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.
- Geology (p. 1)
- Geophysics (p. 2)
- Environmental Geoscience (p. 3)
- Paleontology (p. 4)

Earth Sciences Major - Geology Track

Code	Title	Credits
Core Courses		
ERTH 101 & ERTH 102 & ERTH 103 or ERTH 201 & ERTH 202 & ERTH 203	Exploring Planet Earth and Exploring Earth's Environment and Exploring Earth History ¹ Dynamic Planet Earth and Earth's Surface and Environment and History of Life	12
PHYS 201–202 or PHYS 251	General Physics Foundations of Physics I	8
& PHYS 252	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 Solv	ing
Additional Requi	irements	
ERTH 331	Mineralogy	5
ERTH 332	Introduction to Petrology	5
ERTH 334	Sedimentology and Stratigraphy	4

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

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 number	ed 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 Scien	ce	
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	Advanced Climatology: [Topic]	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 ERTH	H 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 th	nan 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 C	redits
ERTH 315	Earth Physics	4
ERTH 363	Computational Tools for Earth Sciences	4
or CS 122	Introduction to Programming and Problem Solvin	g
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 Requ	irements	
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 tab	le 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 ERT	H 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 number	ed 408 or higher	
Mathematics		
MATH 341-342	Elementary Linear Algebra	8
or MATH 421- 422	- Partial Differential Equations: Fourier Analysis	1-11

Earth Sciences Major - Environmental Geoscience Track

Core Requirements (60 or 65 credits)ERTH 101Exploring Planet Earth12& ERTH 102and Exploring Earth's Environment& ERTH 103and Exploring Earth History 1or ERTH 201Dynamic Planet Earth& ERTH 202and Earth's Surface and Environment
& ERTH 102 and Exploring Earth's Environment & ERTH 103 and Exploring Earth History ¹ or ERTH 201 Dynamic Planet Earth
& ERTH 203 and History of Life
ERTH 311 Earth Materials 5
or ERTH 331 Mineralogy & ERTH 332 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 201General Physics8& PHYS 202and General Physics8
or PHYS 251 Foundations of Physics I & PHYS 252 and Foundations of Physics I
CH 221–222 General Chemistry 8
or CH 224H Advanced General Chemistry I & CH 225H and Advanced General Chemistry II
MATH 251–252 Calculus I-II 8

Total Credits		104
See Electives table for choices		44
Electives		
or MATH 425	Statistical Methods I	
or MATH 343	Statistical Models and Methods	
or MATH 253	Calculus III	
ERTH 418	Earth and Environmental Data Analysis	4
	Calculus for the Biological Sciences I and Calculus for the Biological Sciences II	

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 ER	TH 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 a	bove 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

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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 or ERTH 331 or ERTH 332	Earth Materials Mineralogy Introduction to Petrology	5
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	Advanced General Chemistry I	
& CH 225H	and Advanced General Chemistry II	
MATH 246–247	Calculus for the Biological Sciences I-II	8
or MATH 251-	Calculus I-II	
252		
PHYS 201	General Physics	4
or PHYS 251	Foundations of Physics I	
Additional Requ		
ERTH 334	Sedimentology and Stratigraphy	4
ERTH 350	Structural Geology	5
& ERTH 351 & ERTH 352	and Structural Geology Problems	
a erin 352	and Structural Geology Laboratory and Field	
Field Studies:		12
ERTH 406	Field Studies: [Topic]	
Select two of the		8
ERTH 433	Paleobotany	
ERTH 434	Vertebrate Paleontology	
ERTH 435	Paleopedology	
ERTH 436	Paleoecology and Functional Morphology	
Electives		
See Electives tab	le 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	ed 306 or higher	
Chemistry		
CH 227–229	General Chemistry Laboratory	6

or CH 237–	Advanced General Chemistry Laboratory	
239		
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 Scien		
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 :		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 th	nan 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	Or a serie Diseries	
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 PHYS 290	Foundations of Physics I Foundations of Physics Laboratory	4

PHYS 351-353 Foundations of Physics II

PHYS 411-413 Mechanics, Electricity, and Magnetism

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

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- Geophysics Track
- Environmental Geoscience Track
- Paleontology Track

