

# **Astronomy**

## **Grades 10-12**

**Prepared by:**

Deb Marks

***Superintendent of Schools:***

Marie C. Cirasella, Ed.D.

Approved by the Midland Park Board of Education on

June 21, 2022

# Astronomy

**Course Description:**

This course will introduce students to the exploration, composition, behavior and structure of the universe. This elective course will provide the student with a study of the universe and the conditions, properties, and motions of bodies in space. The topics of study include, but not limited to, historical studies of space, astronomical instruments and tools, the physical features of the solar system, the earth as a system in space, other space bodies, stars and the future of space exploration. Aspects of the physical sciences, engineering, technology & applications of science are taught throughout this half year course. A guided inquiry program gives students the opportunity to explore topics and concepts through investigations. Participating in this hands-on program helps students:

1. To foster a life-long enjoyment of learning science.
2. To observe science in the world around them.
3. To meet the science standards for New Jersey Public Schools.

**Course Sequence:**

Suggested Course Sequence\*:

**Unit One:** Historical Perspective of Space Exploration and Astronomy (2 weeks)

**Unit Two:** Tour of the Solar System (3-4 weeks)

**Unit Three:** Technology, Light and Telescopes (3 weeks)

**Unit Four:** The Earth as a Planet and its One Moon (3-4 weeks)

**Unit Five:** Energy in the Stars and Galaxies (3 weeks)

**Unit Six:** The Future of Exploration and Knowledge of Space (3-4 weeks)

**Pre-Requisites:**

none

*\*The number of instructional days is an estimate based on the information available at this time. 1 day equals approximately 48 minutes of seat time. Teachers are strongly encouraged to review the entire unit of study carefully and collaboratively to determine whether adjustments to this estimate need to be made.*

**Unit # 1**

**Overview**

**Content Area: Astronomy**

**Unit Title: 1 Historical Perspective of Space Exploration and Astronomy**

**Grade Level: 10-12**

**Core Ideas:** Students will analyze the dynamic nature of astronomy by comparing and contrasting evidence supporting current

views of the universe with historical views, while studying the contributions of various people and programs to space exploration.

**Standards (Content and Technology)**

**CPI#:**

**Statement:**

**Performance Expectations (NJSLs)**

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.

HS-ESS1-4

Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

**Career Readiness, Life Literacies, and Key Skills**

9.1.12.EG.3 Explain how individuals and businesses influence government policies.

9.1.12.FP.3 Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.

9.2.12.CAP.3 Investigate how continuing education contributes to one's career and personal growth. 9.4.12.IML.2 Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.

**Computer Science and Design Thinking**

8.1.12.IC.1 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

8.1.12.IC.2 Test and refine computational artifacts to reduce bias and equity deficits.

8.1.12.IC.3 Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.

8.2.12.ITH.3 Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.

8.2.12.ETW.4

Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.

**Interdisciplinary Connection**

NJSLs.A-SSE.A.1

Interpret expressions that represent a quantity in terms of its context.

NJSLs.A-CED.4

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

**Companion Standards ELA/L**

NJLSA.R1.

Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

NJLSA.R2.

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

NJLSA.R23

Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

NJLSA.R24

Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

RI.11-12.1

Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the

	text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
<b>Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)</b>	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our exploration of space	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	

Midland Park Public Schools

7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

**Unit Essential Question(s):**

- How has our knowledge of space expanded and changed through history?
- What is the relevance of certain experimental work and explorations?
- How is Astronomy an ever changing science?

**Unit Enduring Understandings:**

- Satellites, probes, rovers, and manned space shuttles are used to collect data about objects within our solar system.
- Technological advances that were developed by the space program have influenced our lives.
- Astronomy is a very dynamic science because new discoveries are made everyday

**Evidence of Learning**

**Formative Assessments:**

Teacher feedback, class discussion

**Summative/Benchmark Assessment(s):**

Journals, Quizzes, Tests, Labs, Projects

**Resources/Materials:**

Crash Course “Astronomy”

[National Science Foundation](#)

[Astronomy.org](#)

