



<b>Course: Astronomy and Meteorology</b> <b>Grade: 11<sup>th</sup> and 12<sup>th</sup></b> <b>Designer(s): Nicole Welsh</b>	<b>Overview of Course:</b> The course is designed to give academic students the necessary background in astronomy and meteorology as to prepare the student for college courses. This course is an elective that allows students to study the two aspects of science that affect the world we live in. The first part will deal with meteorology and the second half will deal with astronomy. This class requires some mathematics skills. This is a student driven class not teacher centered. This means many individual and group presentations, learning groups, and inquiry activities.
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**Overarching Big Ideas, Enduring Understandings, and Essential Questions**

<b>Big Idea</b>	<b>Standard(s) Addressed</b>	<b>Enduring Understanding(s)</b>	<b>Essential Question(s) in Blue Important Questions in Black</b>
Patterns	3.2.10.B6: PATTERNS SCALE MODELS CONSTANCY/ CHANGE-Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.  3.3.10.A6: Interpret meteorological data to describe and/or predict weather. Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns  3.3.12.A7: MODELS -Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections.	By looking at a pattern one can relate one subject to the next in order to make predictions, describe, and explain the world around them.	<ol style="list-style-type: none"> <li>1. From looking at weather patterns, how can one predict, describe, and explain an areas climate and weather?</li> <li>2. From looking at our solar system, can you make predictions, describe, and explain how other objects move and interact in the universe?</li> </ol>

	<p>CONSTANCY/CHANGE -Infer how human activities may impact the natural course of Earth's cycles.</p> <p>PATTERNS -Summarize the use of data in understanding seismic events, meteorology, and geologic time.</p>		
Systems	<p>3.1.12.A8: CHANGE AND CONSTANCY -Describe and interpret dynamic changes in stable systems.</p> <p>3.3.12.A1: Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy</p>	When looking at systems one is able to see relationships and how these objects are interconnected as a whole.	<ol style="list-style-type: none"> <li>1. What would happen to the universe or our solar system if one planet was either destroyed or never existed?</li> <li>2. What would happen to Earth if one planet would be destroyed or never existed, in the regards to physical characteristics and meteorological aspects?</li> <li>3. Describe and explain how human impacts and global changes would affect our weather systems?</li> </ol>
Analysis	<p>3.2.10.B6: PATTERNS SCALE MODELS CONSTANCY/CHANGE-Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.</p> <p>3.2.10.B7: Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the natural world and universe. Identify questions and concepts that guide scientific investigations. Formulate and revise explanations and models using logic and evidence. Recognize and analyze alternative explanations and models.</p>	When looking at scientific data, one can make a hypothesis on an outcome.	<ol style="list-style-type: none"> <li>1. What type of data and observations does one need in order to make an accurate weather forecast?</li> <li>2. From looking at astronomical data, what hypothesis can be made about our solar system and our universe and what evidence proves this thought?</li> </ol>

**Big Ideas, Enduring Understandings, and Essential Questions Per Unit of Study**  
 (These do NOT “spiral” throughout the entire curriculum, but are specific to each unit.)

Week of Instruction (Tentative)	Title of Unit	Big Idea(s)	Standard(s) Addressed	Enduring Understanding(s)	Essential Question(s)	Common	Common Resource(s)* Used
Week 1	Atmosphere	<b>Patterns</b> Atmosphere Radiation	3.2.10.B6: PATTERNS SCALE MODELS CONSTANCY/ CHANGE Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.  S11.D.2.1.1: Describe how changes in concentration of minor components (e.g., O <sub>2</sub> , CO <sub>2</sub> , dust, pollution) in Earth's atmosphere may be linked to climate change.  S11.D.2.1.2: Compare the transmission, reflection, absorption, and	The composition, structure, and properties of Earth's atmosphere form the basis of Earth's weather.	<ol style="list-style-type: none"> <li>1. What is the gas and particle composition of the atmosphere?</li> <li>2. What are the five layers of the atmosphere?</li> <li>3. How is energy transferred in the atmosphere?</li> <li>4. What are the 3 main properties of the atmosphere and how do they interact?</li> <li>5. Why do the properties of the atmosphere change with altitude?</li> </ol>		

			radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer, increased global cloud cover).				
Week 2	Clouds	<b>Patterns</b> Clouds Precipitation	<p>3.3.10.A6: Interpret meteorological data to describe and/or predict weather. Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns</p> <p>S11.D.2.1.2: Compare the transmission, reflection, absorption, and radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer, increased global cloud</p>	The clouds are an indicator of what form of weather we are going to occur.	<ol style="list-style-type: none"> <li>1. What is the difference between stable and unstable air?</li> <li>2. How do low, middle, high, and vertical development clouds differ?</li> <li>3. How does precipitation form?</li> </ol>		

			cover).				
Week 3 &4	Weather	<b>Patterns Systems Analysis</b> Weather Climate Air Masses Fronts	3.3.10.A6: Interpret meteorological data to describe and/or predict weather. Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns  3.1.12.A8: CHANGE AND CONSTANCY -Describe and interpret dynamic changes in stable systems.  S11.D.2.1.4: Analyze weather maps and weather data (e.g., air masses, fronts, temperature, air pressure, wind speed, wind direction, precipitation) to predict regional or global weather events.	Weather patterns can be observed, analyzed, and predicted.	<ol style="list-style-type: none"> <li>1. What is the difference between weather and climate?</li> <li>2. How do imbalances in the heating of Earth's surface create weather?</li> <li>3. How do air masses form?</li> <li>4. What are the five types of air masses?</li> <li>5. What are the similarities and differences between the three major wind systems?</li> <li>6. What are the four types of fronts?</li> <li>7. How do high and low pressure systems differ?</li> </ol>		
Week 5	Weather	<b>Analysis</b> Weather Instruments Radar Satellites Forecasts	3.2.10.B7: Compare and contrast scientific theories. Know that both direct and indirect observations are used by scientists to study the	Weather patterns can be observed, analyzed, and predicted.	<ol style="list-style-type: none"> <li>1. Why is accurate weather data important?</li> <li>2. What are some of the instruments used to collect weather data from the Earth's</li> </ol>		

			<p>natural world and universe.  Identify questions and concepts that guide scientific investigations.  Formulate and revise explanations and models using logic and evidence.  Recognize and analyze alternative explanations and models.</p> <p>3.3.12.A1:  Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy</p> <p>S11.D.2.1.4:  Analyze weather maps and weather data (e.g., air masses, fronts, temperature, air pressure, wind speed,</p>		<p>surface?</p> <ol style="list-style-type: none"> <li>3. What are the strengths and weaknesses of weather radar and weather satellites?</li> <li>4. What information is on a basic surface weather chart?</li> <li>5. How does digital and analog forecasting differ?</li> <li>6. What are problems associated with long term forecasts?</li> </ol>		
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			wind direction, precipitation) to predict regional or global weather events.				
Week 6 &7	Storms	<b>Patterns</b> Thunderstorms Hurricanes Tropical Cyclones	3.3.10.A6: Interpret meteorological data to describe and/or predict weather. Explain the phenomena that cause global atmospheric processes such as storms, currents, and wind patterns.	The exchange of thermal energy in the atmosphere sometimes occurs with great violence that varies in form, size, and duration.	<ol style="list-style-type: none"> <li>1. How do thunderstorms develop?</li> <li>2. What are the different types of thunderstorms?</li> <li>3. What is the life cycle of a thunderstorm?</li> <li>4. Why are some storms more severe compared to others?</li> <li>5. How do tornadoes form?</li> <li>6. How do tropical cyclones form?</li> <li>7. What is the life cycle of a tropical cyclone?</li> <li>8. What are the dangers associated with hurricanes?</li> <li>9. What are the problems associated with recurring weather patterns?</li> <li>10. What atmospheric events cause recurring weather patterns?</li> <li>11. How do heat waves and cold waves differ?</li> </ol>		
Week 8	Climate	Models <b>Patterns</b> Climate	S11.D.2.1.2: Compare the transmission, reflection, absorption,	The different climates on Earth are influenced by natural factors as well as	<ol style="list-style-type: none"> <li>1. Why do climates vary?</li> <li>2. How do temperatures in different regions on</li> </ol>		