Bachelor of Science in Earth Sciences: Geology Track

Sachelor	of Science in Earth Scien	ces:	winter		
Geology	Track		PHYS 202	General Physics	4
Course	Title	Credits Milestones	or PHYS 252	or Foundations of Physics I	
irst Year			ERTH 315	Earth Physics	4
all			ERTH 332	Introduction to Petrology	5
/IATH 111Z	Precalculus I: Functions	4		ation, multicultural, or other group-	4
VR 121Z	Composition I	4	satisfying cou		-
CH 221	General Chemistry I	4		Credits	17
or CH 224H	or Advanced General Chemistry I		Spring PHYS 203	General Physics	4
RTH 101	Exploring Planet Earth	4	or	or Foundations of Physics I	4
or ERTH 201	or Dynamic Planet Earth		PHYS 253 or CH 223		
	Credits	16	01 011 220	of Advanced Ceneral Chemistry in	
Vinter			or		
RTH 102	Exploring Earth's Environment	4	CH 226H		
or	or Earth's Surface and Environment		ERTH 318	Introduction to Field Methods	3
ERTH 202			ERTH 316	Introduction to Hydrogeology	4
/IATH 112Z	Precalculus II: Trigonometry	4	General-educ	ation, multicultural, or other group-	4
CH 222	General Chemistry II	4	satisfying cou	rse	
or CH 225H	or Advanced General Chemistry II			Credits	15
	ation, multicultural, or other group-	4		Total Credits	49
atisfying could		-	Course	Title	Credits Milestor
	Credits	16	Third Year		
pring			Fall		
RTH 103 or ERTH 203	Exploring Earth History or History of Life	4	ERTH 418 or	Earth and Environmental Data Analysis or Calculus III	4
VR 122Z	Composition II	4	MATH 253	or Statistical Models and Methods or Statistical Methods I	
or WR 123	or College Composition III	7	or	or Design of Experiments	
/ATH 246 or MATH 251	Calculus for the Biological Sciences I or Calculus I	4	MATH 343 or		
	ation, multicultural, or other group-	4	MATH 425		
atisfying cou					
	Credits	16	or PHYS 481		
	Total Credits	48		ation, multicultural, or other group-	8
			satisfying cou		0
Course	Title	Credits Milestones	Geology elect		4
econd Year				Credits	16
all			Winter	eround	
PHYS 201	General Physics	4		ation, multicultural, or other group-	8
or	or Foundations of Physics I		satisfying cou		0
PHYS 251			Geology elect		4
IATH 247 or	Calculus for the Biological Sciences II or Calculus II	4		Credits	12
			Spring ERTH 334	Codimentalems and Otrationary bus	
MATH 252	M's such as	-		Soamoonology and Stratigraphy	4
RTH 331	Mineralogy	5		Sedimentology and Stratigraphy	
ERTH 331 General-educ	ation, multicultural, or other group-	5 4	ERTH 350	Structural Geology	3
ERTH 331	ation, multicultural, or other group-				

