors in Earth Sciences.

Honors in Earth Sciences

Application for graduation with honors in earth sciences must be made no later than spring term of the student's junior year. To be eligible for graduation with honors, a student must

- maintain a grade point average (GPA) of 3.50 or better in geological sciences courses or a 3.00 or better in all science courses
- submit and orally present an acceptable honors thesis written under the supervision of a department faculty member and evaluated by a committee consisting of three faculty members including the supervisor. The thesis should be presented no later than three weeks before final examinations during the term the student plans to graduate

Honors students may register for 3 credits of Research: [Topic] (ERTH 401) the term before they intend to graduate, and 3 credits of Thesis (ERTH 403) the term of graduation. These credits may be applied toward electives.

Four-Year Degree Plan

The degree plan shown is only a sample of how students may complete their degrees in four years. There are alternative ways. Students should consult their advisor to determine the best path for them.

- **Geology Track**
- **Geophysics Track**
- **Environmental Geoscience Track**
- **Paleontology Track**

Bachelor of Science in Earth Sciences: Geology Track

Course	Title	Credits	Milestones
First Year			
Fall			
MATH 111Z	Precalculus I: Functions	4	
WR 121Z	Composition I	4	
CH 221 or CH 224H	General Chemistry I or Advanced General Chemistry I	4	
ERTH 101 or ERTH 201	Exploring Planet Earth or Dynamic Planet Earth	4	
	Credits	**16**	
Winter			
ERTH 102 or ERTH 202	Exploring Earth's Environment or Earth's Surface and Environment	4	
MATH 112Z	Precalculus II: Trigonometry	4	
CH 222 or CH 225H	General Chemistry II or Advanced General Chemistry II	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
Spring			
ERTH 103 or ERTH 203	Exploring Earth History or History of Life	4	
WR 122Z or WR 123	Composition II or College Composition III	4	
MATH 246 or MATH 251	Calculus for the Biological Sciences I or Calculus I	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Second Year			
Fall			
PHYS 201 or PHYS 251	General Physics or Foundations of Physics I	4	
MATH 247 or MATH 252	Calculus for the Biological Sciences II or Calculus II	4	
ERTH 331	Mineralogy	5	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**17**	
Winter			
PHYS 202 or PHYS 252	General Physics or Foundations of Physics I	4	
ERTH 315	Earth Physics	4	
ERTH 332	Introduction to Petrology	5	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**17**	
Spring			
PHYS 203 or PHYS 253 or CH 223 or CH 226H	General Physics or Foundations of Physics I or General Chemistry III or Advanced General Chemistry III	4	
ERTH 318	Introduction to Field Methods	3	
ERTH 316	Introduction to Hydrogeology	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**15**	
	Total Credits	**49**	

Course	Title	Credits	Milestones
Third Year			
Fall			
ERTH 418 or MATH 253 or MATH 343 or MATH 425 or PHYS 481	Earth and Environmental Data Analysis or Calculus III or Statistical Models and Methods or Statistical Methods I or Design of Experiments	4	
General-education, multicultural, or other group-satisfying courses		8	
Geology elective		4	
	Credits	**16**	
Winter			
General-education, multicultural, or other group-satisfying courses		8	
Geology elective		4	
	Credits	**12**	
Spring			
ERTH 334	Sedimentology and Stratigraphy	4	
ERTH 350	Structural Geology	3	
ERTH 351	Structural Geology Problems	1	
ERTH 352	Structural Geology Laboratory and Field	1	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**13**	

Summer		
ERTH 406	Field Studies: [Topic] (12 Credits)	1-6
	Credits	**1-6**
	Total Credits	**42-47**

Course	Title	Credits	Milestones
Fourth Year			
Fall			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		4	
	Credits	**12**	
Winter			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		4	
	Credits	**12**	
Spring			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		4	
	Credits	**12**	
	Total Credits	**36**	