<https://www.nasa.gov>

**Key Vocabulary:**

Astronomer

Satellite

Probe

Rocket

Missile

Capsule

**Suggested Pacing Guide**

**Lesson**

**Student Learning Objective(s) Suggested Tasks/Activities: Day(s) to Complete Name/Topic**

Intro Activity Recognize the various events in the space

exploration in history  
 Video Clip View and discuss the launch of rockets and  
 satellites

Class Discussion 2

Notes Presentation	Name and describe several key events in the early days of space explorations Teacher directed presentation of notes	1-2
Edpuzzle quiz	Identify people, places and things Edpuzzle	1
Research	Make a claim about the most important event, person, machine... in space exploration history Who/What? Research	4
Assessment	Demonstrate understanding and appreciation of the history of space exploration Project and Presentations	2

**Teacher Notes:** Activities will be adjusted as current events and news arise.

**Additional Resources:**  
 research sources

**Differentiation/Modification Strategies**

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
<ul style="list-style-type: none"> <li>Consult student IEP</li> <li>Allow errors</li> <li>Rephrase questions, directions, and explanations</li> <li>Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>	<ul style="list-style-type: none"> <li>Consult ELL student Plan</li> <li>Assign a buddy, same language or English speaking</li> <li>Allow errors in speaking</li> <li>Rephrase questions, directions, and explanations</li> <li>Allow extended time to answer questions</li> </ul>	<ul style="list-style-type: none"> <li>Consult G and T teacher</li> <li>Provide extension activities</li> <li>Build on students' intrinsic motivations</li> <li>Higher Level mathematical computations</li> </ul>	<ul style="list-style-type: none"> <li>Consult with IR&amp;S as needed</li> <li>Provide extended time to complete tasks</li> <li>Consult with Guidance</li> </ul>	<ul style="list-style-type: none"> <li>Consult 504 Plan</li> <li>Allow errors</li> <li>Rephrase questions, directions, and explanations</li> <li>Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>

Midland Park Public Schools  
 Midland Park Public Schools

**Unit # 2 -**

**Overview**

**Content Area: Astronomy**

**Unit Title: 2 Tour of the Solar System**

<b>Grade Level: 10-12</b>	
<b>Core Ideas:</b> Students will describe the scientific view of the origin of the universe, the evolution of matter and the development of resulting celestial objects.	
<b>Standards (Content and Technology)</b>	
<b>CPI#:</b>	<b>Statement:</b>
<b>Performance Expectations (NJSL)</b>	
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.
HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
<b>Career Readiness, Life Literacies, and Key Skills</b>	
9.1.12.EG.3 9.1.12.FP.3	Explain how individuals and businesses influence government policies. Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.
9.2.12.CAP.3 Investigate how continuing education contributes to one's career and personal growth. 9.4.12.IML.2 Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.	
<b>Computer Science and Design Thinking</b>	
8.1.12.IC.1 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.	
8.1.12.IC.2 Test and refine computational artifacts to reduce bias and equity deficits.	
8.1.12.IC.3 8.2.12.ITH.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources. Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
<b>Interdisciplinary Connection</b>	
NJSLA.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLA.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
<b>Companion Standards ELA/L</b>	
NJLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJLSA.R23	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

NJSLSA.R24	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
<b>Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)</b>	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our astronomy knowledge	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	

Midland Park Public Schools

7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.
<p><b>Unit Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• What evidence is there that supports our understanding of the solar systems and the universe?</li> <li>• What are the major properties and components of celestial objects?</li> <li>• How are planets, stars and other space objects the same and different?</li> </ul> <p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>• Our solar system consists of the Sun and everything that orbits the Sun. (includes 8 planets, moons (satellites), dwarf planets, asteroids, meteoroids, comets, Asteroid belt, Kuiper belt, and the Oort cloud).</li> <li>• The planets orbit the sun and rotate in the same direction.</li> <li>• Planets are classified by density as either inner planets or outer planets.</li> <li>• Properties of planets can be determined by observations and calculations based on Kepler’s and Newton’s Laws. The objects of the solar system formed at the same time, 4.6 billion years ago, from a rotating cloud of gas and dust.</li> </ul>	
<b>Evidence of Learning</b>	
<p><b>Formative Assessments:</b> Teacher feedback, class discussion</p> <p><b>Summative/Benchmark Assessment(s):</b> Journals, Quizzes, Tests, Labs, Projects</p>	
<p><b>Resources/Materials:</b> Crash Course “Astronomy” <a href="#">National Science Foundation</a></p> <p><b>Key Vocabulary:</b> Asteroids Meteorites Comets Meteors</p>	