Winter

	ation, multicultural, or other group-	4	Spring		
satisfying cou			WR 122Z	Composition II	4
	Credits	13	or WR 123	5 1	
Summer			MATH 246	Calculus for the Biological Sciences I	4
ERTH 406	Field Studies: [Topic] (12 Credits)	1-6	or MATH 251	or Calculus I	
	Credits	1-6		ation, multicultural, or other group-	4
	Total Credits	42-47	satisfying cou		+
Course	Title	Credits Milestones		Credits	12
Fourth Year Fall				Total Credits	44
General-educ satisfying cou	ation, multicultural, or other group-	8	Course Second Year	Title	Credits Milestone
	her science elective	4	Fall		
0,	Credits	12	PHYS 251	Foundations of Physics I	4
Winter			MATH 252	Calculus II	4
	ation, multicultural, or other group-	8	ERTH 318	Introduction to Field Methods	3
satisfying cou	irses		General-educ satisfying cou	ation, multicultural, or other group-	4
Geology or ot	her science elective	4	, ,	Credits	15
. .	Credits	12	Winter		
Spring		0	PHYS 252	Foundations of Physics I	4
	ation, multicultural, or other group-	8	MATH 253	Calculus III	4
satisfying cou	her science elective	4	ERTH 315	Earth Physics	4
Geology of of		4		ation, multicultural, or other group-	4
	Credits Total Credits	<u> </u>	satisfying cou		
	r of Science in Earth Scien sics Track	ces:	Spring PHYS 253	Foundations of Physics I	4
	r of Science in Earth Scien sics Track Title	CES: Credits Milestones	PHYS 253 ERTH 311 ERTH 316	Earth Materials Introduction to Hydrogeology	4 5 4
Geophys Course First Year	sics Track		PHYS 253 ERTH 311 ERTH 316 General-educ	Earth Materials Introduction to Hydrogeology ation, multicultural, or other group-	5
Geophys _{Course}	sics Track		PHYS 253 ERTH 311 ERTH 316	Earth Materials Introduction to Hydrogeology ation, multicultural, or other group- rrse	5 4 4
Geophys Course First Year Fall	Title Exploring Planet Earth or Exploring Earth's Environment	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ	Earth Materials Introduction to Hydrogeology ation, multicultural, or other group-	5
Geophys Course First Year Fall ERTH 101 or ERTH 102	Title Exploring Planet Earth or Exploring Earth's Environment	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits	5 4 4 17 48
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou	Earth Materials Introduction to Hydrogeology ation, multicultural, or other group- irse Credits	5 4 4 17 48
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z	Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits	5 4 4 17 48
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or	Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title	5 4 4 4 <u>17</u> 48 Credits Milestone
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations	5 4 4 4 <u>17</u> 48 Credits Milestone
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group-	5 4 4 4 <u>17</u> 48 Credits Milestone
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter	sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group-	5 4 4 4 <u>17</u> 48 Credits Milestone 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 WR 121Z CH 221 or CH 224H Winter ERTH 102 or	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Surface and Environment	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group-	5 4 4 4 <u>17</u> 48 Credits Milestone 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter ERTH 102 or ERTH 102 or ERTH 202	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Surface and Environment	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ satisfying cou	Earth Materials Introduction to Hydrogeology Eation, multicultural, or other group- Irrse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II Eation, multicultural, or other group- Irrse	5 4 4 4 4 17 48 Credits Milestone 4 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter ERTH 102 or ERTH 102 OR ERTH 202 MATH 112Z CH 222	sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Surface and Environment Precalculus II: Trigonometry General Chemistry II	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ satisfying cou	Earth Materials Introduction to Hydrogeology action, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group- irse Credits Credits	5 4 4 4 4 17 48 Credits Milestone 4 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter ERTH 102 or ERTH 102 or ERTH 202 MATH 112Z	sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Surface and Environment Precalculus II: Trigonometry	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ satisfying cou Winter MATH 281 PHYS 352	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group- irse Credits Several-Variable Calculus I Thermal Physics and Statistical Mechanics I	5 4 4 4 4 17 48 Credits Milestone 4 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter ERTH 102 or ERTH 202 MATH 112Z CH 222 or CH 225H General-educ	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Environment or Earth's Surface and Environment or Earth's Surface and Environment Precalculus II: Trigonometry General Chemistry II or Advanced General Chemistry II or Advanced General Chemistry II ation, multicultural, or other group-	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ satisfying cou Winter MATH 281 PHYS 352 ERTH 455	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group- irse Credits Several-Variable Calculus I Thermal Physics and Statistical	5 4 4 4 4 17 48 Credits Milestone 4 4 4 4 4 4 4 4 4 4 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter ERTH 102 or ERTH 202 MATH 112Z CH 222 or CH 225H General-educ	sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Surface and Environment or Advanced General Chemistry II or Advanced General Chemistry II or Advanced General Chemistry II	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ satisfying cou Winter MATH 281 PHYS 352 ERTH 455 Spring	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II ation, multicultural, or other group- irse Credits Several-Variable Calculus I Thermal Physics and Statistical Mechanical Earth Credits	5 4 4 4 4 17 48 Credits Milestone 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Geophys Course First Year Fall ERTH 101 or ERTH 102 MATH 111Z WR 121Z CH 221 or CH 224H Winter ERTH 102 or ERTH 102 OR ERTH 202 MATH 112Z CH 222 or CH 225H	Sics Track Title Exploring Planet Earth or Exploring Earth's Environment Precalculus I: Functions Composition I General Chemistry I or Advanced General Chemistry I Credits Exploring Earth's Environment or Earth's Environment or Earth's Surface and Environment or Earth's Surface and Environment Precalculus II: Trigonometry General Chemistry II or Advanced General Chemistry II or Advanced General Chemistry II ation, multicultural, or other group-	Credits Milestones	PHYS 253 ERTH 311 ERTH 316 General-educ satisfying cou Course Third Year Fall MATH 256 PHYS 351 General-educ satisfying cou Winter MATH 281 PHYS 352 ERTH 455	Earth Materials Introduction to Hydrogeology eation, multicultural, or other group- irse Credits Total Credits Title Introduction to Differential Equations Foundations of Physics II eation, multicultural, or other group- irse Credits Several-Variable Calculus I Thermal Physics and Statistical Mechanics I Mechanical Earth	5 4 4 4 4 17 48 Credits Milestone 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4