		<p>Greenhouse Effect Human Impact</p>	<p>and radiation of solar energy to and by Earth's surface under different environmental conditions (e.g., major volcanic eruptions, greenhouse effect, reduction of ozone layer, increased global cloud cover).</p> <p>3.3.12.A7: MODELS -Interpret and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. CONSTANCY/CHANGE - Infer how human activities may impact the natural course of Earth's cycles. PATTERNS -Summarize the use of data in understanding seismic events, meteorology, and geologic time.</p>	<p>human activities.</p>	<p>the Earth differ?</p> <ol style="list-style-type: none"> <li>3. What criteria do we use to classify climates?</li> <li>4. What are natural causes of climate change?</li> <li>5. Why do climatic changes occur?</li> <li>6. What is the greenhouse effect?</li> <li>7. What is global warming?</li> <li>8. How do humans impact climate?</li> </ol>		
Week 9	Viewing the Universe	Invention Electromagnetic Radiation Telescopes	3.4.10.B4: Recognize that technological development has been evolutionary, the result of a series of	From studying the universe using telescopes and the naked eye one can make a hypothesis of the organization and function of the universe.	<ol style="list-style-type: none"> <li>1. What is the electromagnetic spectrum?</li> <li>2. What can the electromagnetic spectrum tell us</li> </ol>		

			<p>refinements to a basic invention.</p> <p>S11.A.2.2.2: Explain how technology (e.g., GPS, spectroscope, scanning electron microscope, pH meter, probe, interface, imaging technology, telescope) is used to extend human abilities and precision.</p>		<p>about space?</p> <ol style="list-style-type: none"> <li>How does a telescope work?</li> <li>What is the purpose of studying space?</li> </ol>		
Week 10& 11	Earth/Moon	<p><b>Systems</b></p> <p>Earth Motion</p> <p>Seasons</p> <p>Moon Motion</p> <p>Phases</p> <p>Eclipses</p>	<p>3.3.12.A1: Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy</p> <p>3.1.12.A8: CHANGE AND CONSTANCY -Describe and interpret dynamic</p>	The Sun, Earth, and Moon form a dynamic system that influences all life on Earth.	<ol style="list-style-type: none"> <li>How are the lunar properties and structures described?</li> <li>What are the features of the Moon?</li> <li>What is the theory of the Moon's origin and formation?</li> <li>What are the relative positions and motions of the Sun, Earth, and the Moon?</li> <li>What are the phases of the Moon?</li> <li>Why do we have seasons and phases of the moon?</li> <li>What are differences between solstices and equinoxes?</li> <li>How are eclipses of the Moon and the Sun</li> </ol>		

			<p>changes in stable systems.</p> <p>S11.D.3.1.1: Describe planetary motion and the physical laws that explain planetary motion.</p>		explained?		
Week 12 & 13	Formation of the Solar System	<p><b>Systems</b></p> <p><b>Patterns</b></p> <p>Formation</p> <p>Exploration</p> <p>Models</p> <p>Outer Planets</p> <p>Inner Planets</p>	<p>3.3.12.A1: Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy</p> <p>S11.D.3.1.3: Explain the current scientific theories of the origin of the solar system and universe (e.g., big bang theory, solar nebular theory, stellar evolution)</p>	Using the laws of motion and gravitation, astronomers can understand the orbits and the properties of the planets and other objects in the solar system.	<ol style="list-style-type: none"> <li>1. How did the solar system form?</li> <li>2. What are some of the early concepts of the structure of the solar system?</li> <li>3. How has our current knowledge of the solar system developed?</li> <li>4. What is the relationship between gravity and the motions of the objects in the solar system?</li> <li>5. How are the characteristics of the inner planets similar?</li> <li>6. How are the terrestrial planets different from each other?</li> <li>7. What are the similarities and difference between the outer planets?</li> <li>8. What are the major</li> </ol>		