**Suggested Pacing Guide**

<b>Lesson Name/Topic</b>	<b>Student Learning Objective(s) Suggested Tasks/Activities:</b>	<b>Day(s) to Complete</b>
Intro	Model the relative distances from the sun of	2
Activity	each planet in our solar system	2-3
Video	Describe the features of the various objects in	
Study	the Solar System	
Notes Presentation	Identify similarities and differences Graphic Organizer	2-3
Label and design	Create Model of Solar System Group project	4-5
Edpuzzle Quiz	Demonstrate ability to match description to object	1
Virtual Activity	Explore Solar system Solar System Scope website	2
Lab/Hands on Investigation	Gather information that supports our understanding of the solar system	2-3
Assessment	Summarize the objects of our solar system Assessment	1-2

**Teacher Notes:** News articles added as needed**Additional Resources:**<https://www.solarsystemscope.com/>**Differentiation/Modification Strategies**

<b>Students with Disabilities</b>	<b>English Language Learners</b>	<b>Gifted and Talented Students</b>	<b>Students at Risk</b>	<b>504 Students</b>
-----------------------------------	----------------------------------	-------------------------------------	-------------------------	---------------------



<ul style="list-style-type: none"> <li>● Consult student IEP</li> <li>● Allow errors <ul style="list-style-type: none"> <li>● Rephrase questions, directions, and explanations</li> </ul> </li> <li>● Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>	<ul style="list-style-type: none"> <li>● Consult ELL student Plan</li> <li>● Assign a buddy, same language or English speaking</li> <li>● Allow errors in speaking <ul style="list-style-type: none"> <li>● Rephrase questions, directions, and explanations</li> </ul> </li> <li>● Allow extended time to answer questions</li> </ul>	<ul style="list-style-type: none"> <li>● Consult G and T teacher</li> <li>● Provide extension activities</li> <li>● Build on students' intrinsic motivations</li> <li>● Higher Level mathematical computations</li> </ul>	<ul style="list-style-type: none"> <li>● Consult with IR&amp;S as needed</li> <li>● Provide extended time to complete tasks</li> <li>● Consult with Guidance</li> </ul>	<ul style="list-style-type: none"> <li>● Consult 504 Plan</li> <li>● Allow errors <ul style="list-style-type: none"> <li>● Rephrase questions, directions, and explanations</li> </ul> </li> <li>● Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>
---	--	---	---	--

Midland Park Public Schools

**Unit #3 -**

**Overview**

**Content Area: Astronomy**

**Unit Title: 3** Technology, Light and Telescopes

**Grade Level: 10-12**

**Core Ideas:** Students will explain the tools used by astronomers to study electromagnetic radiation to determine the composition, motions, and other physical attributes of astronomical objects.

**Standards (Content and Technology)**

**CPI#:**

**Statement:**

**Performance Expectations (NJSL)**

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.

HS-ESS1-4

Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

**Career Readiness, Life Literacies, and Key Skills**

9.1.12.EG.3

Explain how individuals and businesses influence government policies.

9.1.12.FP.3

Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.

9.2.12.CAP.3

Investigate how continuing education contributes to one's career and personal growth.

9.4.12.IML.2

Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources.

**Computer Science and Design Thinking**

8.1.12.IC.1	Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.
8.1.12.IC.2	Test and refine computational artifacts to reduce bias and equity deficits.
8.1.12.IC.3	Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.
8.2.12.ITH.3	Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.

**Interdisciplinary Connection**

NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

**Companion Standards ELA/L**

NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R23	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R24	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem

**Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)**

Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our astronomy technology
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)
Develop, implement and model effective problem solving and critical thinking skills (CASEL)

**Midland Park Public Schools**

7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

**Unit Essential Question(s):**

- How are the properties of light both a challenge and a tool in our study of the universe?
- What are the different types of telescopes and their uses?
- How does spectroscopy provide information about the inherent properties and motion of objects in space?
- How did the invention of the telescope influence science?
- How do telescopes work?