Bachelor of Science in Earth Sciences: Geophysics Track

Course	Title	Credits	Milestones
First Year			
Fall			
ERTH 101 or ERTH 102	Exploring Planet Earth or Exploring Earth's Environment	4	
MATH 111Z	Precalculus I: Functions	4	
WR 121Z	Composition I	4	
CH 221 or CH 224H	General Chemistry I or Advanced General Chemistry I	4	
	Credits	**16**	
Winter			
ERTH 102 or ERTH 202	Exploring Earth's Environment or Earth's Surface and Environment	4	
MATH 112Z	Precalculus II: Trigonometry	4	
CH 222 or CH 225H	General Chemistry II or Advanced General Chemistry II	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
Spring			
WR 122Z or WR 123	Composition II or College Composition III	4	
MATH 246 or MATH 251	Calculus for the Biological Sciences I or Calculus I	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**12**	
	Total Credits	**44**	

Course	Title	Credits	Milestones
Second Year			
Fall			
PHYS 251	Foundations of Physics I	4	
MATH 252	Calculus II	4	
ERTH 318	Introduction to Field Methods	3	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**15**	
Winter			
PHYS 252	Foundations of Physics I	4	
MATH 253	Calculus III	4	
ERTH 315	Earth Physics	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
Spring			
PHYS 253	Foundations of Physics I	4	
ERTH 311	Earth Materials	5	
ERTH 316	Introduction to Hydrogeology	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**17**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Third Year			
Fall			
MATH 256	Introduction to Differential Equations	4	
PHYS 351	Foundations of Physics II	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**12**	
Winter			
MATH 281	Several-Variable Calculus I	4	
PHYS 352	Foundations of Physics II	4	
ERTH 455	Mechanical Earth	4	
	Credits	**12**	
Spring			
MATH 282	Several-Variable Calculus II	4	
PHYS 353	Foundations of Physics II	4	
Geology or other science elective		4	
	Credits	**12**	
	Total Credits	**36**	

Course	Title	Credits	Milestones
Fourth Year			
Fall			
General-education, multicultural, or other group-satisfying courses		4	
Geology or other science elective		8	
	Credits	**12**	
Winter			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		4	
	Credits	**12**	
Spring			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		4	
	Credits	**12**	
	Total Credits	**36**	

Bachelor of Science in Earth Sciences: Environmental Geoscience Track

Course	Title	Credits	Milestones
First Year			
Fall			
ERTH 101 or ERTH 102	Exploring Planet Earth or Exploring Earth's Environment	4	
MATH 111Z	Precalculus I: Functions	4	
WR 121Z	Composition I	4	
CH 221 or CH 224H	General Chemistry I or Advanced General Chemistry I	4	
	Credits	**16**	
Winter			
ERTH 102 or ERTH 202	Exploring Earth's Environment or Earth's Surface and Environment	4	
MATH 112Z	Precalculus II: Trigonometry	4	
CH 222 or CH 225H	General Chemistry II or Advanced General Chemistry II	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
Spring			
ERTH 103 or ERTH 203	Exploring Earth History or History of Life	4	
WR 122Z or WR 123	Composition II or College Composition III	4	
MATH 246 or MATH 251	Calculus for the Biological Sciences I or Calculus I	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Second Year			
Fall			
PHYS 201 or PHYS 251	General Physics or Foundations of Physics I	4	
MATH 247 or MATH 252	Calculus for the Biological Sciences II or Calculus II	4	
ERTH 311	Earth Materials	5	
Geology elective		4	
	Credits	**17**	
Winter			
PHYS 202 or BI 211	General Physics or General Biology I: Cells	4	
ERTH 315	Earth Physics	4	
ERTH 332	Introduction to Petrology	5	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**17**	
Spring			
PHYS 203 or PHYS 253 or BI 212 or BI 213 or CH 223 or CH 226H	General Physics or Foundations of Physics I or General Biology II: Organisms or General Biology III: Ecology and Evolution or General Chemistry III or Advanced General Chemistry III	4	
ERTH 311	Earth Materials	5	
ERTH 316	Introduction to Hydrogeology	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**17**	
	Total Credits	**51**	

Course	Title	Credits	Milestones
Third Year			
Fall			
ERTH 310	Earth Resources and the Environment	4	
ERTH 318	Introduction to Field Methods	3	
General-education, multicultural, or other group-satisfying courses		8	
	Credits	**15**	
Winter			
ERTH 353	Geologic Hazards	4	
ERTH 451	Hydrogeology	4	
ERTH 418	Earth and Environmental Data Analysis	4	