Mechanics II

Geology or	other science elective	4	MATH 246 or	Calculus for the Biological Sciences I or Calculus I	4
	Credits	12	MATH 251	of Calculus I	
	Total Credits	36	General-educ	ation, multicultural, or other group-	4
Course	Title	Credits Milestones	and the second	· · · · · · · · · · · · · · · · · · ·	
Fourth Yea	r			Credits	16
all				Total Credits	48
General-edu	ucation, multicultural, or other group-	4			
atisfying co	burses		Course	Title	Credits Mileston
Seology or	other science elective	8	Second Year		
	Credits	12	Fall		
Vinter			PHYS 201	General Physics	4
General-edu	ucation, multicultural, or other group-	8	or PHYS 251	or Foundations of Physics I	
atisfying co	burses		MATH 247	Calculus for the Biological Sciences II	4
Geology or	other science elective	4	Oľ	or Calculus II	4
	Credits	12	MATH 252		
Spring			ERTH 311	Earth Materials	5
General-edu	ucation, multicultural, or other group-	8	Geology elect	ive	4
atisfying co	Durses			Credits	17
Geology or	other science elective	4	Winter		
	Credits	12	PHYS 202	General Physics	4
	Total Credits	36	or BI 211	or General Biology I: Cells	
			ERTH 315	Earth Physics	4
	or of Science in Earth Scier	ices:	ERTH 332	Introduction to Petrology	5
Environ	mental Geoscience Track		General-educ	ation, multicultural, or other group-	4
ourse	Title	Credits Milestones	satisfying cou	rse	
irst Year				Credits	17
all			Spring		
RTH 101	Exploring Planet Earth	4	PHYS 203	General Physics	4
or	or Exploring Earth's Environment		or	or Foundations of Physics I	
ERTH 10	2		PHYS 253		
1ATH 111Z	Precalculus I: Functions	4	or BI 212 or BI 213	or General Biology III: Ecology and Evolution	
VR 121Z	Composition I	4	or CH 223	or General Chemistry III	
CH 221	General Chemistry I	4	01 011 220	or Advanced Concret Chemistry III	

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-educa satisfying cour	ation, multicultural, or other group- rse	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

PHYS 253 or BI 212 or BI 213 or CH 223	or General Biology III: Ecology and Evolution	
or CH 226H	of Advanced General Chemistry III	
ERTH 311	Earth Materials	5
ERTH 316	Introduction to Hydrogeology	4
General-educ satisfying cou	ation, multicultural, or other group- Irse	4
	Credits	17
	Total Credits	51
		51
Course Third Year Fall	Title	Credits Milestones
Third Year		
Third Year Fall	Title	Credits Milestones
Third Year Fall ERTH 310 ERTH 318	Title Earth Resources and the Environment Introduction to Field Methods eation, multicultural, or other group-	Credits Milestones
Third Year Fall ERTH 310 ERTH 318 General-educ	Title Earth Resources and the Environment Introduction to Field Methods eation, multicultural, or other group-	Credits Milestones
Third Year Fall ERTH 310 ERTH 318 General-educ	Title Earth Resources and the Environment Introduction to Field Methods eation, multicultural, or other group- mrses	Credits Milestones

ERTH 451		
L.())	Hydrogeology	4
ERTH 418	Earth and Environmental Data Analysis	4
General-edu satisfying co	cation, multicultural, or other group- urse	4
	Credits	16
Spring		
ERTH 334	Sedimentology and Stratigraphy	4
GEOG 323	Biogeography	4
General-edu satisfying co	cation, multicultural, or other group- urse	4
Geology elec	tive	4
	Credits	16
	Total Credits	47
Course	Title	Credits Mileston
Fourth Year		
Fall		
General-edu satisfying co	cation, multicultural, or other group- urses	8
satisfying co		8
satisfying co	urses	-
satisfying co	urses ther science elective	8
satisfying con Geology or o Winter	urses ther science elective	8
satisfying con Geology or o Winter	ther science elective Credits cation, multicultural, or other group-	8 16
satisfying con Geology or o Winter General-edu satisfying con	ther science elective Credits cation, multicultural, or other group-	8 16
satisfying con Geology or o Winter General-edu satisfying con	ther science elective Credits cation, multicultural, or other group-	8 16 8
satisfying con Geology or o Winter General-edu satisfying con	ther science elective Credits cation, multicultural, or other group- urses ther science elective	8 16 8 8
satisfying con Geology or o Winter General-edu satisfying con Geology or o Spring	ther science elective Credits cation, multicultural, or other group- urses ther science elective	8 16 8 8
satisfying con Geology or o Winter General-edu satisfying con Geology or o Spring	ther science elective Credits cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group-	8 16 8 8 16
satisfying con Geology or o Winter General-edu satisfying con Geology or o Spring General-edu satisfying con	ther science elective Credits cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group-	8 16 8 8 16

