Course: Earth and Space Science

Grade Level: 12

Content Area: Science

Frequency: Full Year

Big Ideas:

The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws.
The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.
The Earth's processes effect and are affected by human activities.

Essential Questions:

What is the universe and what is Earth's place in it?
How and why is Earth constantly changing?
How do Earth's processes and human activities affect each other?

Primary Resources(s) and Technology:

Prentice Hall Earth Science, stellarium.org online software, PhET Lab online software, Microsoft Teams

Pennsylvania and/or focus standards referenced at:

www.pdesas.org
www.education.pa.gov

Big Ideas/EQs	Focus Standard(s)	Assessed Competencies (Key content and skills)	Timeline
The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws.	The Big Bang Cosmology Scale of the Universe Stars and Galaxies	• Use data about the expansion, scale and age of the universe to explain the Big Bang theory as a model for the origin of the Universe • Construct explanations based on observable astronomical data as empirical evidence for the Big Bang theory • Use models to describe the sun's place in space in relation to the Milky Way Galaxy and the distribution of galaxy clusters in the universe. • Compare and contrast the life cycles of stars of different masses and compositions, including our sun. • Develop a model of how the competing forces of gravity and thermal expansion effect a star's density throughout its life cycle • Use observational data to construct an explanation of a star's apparent (relative) magnitude based on its distance from the observer and its mass. • Use observational data to describe the composition of stars. • Describe the mechanism by which heavier and heavier elements are produced within a star's core throughout its life cycle.	8 weeks

The universe is composed of a variety of different objects that are organized into systems each of which develops according to accepted physical processes and laws.	Exploring our solar system The Earth, Moon, and Sun system Astrology vs. Astronomy	• Compare time periods in history, the technology available at that time and the resulting model of the organization of our solar system. (e.g. – Early Greeks used purely observational data resulting in a geocentric model). • Model Kepler's laws that describe common features of the motions of orbiting objects, including their elliptical paths around the sun. Orbits may change due to the gravitational effects from, or collisions with, other objects in the solar system. • Use mathematical and computational representations of human-made and solar system objects in order to describe their motions and predict their trajectories and/or collisions • Discuss how humans have used the stars as guides, calendars, and characters in myths and stories and differentiate between the science of astronomy and the pseudoscience of astrology.	8 weeks
The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales	Mapping Rocks and minerals Plate Tectonics Earth's history Surface processes	• Describe the formation of minerals, igneous, sedimentary, and metamorphic rocks, keeping in mind where they form • Analyze actual or simulated isotope ratios within earth materials to make valid and reliable scientific claims about the planet's age; the ages of earth events and rocks; and the overall time scale of earth's history • Use a model for Earth's interior including the mechanisms of thermal convection to support the explanation for the cycling of matter within the Earth. • Construct an account of Earth's formation and early history (e.g. – origin of oceanic and atmospheric components) from evidence acquired from the study of ancient Earth materials and objects in our solar system. • Develop qualitative models to describe biogeochemical cycles among the hydrosphere, atmosphere, geosphere, and biosphere.	9 weeks
The Earth's processes effect and are affected by human activities.	Atmosphere Temperature Water and precipitation Air pressure and wind patterns Forecasting the weather	• Use models of the flow of energy between the sun and Earth's atmosphere, ocean and land to support explanations of how Earth's radiative energy balance is affected by the absorption and retention of heat in Earth's atmosphere. • Use data to graphically represent and draw conclusions about the causes and effects of climate change over 10-100s years; 1,000s-10,000s years; and 100,000s-1,000,000s. • Use geoscience data and the results from global climate models to make evidence-based forecasts of climate change.	11 weeks

	The ocean's impact on climate Climate change	• Evaluate the impact of the availability of renewable and nonrenewable resources on the development of a civilization • Investigate human environmental impacts, comparing the kinds of solutions that are feasible, and designing and analyzing solutions that could reduce that impact (e.g. examples of human impacts can include water usage, such as the withdrawal of water from streams and aquifers or the construction of dams and levees; land usage such as urban development, agriculture or the removal of wetlands; and pollution such as of the air, water or land. • Construct an argument from evidence for how increases in human population and consumption of natural resources impact Earth's systems.	