**Unit Enduring Understandings:**

- The use of scientific instruments, specifically the optical telescope, led to great advancements in the understanding of our universe.
- Telescopes work by collecting radiation, which can be converted into a picture.
- Satellites, probes, rovers, and manned space shuttles are used to collect data about objects within our solar system.
- Technological advances that were developed by the space program have influenced our lives.
- Astronomy is a very dynamic science because new discoveries are made everyday

**Evidence of Learning****Formative Assessments:**

Teacher feedback, class discussion

**Summative/Benchmark Assessment(s):**

Journals, Quizzes, Tests, Labs, Projects

**Resources/Materials:**

Crash Course “Astronomy”

[National Science Foundation](#)

[Astronomy.org](#)

**Key Vocabulary:**

Electromagnetic Radiation

Wavelength

Spectrum

Telescopes

Refracting

Reflecting

Optical

Convex

Concave

**Suggested Pacing Guide**

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete
Intro Activity	Explain the challenges faced by astronomers due to the properties of light and the vast distances in the cosmos  Create a timeline of how telescopes have developed over time.	1

Crash Course Video #24 & 25	Evaluate the types of telescopes used by astronomers for examining different frequencies of electromagnetic radiation and compare and contrast the uses and advantages of each (e.g. radio, visible, gamma ray, reflector, and refractor).	Describe the uses of telescopes and energy in the study of space in graphic organizer	2
Notes Presentation	Evaluate the types of telescopes used by astronomers for examining different frequencies of electromagnetic radiation and compare and contrast the uses and advantages of each (e.g. radio, visible, gamma ray, reflector, and refractor).	Compare and contrast optical reflecting and refracting telescopes. List the advantages and drawback of optical telescopes.	2-3
Images activity	Discuss how spectroscopy provides information about the inherent properties and motions of objects.	Appreciate how energy is used to create images of objects in space	4-5
Lab/Hands on Investigation	Quantitatively analyze data from telescopes (e.g. spectra, multi-wavelength photometry, and images) and/or other astronomical sources (e.g. tide tables, sky charts).	Summarize the meaning behind provided data	2-3

Midland Park Public Schools

Assessment	Explain how scientific instruments can enhance observations and lead to new discoveries	Assessment	1
------------	---	------------	---

**Teacher Notes:**

Current events (i.e. Mars Rover) applied throughout unit

**Additional Resources:** “Visualization - From Energy to Image” NASA

**Differentiation/Modification Strategies**

<b>Students with Disabilities</b>	<b>English Language Learners</b>	<b>Gifted and Talented Students</b>	<b>Students at Risk</b>	<b>504 Students</b>
-----------------------------------	----------------------------------	-------------------------------------	-------------------------	---------------------

- Consult student IEP
- Allow errors
  - Rephrase questions, directions, and

- explanations
- Allow extended time to answer questions, and permit drawing, as

- an explanation
- Consult ELL student Plan
- Assign a buddy, same language or

- English speaking
- Allow errors in speaking
  - Rephrase questions, directions,

- and explanations
- Allow extended time to answer questions
- Consult G and T

- teacher
- Provide extension activities
  - Build on students' intrinsic motivations
- Higher Level

- mathematical computations
- Consult with IR&S as needed
  - Provide extended time to complete

- tasks
- Consult with Guidance
  - Consult 504 Plan
  - Allow errors
    - Rephrase

- questions, directions, and explanations
- Allow extended time to answer questions, and

permit drawing, as an explanation

Midland Park Public Schools

**Unit # 4**

**Overview**

**Content Area: Astronomy**

**Unit Title: 4 The Earth as a Planet and its One Moon**

**Grade Level: 10-12**

**Core Ideas:** Students will describe and explain our sun -moon - earth system and the astronomical observations made from the point of reference of the Earth.

**Standards (Content and Technology)**

**CPI#:**

**Statement:**

**Performance Expectations (NJSL)**

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.

HS-ESS1-4

Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

**Career Readiness, Life Literacies, and Key Skills**

9.1.12.EG.3

Explain how individuals and businesses influence government policies.

9.1.12.FP.3

Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.

9.2.12.CAP.3

Investigate how continuing education contributes to one's career and personal growth.

