

# ASTRONOMY

## Description

This course will focus on the theories and principles of Astronomy, and on the science and practices that are conducted to understand our observations of the universe. Emphasis will be placed on current theories and recent developments in space exploration. Questions about the stars, planets, and universe will be answered through discussion, investigation, and laboratory activities designed to give students a first-hand knowledge of, and appreciation for, the universe in which they live.

## Course Overview

### Course Goals

Students should:

### Essential Questions

- Why do we study the night sky?
- What is the role of energy in our world?
- What is at the edge of our understanding of astronomy?
- What do students need to know prior to using information and technology resources?
- How do students evaluate and use information resources?
- How do students use information and technology to express and communicate ideas?
- What are student responsibilities regarding the use of information and technology?
- How do students evaluate the process and the final product?

### Assessments

### Content Outline

- I. [Unit 1](#) - Astronomy and the Universe
- II. [Unit 2](#) - Information from the Universe
- III. [Unit 3](#) - Our Planetary System
- IV. [Unit 4](#) - Stars and Stellar Evolution
- V. [Unit 5](#) - Science Research

### Standards

Connecticut State Standards are met in the following areas:

[State of Connecticut Science Curriculum Frameworks](#)

### Physics Enrichment Standards

### Grade Level Skills

Students will:

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	<p><i>Motions and Force</i></p> <p><b><u>Earth Science Enrichment Standards</u></b> <i>Earth's Place in the Universe</i></p> <p><a href="#"><u>State of Connecticut Information and Technology Literacy Frameworks</u></a></p> <p><b><u>Information &amp; Technology Literacy Standards</u></b></p> <ul style="list-style-type: none"><li>• <i>Definition and Identification of Information Needs</i></li><li>• <i>Information Processing</i></li><li>• <i>Application</i></li><li>• <i>Responsible Use</i></li><li>• <i>Assessment</i></li></ul>	
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Pacing Guide				
1st Marking Period		2nd Marking Period		
Month 1	Month 2	Month 3	Month 4	Month 5
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
<u><a href="#">Astronomy and the Universe</a></u>	<u><a href="#">Information from the Universe</a></u>	<u><a href="#">Our Planetary System</a></u>	<u><a href="#">Stars and Stellar Evolution</a></u>	<u><a href="#">Science Research</a></u>
4 weeks	3 weeks	5 weeks	3 weeks	2 weeks

**Unit 1 - Astronomy and the Universe, 4 weeks [top](#)**

**Physics Enrichment Standards**

*Motions and Force*

**Gravitation is a universal force that each mass exerts on any other mass**

- The strength of the gravitational attractive force between two masses is proportional to the masses and inversely proportional to the square of the distance between them.

**Unit Objectives**

Students will be able to:

- describe the major contributions of Copernicus, Galileo and Kepler to the study of Astronomy.
- explain the concept of the celestial sphere and how we use angular measurement to locate objects in the sky.
- describe how and why the Sun, Moon, and stars appear to change their positions over time.
- demonstrate how the relative motion of the Sun, Earth and Moon lead to eclipses.
- explain how astronomers measure distances and sizes of objects in the universe.

**Essential Question**

- Why do we study the night sky?

**Focus Questions**

- What is the size or scale of the universe?
- How has our understanding of Astronomy changed during human history?
- What are constellations and how are they identified?
- What is Earth's motion in our solar system?
- How is the Moon's orbit tied to the Earth?

**Assessment**

- Lunar transit lab

**Skill Objectives**

Students will:

- calculate astronomical distances using a variety of units including: kilometers, AU, and light years.
- calculate positions in the Earth/Moon system at various points throughout the year.
- graph the Moon's transit at different phases throughout the lunar cycle.

**Unit 2 – Information from the Universe, 3 weeks [top](#)**

**Earth Science Enrichment Standards**

*Earth's Place in the Universe*

Earth-based and space-based astronomy reveal the structure, scale and changes in stars, galaxies, and the universe over time

- Visual, radio, and x-ray telescopes may be used to collect data that reveal those differences in the life cycles of stars.

**Unit Objectives**

Students will be able to:

- discuss the nature of electromagnetic radiation.
- relate emission spectra to atomic structure.
- explain the types of information that can be obtained by analyzing the spectra of astronomical objects.
- identify different types of telescopes and their uses.
- examine the limitations of making astronomical observations from the ground.

**Essential Question**

- What is the role of energy in our world?

**Focus Questions**

- How do professional and backyard astronomers choose the tools, techniques, and equipment they need to make observations?
- What is the electromagnetic spectrum and how is it useful in astronomy?
- Why is spectroscopy a significant tool in astronomical observations?
- How have telescopes been developed historically and how are they used in modern day?

**Assessments**

- Spectroscopy Lab
- Telescopic observations of celestial objects

**Skill Objectives**

Students will:

- use simple spectrosopes to identify chemical elements.
- use visible light telescopes to complete visual observations of a variety of celestial objects.

