

Treasure Coast Science Scope and Sequence 2012-2013

Course: Earth/Space Science Honors

Course Code: 2001320

Quarter: 4A

Topic(s) of Study History of Astronomy

Bodies of Knowledge: Earth and Space, Nature of Science

Standard(s): 7: Earth Systems and Pattern,

Essential Questions: Why has it always been a struggle for scientists to convince people of new astronomical findings? How has various aspects of Floridians lifestyles been affected by space exploration? How can future space exploration be economically and scientifically justified? How do scientists design an investigation to answer a scientific question and communicate their

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[Syllabus: Click here](#)

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NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	TARGETS
<p>SC.912.E.5.1 Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe. Cognitive Complexity: High</p>	<p>I Astronomy vs. Astrology A. Early astronomers 1. Greeks 2. Egyptians 3. Chinese 4. Ptolemy a. Geocentric model</p>	<ul style="list-style-type: none"> • Differentiate between astronomy and astrology.(I) • Assess the methods used by early astronomers to study the stars without the availability of modern tools (I) • Hypothesis the units used to calculate distance in space. (I)
<p>SC.912.E.5.2 Identify patterns in the organization and distribution of matter in the universe and the forces that determine them. Cognitive Complexity: Moderate</p>	<p>B. Modern astronomers 1. Copernicus 2. Heliocentric model 3. Brahe 4. Kepler a. Laws of planetary motion</p>	<ul style="list-style-type: none"> • Differentiate between the geocentric and heliocentric models of Ptolemy and Copernicus (I) • Connect Galileo’s observations with traditional beliefs and assess his theory’s impact on modern society (I)
<p>SC.912.E.5.7 Relate the history of and explain the justification for future space exploration and continuing technology development. Cognitive Complexity: Moderate</p>	<p>5. Galileo a. Observation b. Conflict with church</p>	<ul style="list-style-type: none"> • Assess the impact of Kepler and Newton on modern astronomy and physics (I) • Critique the impact of Brahe, Einstein and Hawking’s work on modern astronomy (I)
<p>SC.912.E.5.8 Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. Cognitive Complexity: Moderate</p>	<p>6. Newton 7. Einstein 8. Hawking</p>	<ul style="list-style-type: none"> • Rationalize the theories depicting the origin of our solar system and the universe (II) • Investigate the evidence that supports the Big Bang Theory (II)
<p>SC.912.E.5.9 Analyze the broad effects of space exploration on</p>	<p>II The Big Bang Theory is a possible explanation of the origin of the universe A. Red Shift B. Expanding universe</p>	<ul style="list-style-type: none"> • Conclude the universe is expanding based on scientific observations (II) • Investigate the evidence that supports the existence of dark