9.4.12.TL.1

Assess digital tools based on features such as accessibility options, capacities and utility for accomplishing a specified task

**Computer Science and Design Thinking**

8.1.12.IC.1

Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

8.1.12.IC.2

Test and refine computational artifacts to reduce bias and equity deficits.

8.1.12.IC.3

Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.

8.2.12.ITH.3

Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.

8.2.12.ETW.4

Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the

	competing viewpoints.
<b>Interdisciplinary Connection</b>	
NJSLS.A-SSE .A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
<b>Companion Standards ELA/L</b>	
NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R23	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R24	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
<b>Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)</b>	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our understanding of Earth in space	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	

**Midland Park Public Schools**

7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.

**Unit Essential Question(s):**

- How do the sun, the earth and the moon interact?
- How do the positions of the three allow us to predict and observe various phenomena?
- How are various laws of science observable in this system?
- What are the various phenomena that occur throughout the earth, moon and sun cycles?

**Unit Enduring Understandings:**

- Objects appear to move through the sky due to the rotation of the earth.
- The axis on which the Earth rotates is tilted relative to its orbital plane.
- The tilt combined with Earth's revolution around the Sun causes changes in the amount of heating throughout the year.
- Constellations are patterns of the stars created by ancient civilizations. They have been used for navigating and creating calendars.
- The Earth's orbit is slightly elliptical. Earth is closer to the Sun during the Northern Hemisphere's winter.
- As the Moon revolves we see different amounts of its lighted half; these are called phases. The Moon's rotational and orbital period are both 27.3 days allowing us to only see one side of the moon from Earth.
- Zodiac constellations are a group of star patterns centered on the plane of the Earth's orbit.
- The Moon and Sun cause the tides. Tides have a daily and monthly set of changes.

**Evidence of Learning****Formative Assessments:**

Teacher feedback, class discussion

**Summative/Benchmark Assessment(s):**

Journals, Quizzes, Tests, Labs, Projects

**Resources/Materials:**

Crash Course "Astronomy"

[National Science Foundation](#)

[Astronomy.org](#)

**Key Vocabulary:**

Earth-Moon-Sun system

Constellation

Eclipse (Lunar, Solar)

Elliptical Orbit

Neap Tide

Orbital Period

Spring Tide

Penumbra

Umbra

**Suggested Pacing Guide**

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete
Intro Activity	Distinguish facts from common Myth or Fact	1

	misconceptions	
Crash Courses: 4,5,10,11	Evaluate the effects of the relative positions of the Earth, moon, and sun on observable phenomena, e.g. phases of the moon, eclipses, seasons, and diurnal cycles.	Describe the features and interaction of the Earth-Moon Sun System 2
Lab/Hands on Investigation	Describe how latitude and time of the year affect visibility of constellations.	Plot the Apparent Motion of the Stars 2-3
Poster	Predict visibility of planets (major and minor) in the solar system based on relative orbital motion.	Diagram the moving planets 2-3
Virtual Investigation	Evaluate the effects of the relative positions of the Earth, moon, and sun on observable	Name the Tides and Phases of the Moons and Eclipses 3-4

Midland Park Public Schools

	phenomena, e.g. phases of the moon, eclipses, seasons, and diurnal cycles.	
--	--	--

**Teacher Notes:**

**Additional Resources:**

<https://www.edumedia-sciences.com/en/media/899-tides>  
<https://www.earthspacelab.com/app/eclipse/>

**Differentiation/Modification Strategies**

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
<ul style="list-style-type: none"> <li>Consult student IEP</li> <li>Allow errors               <ul style="list-style-type: none"> <li>Rephrase questions, directions, and explanations</li> </ul> </li> <li>Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>	<ul style="list-style-type: none"> <li>Consult ELL student Plan</li> <li>Assign a buddy, same language or English speaking</li> <li>Allow errors in speaking               <ul style="list-style-type: none"> <li>Rephrase questions, directions, and explanations</li> </ul> </li> <li>Allow extended time to answer questions</li> </ul>	<ul style="list-style-type: none"> <li>Consult G and T teacher</li> <li>Provide extension activities</li> <li>Build on students' intrinsic motivations</li> <li>Higher Level mathematical computations</li> </ul>	<ul style="list-style-type: none"> <li>Consult with IR&amp;S as needed</li> <li>Provide extended time to complete tasks</li> <li>Consult with Guidance</li> </ul>	<ul style="list-style-type: none"> <li>Consult 504 Plan</li> <li>Allow errors               <ul style="list-style-type: none"> <li>Rephrase questions, directions, and explanations</li> </ul> </li> <li>Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>