Bachelor of Science in Earth Sciences: Paleontology Track

48

Total Credits

Course First Year Fall	Title	Credits Mileston
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	General Chemistry II	4
or CH 225H	or Advanced General Chemistry II	
General-educ satisfying cou	cation, multicultural, or other group-	4
	Credits	16
Spring		10
ERTH 103	Exploring Earth History	4
or	or History of Life	-
ERTH 203		
WR 122Z	Composition II	4
or WR 123	or College Composition III	
CH 223	General Chemistry III	4
or	or Advanced General Chemistry III	
CH 226H		
MATH 251	Calculus I	4
	Credits	16
	Total Credits	48
Course	Title	Credits Milestones
Second Year		Creatts milestories
Fall		
PHYS 201	General Physics	4
or	or Foundations of Physics I	4
PHYS 251		
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-educ satisfying cou	ation, multicultural, or other group-	4
	Credits	17
es Spring		
PHYS 203	General Physics	4
ERTH 318	Introduction to Field Methods	3
General-educ satisfying cou	cation, multicultural, or other group-	8
	Credits	15
	Total Credits	50
Course	Title	Credits Milestones
Third Year Fall		
Choose one f	rom the following:	4
ERTH 434	Vertebrate Paleontology	4
ERTH 436	Paleoecology and Functional	4
	Morphology	
General-educ satisfying cou	cation, multicultural, or other group-	4
	ther science elective	4

These course	es are typically offered in alternate years,	
so enrollment according to	t is necessary in the third or fourth year availability.	
Contact advis these course	sor or department office for scheduling of s.	
	Credits	20
Winter		
Choose one	from the following:	4
ERTH 434	Vertebrate Paleontology	4
ERTH 436	Paleoecology and Functional Morphology	4
General-educ satisfying cou	cation, multicultural, or other group- urses	4
Geology or o	ther science course	4
	es are typically offered in alternate years, t is necessary in the third or fourth year availability.	
Contact advis these course	sor or department office for scheduling of s.	
	Credits	20
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-educ satisfying cou	cation, multicultural, or other group- urse	4
	Credits	13
Summer		
ERTH 406	Field Studies: [Topic] (12 credits)	1-6
	Credits	
	oreans	1-6
	Total Credits	1-6 54-59
Course	Total Credits	54-59
Course Fourth Year Fall		
Fourth Year Fall	Total Credits Title cation, multicultural, or other group-	54-59
Fourth Year Fall General-educ satisfying cou	Total Credits Title cation, multicultural, or other group-	54-59 Credits Milestor
Fourth Year Fall General-educ satisfying cou	Total Credits Title cation, multicultural, or other group- urses	54-59 Credits Milestor 8
Fourth Year Fall General-educ satisfying cou	Total Credits Title cation, multicultural, or other group- urses ther science elective	54-59 Credits Milestor 8 8
Fourth Year Fall General-educ satisfying cou Geology or o Winter	Total Credits Title cation, multicultural, or other group- urses ther science elective	54-59 Credits Milestor 8 8
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ	Total Credits Title Cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group-	54-59 Credits Milestor 8 8 8 16
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ satisfying cou	Total Credits Title Cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group-	54-59 Credits Milestor 8 8 8 16
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ satisfying cou	Total Credits Title Cation, multicultural, or other group- urses ther science elective Credits Cation, multicultural, or other group- urses	54-59 Credits Milestor 8 8 16 8
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ satisfying cou	Total Credits Title Cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group- urses ther science elective	54-59 Credits Milestor 8 8 16 8 8 8 8
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ satisfying cou Geology or o Spring	Total Credits Title Cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group-	54-59 Credits Milestor 8 8 16 8 8 8 8
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ satisfying cou Spring General-educ satisfying cou	Total Credits Title Cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group- urses ther science elective Credits cation, multicultural, or other group-	54-59 Credits Milestor 8 8 16 8 8 8 16
Fourth Year Fall General-educ satisfying cou Geology or o Winter General-educ satisfying cou Spring General-educ satisfying cou	Total Credits Title Cation, multicultural, or other group- Urses ther science elective Credits Cation, multicultural, or other group- Urses ther science elective Credits Credits Cation, multicultural, or other group- Urses Credits Cation, multicultural, or other group- Urses	54-59 Credits Milestor 8 8 16 8 8 8 16 12