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<p>the economy and culture of Florida Cognitive Complexity: Moderate</p> <p>SC.912.E.5.10 Describe and apply the coordinate system used to locate objects in the sky. Cognitive Complexity: Moderate</p> <p>SC.912.E.5.11 Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations. Cognitive Complexity: High</p> <p>SC.912.P.12.4 Describe how the gravitational force between two objects depends on their masses and the distance between them. Cognitive Complexity: Moderate</p> <p>SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. Cognitive Complexity: Moderate</p>	<p>C. Cosmic background radiation</p> <p>D. Ripples in space</p> <p>III Universe Composition</p> <p>A. Dark matter</p> <p>B. Dark energy</p> <p>IV Formation of the Solar System</p> <p>A. The Nebular Hypothesis</p> <p>B. Interstellar clouds</p> <p>C. Formation of the planets</p> <p>V Studying Space form Space</p> <p>A. Space Telescopes</p> <ol style="list-style-type: none"> 1. Hubble Space Telescope 2. Chandra X-Ray Observatory 3. Compton Gamma Ray Observatory 4. Spitzer Spade Telescope 5. James Webb Space Telescope <p>B. Spacecraft</p> <p>C. Human exploration</p> <p>D. Remote Sensing</p> <p>E. Coordinate System</p> <p>VI The Space Race</p> <p>A. Cold War</p> <p>B. Sputnik I</p> <p>C. Kennedy</p> <p>VII The Space Program</p> <p>A. Florida</p> <p>B. The Apollo program</p> <p>C. The Space Transportation System (STS) and</p>	<p>matter(III)</p> <ul style="list-style-type: none"> • Differentiate between dark energy and dark matter (III) • Explain the universe expansion theory and describe evidence supporting it (IV) • Distinguish various methods of studying space (V) • Determine the benefits of analyzing space from space (V) • Describe methods used by space telescopes and other instruments to study space (V) • Identify some unmanned spacecraft and describe their primary missions • Debate the pros and cons of human space exploration (V) • Recognize common benefits of Remote Sensing Satellites (RSS) (V) • Apply the coordinate system used to locate objects in the sky (V) • Connect the political events that led to the 'space race' (VI) • Investigate the geophysical factors that enable Florida to be prominent in the space program. (VII) • Differentiate between the space shuttle program and the Apollo program. (VII) • Hypothesize why the constellation program was cancelled and deduce the impact of the cancellation on the economy and the future human space flight ventures. (VII) • Formulate benefits of space programs (VII, IX) • Analyze the impact of the space program on Florida's economy VII, (VIII) • Hypothesize the conditions that a planet would have to possess in order for life, as we know it, to evolve on the planet (X) • Argue recent evidence that encourages scientists to further explore Mars (X) • Theorize why scientists have selected the Mares, Europa and Titan as
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	<p style="text-align: center;">the Space Shuttle</p> <p>VIII Florida and the Space Program</p> <ul style="list-style-type: none"> A. Kennedy Space Center B. Economic impact C. Weather satellites D. Communication satellites E. Intelligence satellites <p>IX Benefits of the Space Program</p> <ul style="list-style-type: none"> A. Advances in Technology B. National defense C. Space weather forecasting D. Spinoffs E. Scientific advances F. The future of Florida's Space Program <p>X Search for Life Beyond Earth</p> <ul style="list-style-type: none"> A. Conditions likely necessary for life to exist B. The Drake Equation C. Solar System <p>Extra Solar Systems</p>	<p>prospects for life in our solar system (X)</p> <ul style="list-style-type: none"> • Identify techniques used to detect extra solar planets (IX, X) • Analyze the Drake equation and argue the potential existence of life in the universe (IX, X) • Argue the implication of finding other life in the universe to political, theological, and economical beliefs. (X)
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Course: Earth/Space Science Honors

Course Code: 2001320

Quarter: 4B

Topic(s) of Study Physics in Astronomy

Bodies of Knowledge: Earth and Space, Physical Science, Nature of Science

Standard(s): 7: Earth Systems and Pattern, 10: Forms of Energy, 12: Motion of Objects

Essential Questions: How do Kepler’s and Newton’s Laws of Motion affect and interact with objects in space? How have technological advances affected our understanding of radiation and the electromagnetic spectrum? How would life on earth adapt in order to live without our sun? How do scientists design an investigation to answer a scientific question and communicate their findings?