General-education, multicultural, or other group-satisfying course		4
	Credits	**16**
Spring		
ERTH 334	Sedimentology and Stratigraphy	4
GEOG 323	Biogeography	4
General-education, multicultural, or other group-satisfying course		4
Geology elective		4
	Credits	**16**
	Total Credits	**47**

Course	Title	Credits	Milestones
Fourth Year			
Fall			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		8	
	Credits	**16**	
Winter			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		8	
	Credits	**16**	
Spring			
General-education, multicultural, or other group-satisfying courses		12	
Geology or other science elective		4	
	Credits	**16**	
	Total Credits	**48**	

Bachelor of Science in Earth Sciences: Paleontology Track

Course	Title	Credits	Milestones
First Year			
Fall			
ERTH 101 or ERTH 201	Exploring Planet Earth or Dynamic Planet Earth	4	
MATH 111Z	Precalculus I: Functions	4	
WR 121Z	Composition I	4	
CH 221 or CH 224H	General Chemistry I or Advanced General Chemistry I	4	
	Credits	**16**	
Winter			
ERTH 102 or ERTH 202	Exploring Earth's Environment or Earth's Surface and Environment	4	
MATH 112Z	Precalculus II: Trigonometry	4	
CH 222 or CH 225H	General Chemistry II or Advanced General Chemistry II	4	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**16**	
Spring			
ERTH 103 or ERTH 203	Exploring Earth History or History of Life	4	
WR 122Z or WR 123	Composition II or College Composition III	4	
CH 223 or CH 226H	General Chemistry III or Advanced General Chemistry III	4	
MATH 251	Calculus I	4	
	Credits	**16**	
	Total Credits	**48**	

Course	Title	Credits	Milestones
Second Year			
Fall			
PHYS 201 or PHYS 251	General Physics or Foundations of Physics I	4	
BI 211	General Biology I: Cells	5	
MATH 252	Calculus II	4	
ERTH 331	Mineralogy	5	
	Credits	**18**	
Winter			
PHYS 202	General Physics	4	
ERTH 315	Earth Physics	4	
ERTH 332	Introduction to Petrology	5	
General-education, multicultural, or other group-satisfying course		4	
	Credits	**17**	
Spring			
PHYS 203	General Physics	4	
ERTH 318	Introduction to Field Methods	3	
General-education, multicultural, or other group-satisfying course		8	
	Credits	**15**	
	Total Credits	**50**	

Course	Title	Credits	Milestones
Third Year			
Fall			
Choose one from the following:		4	
ERTH 433	Paleobotany	4	
ERTH 434	Vertebrate Paleontology	4	
ERTH 435	Paleopedology	4	
General-education, multicultural, or other group-satisfying courses		4	
Geology or other science elective		4	

These courses are typically offered in alternate years, so enrollment is necessary in the third or fourth year according to availability.

Contact advisor or department office for scheduling of these courses.		
	Credits	**24**
Winter		
Choose one from the following:		4
ERTH 433	Paleobotany	4
ERTH 434	Vertebrate Paleontology	4
ERTH 435	Paleopedology	4
General-education, multicultural, or other group-satisfying courses		4
Geology or other science course		4
These courses are typically offered in alternate years, so enrollment is necessary in the third or fourth year according to availability.		
Contact advisor or department office for scheduling of these courses.		
	Credits	**24**
Spring		
ERTH 334	Sedimentology and Stratigraphy	4
ERTH 350	Structural Geology	3
ERTH 351	Structural Geology Problems	1
ERTH 352	Structural Geology Laboratory and Field	1
General-education, multicultural, or other group-satisfying course		4
	Credits	**13**
Summer		
ERTH 406	Field Studies: [Topic] (12 credits)	1-6
	Credits	**1-6**
	Total Credits	**62-67**

Course	**Title**	**Credits**	**Milestones**
Fourth Year			
Fall			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		8	
	Credits	**16**	
Winter			
General-education, multicultural, or other group-satisfying courses		8	
Geology or other science elective		8	
	Credits	**16**	
Spring			
General-education, multicultural, or other group-satisfying courses		12	
Geology or other science elective		4	
	Credits	**16**	
	Total Credits	**48**	