**Unit 3 - Our Planetary System, 5 weeks [top](#)**

**Earth Science Enrichment Standards**

*Earth's Place in the Universe*

**Earth-based and space-based astronomy reveal the structure, scale and changes in stars, galaxies, and the universe over time**

- The differences and similarities among the Sun, the terrestrial planets and the gas planets may have been established during the formation of the solar system.
- The solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years.

**Unit Objectives**

Students will be able to:

- outline the theory of solar-system formation.
- discuss the role of collisions in determining planetary characteristics.
- describe the overall scale and structure of the solar system.
- compare and contrast the terrestrial and Jovian planets.
- compare and contrast the characteristics and theories of formation of the Moon and the planets in our solar system.

**Essential Question**

- What is the role of energy in our world?

**Focus Questions**

- What is a planet?
- What is the current theory of planetary system formation?
- How do the properties differ between the terrestrial and Jovian planets?

**Assessment**

- Solar System Modeling

**Skill Objectives**

Students will:

- create a scale model of our solar system.
- use technology to research and share current information about our planetary system.

**Unit 4 - Stars and Stellar Evolution, 3 weeks [top](#)**

**Earth Science Enrichment Standards**

*Earth's Place in the Universe*

**Earth-based and space-based astronomy reveal the structure, scale and changes in stars, galaxies, and the universe over time**

- The Sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium.
- Evidence indicates that all elements with an atomic number greater than that of lithium have been formed by nuclear fusion in stars.

**Unit Objectives**

Students will be able to:

- trace the production of energy by the Sun.
- summarize the composition and properties of the interstellar medium including dark matter.
- summarize the sequence of events leading to star formation.
- analyze the evolution of stars off the main sequence.
- discuss the observations that help verify the theory of stellar evolution.
- discuss the motions of stars through space and how those motions are measured from Earth.
- summarize the events leading to the violent death of a massive star.
- describe the two types of supernovae.
- discuss the nature of neutron stars, pulsars, gamma ray bursts, and black holes.

**Essential Question**

- What is the role of energy in our world?

**Focus Questions**

- What is a star?
- How is the creation of chemical elements related to stars?
- What is the structure and properties of our Sun?
- How are stars classified?
- How do a star's properties effect its life cycle?

**Assessments**

- H-R diagram Lab
- Absolute vs. apparent magnitude lab
- Solar observation lab

**Skill Objectives**

Students will:

- use an H-R diagram to identify stellar properties.
- calculate differences between apparent and absolute magnitude.
- observe solar features using appropriate telescopic equipment.

**Unit 5 - Science Research, 2 week [top](#)**

**Information & Technology Literacy Standards**

***Definition and Identification of Information Needs***

**Students will define their information needs and identify effective courses of action to conduct research and solve problems.**

Students will:

- develop essential questions related to a topic and formulate a research hypothesis related to the topic.

***Information Processing***

**Students will apply information from a variety of sources and formats using evaluative criteria to interpret, analyze, organize and synthesize both print and non-print material.**

Students will:

- organize, analyze and synthesize information to draw meaningful conclusions through written, oral, numeric and visual communications, independently.

***Application***

**Students will use appropriate information and technology to create written, visual, oral and multimedia products to communicate ideas, information or conclusions to others.**

Students will:

- determine appropriate technology(s) and format(s) to clearly present information gathered from a variety of print and non-print resources, for a variety of audiences.

***Responsible Use***

**Students will demonstrate the responsible, legal and ethical use of information resources, computers and other technologies.**

Students will:

- apply established citation standards for a wide range of information sources and formats.

***Assessment***

**Students will assess the effectiveness of their information and technology choices for problem-solving and communication.**

Students will:

- assess, independently, whether their products meet established standards for process, product and presentation.

**Unit Objectives**

Students will be able to:

- develop an Essential Question, along with subsidiary research questions pertinent to the specific topic.

**Essential Question**

- What is at the edge of our understanding of astronomy?
- What do students need to know prior to using

**Assessment**

- Student research project



<ul style="list-style-type: none"> <li>utilize a variety of resources for research so as to draw conclusions about the topic.</li> <li>utilize appropriate technology with which to present findings to the class.</li> <li>properly document all sources using MLA citation format.</li> <li>self-assess to determine the quality of their product before submission.</li> </ul>	<p>information and technology resources?</p> <ul style="list-style-type: none"> <li>How do students evaluate and use information resources?</li> <li>How do students use information and technology to express and communicate ideas?</li> <li>What are student responsibilities regarding the use of information and technology?</li> <li>How do students evaluate the process and the final product?</li> </ul> <p><b><u>Focus Questions</u></b></p> <ul style="list-style-type: none"> <li>Why do we need to continue research on celestial objects that are already known or explored?</li> <li>What can science gain from new research and exploration of a variety of celestial objects, both within and beyond our solar system?</li> <li>What other things are gained from research and exploration in astronomy beyond knowledge of the celestial object in question?</li> </ul>	<p><b><u>Skill Objectives</u></b></p> <p>Students will:</p> <ul style="list-style-type: none"> <li>utilize current resources to obtain information.</li> <li>synthesize findings to answer their Essential Question.</li> <li>present evidence and conclusions to an audience of their peers and instructors.</li> </ul>
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