## Unit # 5 -

**Overview****Content Area: Astronomy****Unit Title: 5 Energy in the Stars and Galaxies****Grade Level: 10-12**

**Core Ideas:** Students will evaluate the significance of energy transfers and energy transformations in understanding the universe. Students will be involved in a study of the various stars and the galaxies; their characteristics and behaviors.

**Standards (Content and Technology)****CPI#:****Statement:****Performance Expectations (NJSL)**

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.

HS-ESS1-4

Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.

**Career Readiness, Life Literacies, and Key Skills**

9.1.12.EG.3 Explain how individuals and businesses influence government policies.

9.1.12.FP.3

Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.

9.2.12.CAP.3

Investigate how continuing education contributes to one's career and personal growth.

9.4.12.TL.1 Assess digital tools based on features such as accessibility options, capacities and utility for accomplishing a specified task

**Computer Science and Design Thinking**

8.1.12.IC.1

Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

8.1.12.IC.2

Test and refine computational artifacts to reduce bias and equity deficits.

8.1.12.IC.3

Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.

8.2.12.ITH.3

Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.

8.2.12.ETW.4

Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.

**Interdisciplinary Connection**NJSL.S.A-SSE  
.A. 1

Interpret expressions that represent a quantity in terms of its context.

NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
<b>Companion Standards ELA/L</b>	
NJSLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJSLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJSLSA.R23	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJSLSA.R24	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
<b>Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)</b>	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community has had on our star and galaxy knowledge	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	

**Midland Park Public Schools**

Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.
7.1.AL.IPRET.9	Differentiate facts from opinions by accurately answering most questions that require inferring implied meanings.
<p><b>Unit Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>● How does energy relate to the life cycles of stars?</li> <li>● What determines the luminosity of stars?</li> <li>● In what ways is the transfer of energy and energy transformation associated with the motion and interactions of celestial bodies?</li> <li>● How do stars go through a “life cycle”?</li> </ul>	
<p><b>Unit Enduring Understandings:</b></p> <ul style="list-style-type: none"> <li>● The Sun contains most of the mass of the solar system and is fueled by the fusion of hydrogen into helium.</li> <li>● Solar activity varies, sometimes producing large flares that affect Earth’s radio communications and cause Auroras.</li> <li>● Stars are classified by their size and brightness.</li> <li>● Stars are formed with a limited amount of fuel that eventually runs out.</li> <li>● Massive stars explode into supernovas and produce the heavier elements in the universe and can collapse into black holes.</li> </ul>	
<b>Evidence of Learning</b>	

**Formative Assessments:**

Teacher feedback, class discussion

**Summative/Benchmark Assessment(s):**

Journals, Quizzes, Tests, Labs, Projects

**Resources/Materials:**Crash Course "Astronomy"  
National Science Foundation  
Astronomy.org**Key Vocabulary:****Suggested Pacing Guide**

Lesson Name/Topic	Student Learning Objective(s) Suggested Tasks/Activities:	Day(s) to Complete
Intro Activity  Crash Course Video #24, 26	Relate nuclear fusion reactions and mass-energy equivalence to the life cycle of stars.  Explain the relationship between the energy produced by fusion in stars to the luminosity.  Explain how solar wind is created and its influence on Earth's magnetic sphere.  Compile a list of conditions necessary for the formation of auroras.  Use concepts in videos to describe the features, life cycles and types of stars	1  1
Notes Presentation	Analyze the energy relationships between the mass, power output, and life span of stars.  Review notes on life cycles and types of stars	1-2
Lab and Edpuzzle Quiz	Analyze the energy relationships between the mass, power output, and life span of stars.  Start Cluster Quiz	2-3
Virtual Activity	Describe the life cycle of a star and explain the role gravity and mass play in the brightness, life span, and end-stages of stars.  Measure and Classify Stars	2-3
Lab/Hands on Investigation	Describe the life cycle of a star and explain the role gravity and mass play in the brightness, life span, and end-stages of stars.  Calculate the luminosity of a star using apparent magnitude and distance	2

