

East Penn School District
Curriculum and Instruction

Curriculum for: Advanced Astronomy, College Preparatory

Course(s): CP Advanced Astronomy

Grades: 10-12

Department: Science

Length of Period (average minutes): 42

Periods per cycle: 6

Length of Course (yrs): 1

Type of offering: elective

Credit(s) awarded: 1.0 4.0/4.0

Developed by: Andrew McConville

ADOPTED: 2018

Enduring Understandings	Essential Questions	Knowledge	Skills	Standards
<ul style="list-style-type: none"> ● Exoplanets continue to be discovered. ● Our solar system continues to form/evolve. ● Mass Extinctions through Earth's history have changed our planet. 	<ul style="list-style-type: none"> ● Are we alone? ● What conditions make life possible? ● What is an extremophile? ● What is an exoplanet? ● How have mass extinction events shaped our world? 	<ul style="list-style-type: none"> ● How an organism adapts to its specific environment. ● How exoplanets are detected. ● Summarize the Drake equation. ● The chemical signatures that life gives off on Earth. ● How Earth's systems have changed the world we live on. 	<ul style="list-style-type: none"> ● Identify potential worlds where life might be possible. ● Evaluate what type of life would be possible in certain conditions. ● Discuss Astrobiologists theories of where and how life might be able to survive elsewhere in our solar system/galaxy. 	<p>NGSS Standards:</p> <ul style="list-style-type: none"> ● HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
<ul style="list-style-type: none"> ● Galaxies are constantly evolving. ● The Big Bang created the universe we live in. ● Telescopes are used to gather light. ● Spectroscopy helps us unlock the mysteries of the universe. ● Human Eye structure ● Electromagnetic Spectrum includes invisible light 	<ul style="list-style-type: none"> ● What are galaxies made of? ● How are telescopes different? ● How do we see? ● How is light used to give us clues of the universe? 	<ul style="list-style-type: none"> ● All galaxies evolve. ● How are telescopes used to view the cosmos? ● How do we see invisible light? ● There is evidence to support the Big Bang Theory ● The different types of Galaxies. ● The different parts of the electromagnetic spectrum. ● Objects in space give off energy across the 	<ul style="list-style-type: none"> ● Observe and identify unknown emission spectra ● Be able to discuss how we see. ● Classify different types of galactic and intergalactic objects. ● Know how each form of EM spectrum is used in our daily lives. ● Know how Astronomers use Spectral analysis to investigate the 	<p>NGSS Standards:</p>

		<p>electromagnetic spectrum.</p> <ul style="list-style-type: none"> • Binary stars are most often identified using their spectra. • How light is gathered in a reflector/refractor. 	<p>nature of the universe.</p> <ul style="list-style-type: none"> • Compare and contrast human vision to how telescopes see. 	
<ul style="list-style-type: none"> • Every discovery is based on a previous discovery. • New discoveries and technology are changing the way we “see” the cosmos, and our planet. 	<ul style="list-style-type: none"> • How has the history of astronomy driven our current and future advancements? • Where are we headed? • How has the past shaped where we are today? 	<ul style="list-style-type: none"> • How Gravity is dependent on Mass • The Planet's' orbital characteristics are determined by gravity of each planet • Kepler's Laws of Planetary motion 	<ul style="list-style-type: none"> • Mathematical concepts of Newton's law of Universal Gravity. • Use Kepler's Laws to predict orbital parameters of our solar system's planets. • Use the observatory to image a solar system object or Deep sky object. 	<p>NGSS Standards:</p> <ul style="list-style-type: none"> • HS-ESS1-4. - Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. • HS-PS2-4. - Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
<ul style="list-style-type: none"> • Tidal forces have shaped life on Earth • The moon and Earth share a common formation history • The moon's orbit is predictable and 	<ul style="list-style-type: none"> • How does the moon influence life on Earth? • How is the moon's geologic history tied into the Earth's formation? 	<ul style="list-style-type: none"> • Connection of Eclipses, Tides, and phases. • How to decipher tidal forces based on different lunar phases. 	<ul style="list-style-type: none"> • Interpretation of Tide charts • Model phases of the moon kinestically. • Discuss how the evolution of the Earth and moon 	<p>NGSS Standards:</p> <ul style="list-style-type: none"> • HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting

<p>constant in our lifetime.</p> <ul style="list-style-type: none"> Eclipses are predictable and periodic. 	<ul style="list-style-type: none"> How can you determine the approximate time based on the moon's phase and position in the sky? How can the moon be used as a clock? 	<ul style="list-style-type: none"> The leading theory of how the moon formed, with backup evidence. The role the moon plays on flora and fauna, around the world. 	<p>share a common path</p> <ul style="list-style-type: none"> Use the Moon as a clock Discuss the different geologic features on the moon's surface. 	<p>objects in the solar system.</p> <ul style="list-style-type: none"> HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
<ul style="list-style-type: none"> Every discovery is based on a previous discovery. New discoveries and technology are changing the way we "see" the cosmos, and our planet. Asteroids/Comets have brought resources to earth. 	<ul style="list-style-type: none"> How has the history of astronomy driven our current and future advancements? Where are we headed? What is a planet? How has comet/asteroid impacts shaped our world? 	<ul style="list-style-type: none"> How Gravity is dependent on mass A planet's distance is proportional to its orbital period. Identify solar system objects in our system and others. The gravitational force of the sun holds the solar system in place. All stars have Protoplanetary discs. Each planet's characteristics are determined by its distance from the sun. 	<ul style="list-style-type: none"> Mathematical concepts of Newton's law of Universal Gravity. Use Kepler's Laws to predict orbital parameters of our solar system's planets. Discuss characteristics of our planets in our solar system. Discuss Astrobiologists theories of where and how life might be able to survive elsewhere in our solar system/galaxy. 	<p>NGSS Standards:</p> <ul style="list-style-type: none"> HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
<ul style="list-style-type: none"> Fall/Winter, Spring/Summer, and 	<ul style="list-style-type: none"> Where are we? How are the stars used to determine 	<ul style="list-style-type: none"> Identify and locate Northern 	<ul style="list-style-type: none"> Locate the seasonal constellations. 	<p>NGSS Standards:</p>

<p>Circumpolar constellations.</p> <ul style="list-style-type: none"> • Differentiate between types life cycles of stars? • Stars create the atoms that make up planets. 	<p>location in the sky?</p> <ul style="list-style-type: none"> • How do stars change through their lives? • Does each star evolve the same way? • How do we take images of various stages of a star's life? • How is our sun different from other stars? 	<p>Hemisphere Constellations</p> <ul style="list-style-type: none"> • Each star will go through a different life cycle. • Earth's materials are created from dead stars. • Use the stars as navigation tools. 	<ul style="list-style-type: none"> • Differentiate between types of stars and their life cycles. • Be able to explain the Hertzsprung Russell Diagram • Explain how the Sun converts matter into energy in its core. 	<ul style="list-style-type: none"> • HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. • HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. • HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.
<ul style="list-style-type: none"> • The stars, planets, and moon move at regular predictable increments. • The sky can be measured a variety of ways. • Time can be told using the Sun, moon, and stars. • Science is an ongoing process. 	<ul style="list-style-type: none"> • How do we measure the sky? • How does the sky move? • What is a pseudoscience? • How does the sky change? 	<ul style="list-style-type: none"> • How to use 2 different systems measure the night sky. • The difference between Azimuth and Right Ascension. • The sky can be used as a timepiece, with regular predictable patterns. • How to determine credible information 	<ul style="list-style-type: none"> • Compare the Horizon System to the Celestial Coordinate system. • Use astronomical charts to locate celestial objects. • To decipher credible sources using the scientific method. • Night time observations using technology, to measure the sky. 	<p>NGSS Standards:</p> <ul style="list-style-type: none"> • HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

		using the Scientific method.		
<ul style="list-style-type: none"> • The motion of the sky determines how we tell time. • How a day, month, and year are calculated. • Understand time zones around the world. • How a light year is determined. 	<ul style="list-style-type: none"> • How are time and space related? • How do we measure time? • What is time? • What time is it? 	<ul style="list-style-type: none"> • How the sky moves. • How we tell time. • How time zones are positioned due to the rotation of the earth. • How space/time/gravity are connected. 	<ul style="list-style-type: none"> • Relate time to the motion of the earth and moon. • Tell correct Local time using a sundial and • Use Einstein's theory of relativity to discuss how space affects time. 	<p>NGSS Standards:</p> <ul style="list-style-type: none"> • HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. • HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.

Materials and Resources:
"Explorations-An Introduction to Astronomy 3rd edition, updated"
ISBN 0-07-246570-0 (McGraw-Hill) 2002