

Introduction to Exploration: Earth, Planets, and Stars

Introduction: The Earth, Solar System, and Universe are diverse and dynamic. Features and processes such as volcanoes, landslides, atmospheres, climates, orbits and rotations, and solar system formation are characterized by a suite of processes. As scientists, we work to understand fundamental questions about the properties of our Solar System and Earth. On Earth, we can use past events and natural systems to better understand how geologic processes affect humans.

Looking beyond Earth, we study astronomy to get a better picture of our place in the Universe. The course is purposely designed to be holistic; we will explore topics such as stellar evolution, atmospheric science, classical geology, interior structure of Earth and extraterrestrial objects, plate tectonics, volcanoes, mountain building, and climate change.

Method: In this course we will explore concepts in astronomy and geological sciences, spending equal time on each subject. The course will consist of 16 weeks, 8 weeks about geology and 8 weeks about astronomy. A cumulative final will be given halfway through the course for geology, and another final will be given at the end of the course for astronomy. The two finals will be take-home exams and will follow the honor system. Students will have one week to complete each exam and we will go over the answers in class. Assignments include readings pulled from chapters in the textbooks listed below and popular science articles.

Textbooks:

Bennet, J., Donahu, M., Schneider, N., and Voit, M. (2016), *The Cosmic Perspective Fundamentals*, 2nd ed., Pearson Education.

Reynolds, S. and Johnson, J. (2016), *Exploring Earth Science*, 1st ed., McGraw Hill Education.

Objectives:

1. Teach students how to use the scientific method to solve basic geological and astronomical questions through class assignments and individual presentations.
2. Teach skills to practice critical thinking using observations, interpretations, predictions, and hypothesis testing.
3. Allow space for students to learn presentation skills by presenting on topics that interest them most.
4. Consider current socially, politically, or culturally relevant issues related to geology and astronomy such as climate change and natural disasters.
5. Teach the various types of geologic processes, such as the rock cycle, natural disasters, hydrology, etc., among other aspects emphasized in a typical ASU School of Earth and Space Exploration education.
6. Teach the various types of astronomical processes, such as moon phases, planets in our Solar System, cosmology, etc. typically emphasized by the School of Earth and Space Exploration.
7. Consider topics which have no definite answers and are at the limits of our current understanding such as dark matter and climate change.

Tentative Schedule:

Week	Topic	Assignment
Week 1	Course intro, intro to Earth Science	Assigned reading and Earth layers and timescales assignment
Week 2	The rock cycle week 1	Assigned reading 2 and rock identification sheet
Week 3	The rock cycle week 2	Assigned reading 3 and rock identification sheet
Week 4	The water cycle	Assigned reading 4 and water cycle identification sheet
Week 5	Natural disasters	Assigned reading 5
Week 6	Atmospheric science	Assigned reading 6 and cloud formation sketch
Week 7	Climate change	GEOLOGY FINAL
Week 8	Answers to geology final, intro to astronomy, scales of the universe	Assigned reading 7
Week 9	Moon phases and the night sky	Assigned reading 8 and moon diagrams
Week 10	Solar System- terrestrial planets	Assigned reading 9 and ranking task
Week 11	Solar System- gas giants	Assigned reading 10 and ranking task
Week 12	Exoplanets	Assigned reading 11 and ranking task
Week 13	Star formation	Assigned reading 12 and ranking task
Week 14	Stellar death and black holes	ASTRONOMY FINAL
Week 15	The big bang, formation of the universe, cosmology and dark matter	