					<p>moons?</p> <p>9. How do moons and rings form?</p> <p>10. How do the Sun and the Gas Giant compare in composition?</p>		
Week 14	Minor Members of the Solar System	<b>Systems</b> Asteroids Meteors Comets	<p>3.3.12.A1: Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy</p> <p>S11.D.3.1.3: Explain the current scientific theories of the origin of the solar system and universe (e.g., big bang theory, solar nebular theory, stellar evolution)</p>	Using the same rules that apply to the planets astronomers can understand the orbits and properties of the minor member of the solar system.	<p>1. What are difference between a dwarf planet and a planet?</p> <p>2. What are the oldest members of the solar system?</p> <p>3. How do comets, meteors, and asteroids compare and contrast from one another?</p> <p>4. What can be learned from studying the minor members of the solar system?</p> <p>5. What are structure and behavior or comets, meteors, and asteroids?</p>		
Week 15	The Sun	<b>Patterns</b> Sun	3.2.10.B6: PATTERNS SCALE MODELS CONSTANCY/	The sun provides Earth with more than just heat. All living things on Earth	<p>1. What are the layers and features of the Sun?</p>		

			<p>CHANGE-Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.</p> <p>S11.D.3.1.2: Describe the structure, formation, and life cycle of stars.</p>	depend, either directly or indirectly.	<ol style="list-style-type: none"> <li>2. How is the process of energy production in the Sun explained?</li> <li>3. How do the different Sun parts affect the Earth?</li> </ol>		
Week 16	Stars	<p><b>Patterns</b> Correlation Star Characteristics Stellar Evolution</p>	<p>3.2.10.B6: PATTERNS SCALE MODELS CONSTANCY/ CHANGE-Explain how the behavior of matter and energy follow predictable patterns that are defined by laws.</p> <p>S11.D.3.1.2: Describe the structure, formation, and life cycle of stars.</p>	The life cycle of every star is determined by its mass, luminosity, magnitude, temperature, and composition.	<ol style="list-style-type: none"> <li>1. How are distances between stars measured?</li> <li>2. What is the difference between brightness and luminosity?</li> <li>3. What are the properties used to classify stars?</li> <li>4. What is the relationship between mass and star's evolution?</li> <li>5. What are the different features of massive and regular star life cycles?</li> <li>6. How is the universe affected by the life cycles of a star?</li> </ol>		
Week 17 & 18	Galaxies and the Universe	<p><b>Systems</b> <b>Patterns</b> Proof Galaxies Universe Big Bang Theory</p>	<p>3.3.12.A1: Explain how parts are related to other parts in weather systems, solar systems, and earth systems, including how the output from one part</p>	Observations of galaxy expansion, cosmic background radiation, and the Big Band Theory describe an expanding universe that is about 14 billion years old.	<ol style="list-style-type: none"> <li>1. What is the size and shape of our galaxy?</li> <li>2. What are the different kinds of variable stars?</li> <li>3. Where are the different types of</li> </ol>		

			<p>can become an input to another part. Analyze the processes that cause the movement of material in the Earth's systems. Classify Earth's internal and external sources of energy such as radioactive decay, gravity, and solar energy</p> <p>S11.D.3.1.3: Explain the current scientific theories of the origin of the solar system and universe (e.g., big bang theory, solar nebular theory, stellar evolution)</p>		<p>stars in the galaxy located?</p> <ol style="list-style-type: none"> <li>4. How do astronomers classify galaxies?</li> <li>5. How are galaxies organized into clusters and super clusters?</li> <li>6. How is the expansion of the universe described?</li> </ol>		
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\* Some teachers may need to think about the assessments and resources used in order to determine the Big Ideas, Enduring Understandings, and Essential Questions embedded in their courses. At this point in your curriculum mapping, you might want to ignore the “Common Assessments” and “Common Resources Used” columns. However, you may use them if you wish.