**Teacher Notes:** update as more knowledge is gained from newer telescopes etc.**Additional Resources:**

Solar scope website/app

**Differentiation/Modification Strategies**

<b>Students with Disabilities</b>	<b>English Language Learners</b>	<b>Gifted and Talented Students</b>	<b>Students at Risk</b>	<b>504 Students</b>
-----------------------------------	----------------------------------	-------------------------------------	-------------------------	---------------------

<ul style="list-style-type: none"> <li>• Consult student IEP</li> <li>• Allow errors <ul style="list-style-type: none"> <li>• Rephrase questions, directions, and explanations</li> </ul> </li> <li>• Allow extended time to answer questions, and</li> </ul>	<ul style="list-style-type: none"> <li>• Consult ELL student Plan</li> <li>• Assign a buddy, same language or English speaking</li> <li>• Allow errors in speaking</li> </ul>	<ul style="list-style-type: none"> <li>• Consult G and T teacher</li> <li>• Provide extension activities</li> <li>• Build on students' intrinsic motivations</li> </ul>	<ul style="list-style-type: none"> <li>• Consult with IR&amp;S as needed</li> <li>• Provide extended time to complete tasks</li> <li>• Consult with Guidance</li> </ul>	<ul style="list-style-type: none"> <li>• Consult 504 Plan</li> <li>• Allow errors <ul style="list-style-type: none"> <li>• Rephrase questions, directions, and explanations</li> </ul> </li> <li>• Allow extended time to answer questions, and</li> </ul>
---	---	---	---	--

MidlandParkPublicSchools

permitdrawing,as anexplanation	<ul style="list-style-type: none"> <li>•Rephrasequestions , directions,and explanations</li> <li>•Allowextendedtime toanswerquestions</li> </ul>	<ul style="list-style-type: none"> <li>•HigherLevel mathematical computations</li> </ul>	permitdrawing,as anexplanation
-----------------------------------	--	--	-----------------------------------

Midland Park Public Schools

<b>Unit #6</b>	
<b>Overview</b>	
<b>Content Area: Astronomy</b>	
<b>Unit Title: The Future of Exploration and Knowledge of Space</b>	
<b>Grade Level: 1-12</b>	
<b>Core Ideas:</b> Students are introduced to the historical motivation for space exploration. They learn about the International Space Station as an example of space travel innovation and are introduced to new and futuristic ideas that space engineers are currently working on to propel space research far into the future.	
<b>Standards (Content and Technology)</b>	
<b>CPI#:</b>	<b>Statement:</b>
<b>Performance Expectations (NJSL)</b>	
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.
HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
<b>Career Readiness, Life Literacies, and Key Skills</b>	

<p>9.1.12.EG.3 Explain how individuals and businesses influence government policies.</p> <p>9.1.12.FP.3 Relate the concept of delayed gratification (i.e., psychological distance) to meeting financial goals, investing and building wealth over time.</p> <p>9.2.12.CAP.3 Investigate how continuing education contributes to one's career and personal growth. 9.4.12.TL.1 Assess digital tools based on features such as accessibility options, capacities and utility for accomplishing a specified task</p> <p><b>Computer Science and Design Thinking</b></p> <p>8.1.12.IC.1 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.</p> <p>8.1.12.IC.2 Test and refine computational artifacts to reduce bias and equity deficits.</p> <p>8.1.12.IC.3 Predict the potential impacts and implications of emerging technologies on larger social, economic, and political structures, using evidence from credible sources.</p> <p>8.2.12.ITH.3 Analyze the impact that globalization, social media, and access to open source technologies have had on innovation and on a society's economy, politics, and culture.</p>	
8.2.12.ETW.4	Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
<b>Interdisciplinary Connection</b>	
NJSLS.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
NJSLS.A-CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
<b>Companion Standards ELA/L</b>	
NJLSA.R1.	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
NJLSA.R2.	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
NJLSA.R23	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
NJLSA.R24	Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.
RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem
<b>Cross-cultural Statements/Mandates (Amistad, Holocaust, LGBT, etc...)</b>	
Reflect on the influence that Hispanic Americans; Blind, Deaf & Hard of Hearing Americans; members of the AAPI, the LGBTQ and handicapped community will have future exploration of Space	
Recognize the importance of self-confidence in handling daily tasks and challenges (CASEL)	
Develop, implement and model effective problem solving and critical thinking skills (CASEL)	
7.1.AL.IPRET.1	Identify main ideas and significant details in a range of oral, viewed, and written texts.