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NGSSS	OUTLINE OF CONTENT (CONCEPT/SKILLS)	OBJECTIVES
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<p>SC.912.E.5.2 Identify patterns in the organization and distribution of matter in the universe and the forces that determine them. Cognitive Complexity: Moderate</p> <p>SC.912.E.5.3 Describe and predict how the initial mass of a star determines its evolution. Cognitive Complexity: Moderate</p> <p>SC.912.E.5.4 Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth. Cognitive Complexity: High</p> <p>SC.912.E.5.5 Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems. Cognitive Complexity: High</p> <p>SC.912.E.5.6 Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other. Cognitive Complexity: High</p> <p>SC.912.E.5.8 Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. Cognitive Complexity: High</p> <p>SC.912.E.7.7 Identify, analyze, and relate the internal (Earth</p>	<p>I Kepler's Laws of Planetary Motion</p> <p style="padding-left: 20px;">A. Law of Ellipses</p> <p style="padding-left: 20px;">B. Law of Equal Areas</p> <p style="padding-left: 20px;">C. Law of Periods</p> <p>II Newton's Laws of Motion</p> <p style="padding-left: 20px;">A. First Law – Inertia</p> <p style="padding-left: 20px;">B. Second Law – Mass, Force and Acceleration</p> <p style="padding-left: 20px;">C. C. Third Law – Reciprocal Actions</p> <p>III Law of Gravitation</p> <p>IV Galaxies</p> <p style="padding-left: 20px;">A. Determining distance to galaxies</p> <p style="padding-left: 40px;">1. Light Year</p> <p style="padding-left: 40px;">2. Parsec</p> <p style="padding-left: 20px;">B. Types of Galaxies</p> <p style="padding-left: 40px;">1. Spiral</p> <p style="padding-left: 40px;">2. Barred</p> <p style="padding-left: 40px;">3. Elliptical</p> <p style="padding-left: 40px;">4. Irregular</p> <p>V Star Clusters</p> <p>VI The Milky Way</p> <p style="padding-left: 20px;">A. The Local Group</p> <p style="padding-left: 20px;">B. Structure</p> <p style="padding-left: 40px;">1. Arm</p> <p style="padding-left: 40px;">2. Body</p> <p style="padding-left: 40px;">3. Center</p> <p style="padding-left: 20px;">C. Sun's location</p> <p>VII Quasars</p> <p>VIII Characteristics of Stars</p> <p style="padding-left: 20px;">A. Electromagnetic Spectrum</p> <p style="padding-left: 20px;">B. Composition</p> <p style="padding-left: 20px;">C. Temperature and color</p>	<ul style="list-style-type: none"> ● Critique Kepler's Laws (I) ● Differentiate between a circle and an ellipse (I) ● Analyze the conditions when a planet moves faster and when it moves slower in its orbit around the sun (I) ● Connect the concepts of gravity and inertia to orbital motion (I) ● Discuss Newton's laws and relate them to Kepler's laws (I, II) ● Hypothesize the conditions in which gravitational force varies between objects based on their mass and distance from each other (III) ● Apply Kepler and Newton's laws to models astronomy (I, II, III) ● Compare and contrast the types of galaxies (IV) ● Identify the components of a galaxy (VI) ● Correlate the relative age of galaxies by their shape (VI) ● Describe the Milky Way Galaxy, including its size, shape and the location of the Sun (IV, VI) ● Theorize how location in a galaxy can influence life's evolution on planets within the galaxy (VI) ● Differentiate between star clusters and galaxies (V) ● Compare the Milky Way Galaxy with the Andromeda Galaxy and correlate earth's location with other rocky planets that may be prospect for life (VI) ● Theorize why the center of galaxies contain black holes (VII) ● Differentiate between quasars and black holes (VII) ● Summarize the concept of stellar spectroscopy by describing how astronomers can determine the composition and temperature of stars (VIII) ● Distinguish between magnitude and luminosity and explain the difference
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<p>system) and external (astronomical) conditions that contribute to global climate</p> <p>SC.912.P.10.4 Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. Cognitive Complexity: High</p> <p>SC.912.P.12.2 Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time. Cognitive Complexity: High</p> <p>SC.912.P.12.4 Describe how the gravitational force between two objects depends on their masses and the distance between them. Cognitive Complexity: Moderate</p> <p>SC.912.P.12.7 Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving. Cognitive Complexity Low</p>	<p>D. Sizes and Masses E. Luminosity and Magnitude F. Stellar Motion 1. Doppler Effect</p> <p>IX Life Cycle of Stars A. Fusion B. Star Evolution 1. Nebula 2. Protostar 3. Main Sequence 4. Massive Stars C. Death of Stars 1. Supernovae 2. Neutron Stars 3. Black Holes</p> <p>X Star Systems A. Binary stars B. Constellations C. Galaxies</p> <p>XI Distance measurements A. Astronomical Unit B. Parallax C. Light year D. Parsec</p> <p>XII The Sun's Energy A. Nuclear fusion B. Changing mass into energy C. Electromagnetic Dynamo</p> <p>XIII Structure of the Sun A. Sun's Interior 1. Core 2. Radiative Zone 3. Convective Zone B. Sun's Atmosphere 1. Photosphere 2. Chromosphere 3. Corona</p>	<p>between absolute and magnitude and apparent magnitude (VIII)</p> <ul style="list-style-type: none"> • Distinguish between apparent and relative motion (VIII) • Correlate stellar size with luminosity, magnitude and temperature (VIII) • Summarize stellar evolution using the Hertzsprung-Russel Diagram (IX) • Classify the types of stars (IX) • Hypothesize the length of time a star will remain in its main sequence evolutionary stage based on the Hertzsprung-Russel Diagram (IX) • Explain how a main-sequence star generates energy (IX) • Describe how the Sun will change during its lifetime and how it will end up (IX) • Identify the characteristics of a constellation (X) • Compare the three main types of galaxies and the prospect for life (X) • Distinguish the origin of elements in the periodic table (X) • Distinguish various forms of measurement used when referring to astronomical units ((XI) • Explain why parallax is important when trying to locate celestial bodies (XI) • Differentiate between fusion and fission (XII) • Compare and contrast the layers of the sun (XIII) • Differentiate between the radiative and the convective zones of the sun (XIII) • Describe the properties of the interior layers of the sun (XIII) • Review the properties of the layers of the solar atmosphere (XIII) • Relate sunspot activity to the Sun's magnetic field (XIV) • Hypothesize how the solar dynamo
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<p>XIV Solar Activity</p> <ol style="list-style-type: none"> A. Sunspot Cycle B. Solar Maximum C. Solar Minimum D. Solar Ejections <ol style="list-style-type: none"> 1. Prominence 2. Solar Flares 3. Coronal Mass Ejections <p>XV Interaction with Earth</p> <ol style="list-style-type: none"> A. The Van Allen Belts B. Aurora Borealis C. Aurora Australis <p>Satellite disruption and electric grid damage</p> <p>XVI Terrestrial/Inner Planets</p> <ol style="list-style-type: none"> A. Mercury B. Venus C. Earth D. Mars <p>XVII Gas Giants/Outer Planets</p> <ol style="list-style-type: none"> A. Jupiter B. Saturn C. Uranus D. Neptune <p>XVIII Minor Bodies of the Solar System</p> <ol style="list-style-type: none"> A. Asteroids B. Comets C. Meteoroids <ol style="list-style-type: none"> 1. Meteor 2. Meteorite D. Planetesimals <ol style="list-style-type: none"> 1. Kuiper Belt 2. Oort Cloud E. Pluto <p>XIX Surface features of the</p>	<p>and differential rotation result in the solar cycle (XIV)</p> <ul style="list-style-type: none"> • Compare and contrast prominences, solar flares, and coronal mass ejections (XIV) • Hypothesize the cause of the auroras and why they are only visible near Earth's poles (XV) • Analyze how solar wind affects technological instruments in space and on earth (XV) • Describe the Nebular Hypothesis and how it supports the accretion theory and the formation of the solar system(XVI, XVII) • Differentiate between the inner and outer planets(XVI, XVII) • Assess the properties that determine if a planet is terrestrial of Jovian and distinguish their characteristics (XVI, XVII) • Compare the surface features and location of the other terrestrial planets with the surface features of Earth (XVI, XVII) • Theorize why earth's location is unique in our solar system (XVI, XVII) • Explore the minor bodies of the solar system and describe the physical characteristics and composition of meteoroids, asteroids and comets (XVIII) • Differentiate between asteroids and comets (XVIII) • Differentiate between a Meteor, a Meteorite and a Meteoroid (XVIII) • Theorize how asteroid impacts may affect the evolution of life on a planet (XVIII) • Hypothesize the formation and characteristics of a comet's tail (XVIII) • Locate the Kuiper Belt and Oort cloud within the solar system (XVIII) • Relate the Oort cloud to comets • Connect the Kuiper Belt to the new planetoid status of Pluto (XVIII) • Differentiate between the lunar topographical features (XIX) • Discuss why the moon has more craters than the earth (XIX) • Compare and contrast the cores of the
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	<p>Moon</p> <ul style="list-style-type: none"> A. Highlands B. Mare C. Craters D. Rilles E. Ridges F. Regolith G. Lunar Rocks <p>XX Interior of the Moon</p> <p>XXI Formation of the Moon</p> <ul style="list-style-type: none"> A. Planetesimal collision hypothesis B. Accretion Hypothesis <p>XXII The Earth-Moon System</p> <ul style="list-style-type: none"> A. Elliptical orbit B. Lunar rotation C. Eclipses <ul style="list-style-type: none"> 1. Solar eclipse 2. Lunar eclipse D. Phases of the moon E. Tides 	<p>sun, moon and earth (XX)</p> <ul style="list-style-type: none"> • Argue the hypothesis of moon formation (XXI) • Analyze the orbital cycles that result in the occurrence of solar and lunar eclipses (XXII) • Hypothesize why the moon is in the synchronous orbit with the earth (XXII) • Compare the moon's synchronous orbit with earth's asynchronous orbit (XXII) • Identify the phases of the moon in order (XXII) • Differentiate between the lunar phases (XXII) • Relate the lunar phases with earth's tides (XXII) • Compare the conditions that cause spring tides to those that cause neap tides (XXII) • Describe the effect of tidal oscillations (XXII) • Describe the effects of tides on Florida's coast (XXII)
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