**Unit Essential Question(s):**

- Why do we explore space?
- What is the value of space exploration?
- How much more will life in space and on Earth change with continued exploration?
- How is technology related to the future of our space knowledge?
- Should we continue to spend money and resources in the pursuit of space exploration?

**Unit Enduring Understandings:**

- There are potential reasons why people want to travel to space.
- Many different types of engineers each contribute to space travel.
- There are endless possibilities for what the future may hold for space travel and how this can affect us.
- Space exploration involves many facets such as financial, political, social issues

**Evidence of Learning****Formative Assessments:**

Teacher feedback, class discussion

**Summative/Benchmark Assessment(s):**

Journals, Quizzes, Tests, Labs, Projects

**Resources/Materials:**

Crash Course "Astronomy"

[National Science Foundation](#)[Astronomy.org](#)**Key Vocabulary:**

Galactic

InterStellar

IntraStellar

Space probes

Space Station

**Suggested Pacing Guide****Lesson****Student Learning Objective(s) Suggested Tasks/Activities: Day(s) to Complete Name/Topic**

Intro Activity Identify and describe products used in daily

List 5 products we use as a result of

1

space exploration

life developed as a result of space exploration.

Videos

Identify and describe the physiological and engineering challenges inherent in long-duration spaceflight

Observe the different ideas about the future of space travel

1

Design and Illustrate

Identify and describe the physiological and engineering challenges inherent in

Illustrate and journal about their own ideas of space travel

1-2

	long-duration spaceflight	
Mission Engineering	Apply knowledge of the physiological and engineering challenges inherent in long-duration spaceflight Design a mission to/through space	2-3
Connections to Biology	Analyze the physiological and engineering challenges inherent in long-duration spaceflight and the effects on life Explore the basic conditions necessary for life and where in the universe these conditions are most likely to exist	1-3
Personal Opinion	Explain solutions and countermeasures used to overcome the challenges of long-duration spaceflight. Is it worth it? Presentation	1

**Teacher Notes:**

**Additional Resources:**

web search, NEWSOLA, [www.nasa.gov](http://www.nasa.gov)

**Differentiation/Modification Strategies**

Students with Disabilities	English Language Learners	Gifted and Talented Students	Students at Risk	504 Students
<ul style="list-style-type: none"> <li>Consult student IEP</li> <li>Allow errors</li> <li>Rephrase questions, directions, and explanations</li> </ul>	<ul style="list-style-type: none"> <li>Consult ELL student Plan</li> <li>Assign a buddy, same language or English speaking</li> </ul>	<ul style="list-style-type: none"> <li>Consult G and T teacher</li> <li>Provide extension activities</li> </ul>	<ul style="list-style-type: none"> <li>Consult with IR&amp;S as needed</li> <li>Provide extended time to complete tasks</li> </ul>	<ul style="list-style-type: none"> <li>Consult 504 Plan</li> <li>Allow errors</li> <li>Rephrase questions, directions, and explanations</li> </ul>

Midland Park Public Schools

<ul style="list-style-type: none"> <li>Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>	<ul style="list-style-type: none"> <li>Allow errors in speaking</li> <li>Rephrase questions, directions, and explanations</li> <li>Allow extended time to answer questions</li> </ul>	<ul style="list-style-type: none"> <li>Build on students' intrinsic motivations</li> <li>Higher Level mathematical computations</li> </ul>	<ul style="list-style-type: none"> <li>Consult with Guidance</li> </ul>	<ul style="list-style-type: none"> <li>Allow extended time to answer questions, and permit drawing, as an explanation</li> </ul>
--	---	--	---	--