



# SCHOOL DISTRICT OF THE CHATHAMS CURRICULUM PROFILE TEMPLATE



**CONTENT AREA(S): Science**

**COURSE/GRADE LEVEL(S): Astronomy**

## **I. Course Overview**

Astronomy gives students an opportunity to investigate answers to questions that are as old as mankind itself. As one of the oldest sciences, its roots trace back through time to prehistoric cultures. The science of astronomy explores the events and phenomena that occur beyond our own planet. By looking at real-world data, students will study the stars, planets, and workings of the universe. They also will study the evidence that supports the Big Bang and the implications this theory holds for the universe's future.

## **II. Units of Study**

Unit I: Motions of the Sky within the Earth-Moon-Sun System

Unit II: Planets

Unit III: Tools of Astronomy

Unit IV: Stars

Unit V: The Universe

## **III. Essential Questions**

### **Unit I: Motions of the Sky within the Earth-Moon-Sun System**

- How does the position of the sun in the sky change throughout the day and throughout the year? How and why does the daily path of the sun across the sky change for different locations on Earth?
- How and why do stars appear to move across the sky each night and throughout the year?
- How and why do planets appear to move in the sky?
- How do important characteristics of the sun, Earth and the moon compare to one another?

### **Unit II: Planets**

- What planetary characteristics are most important to understanding the origin and structure of planetary systems, and why?
- In what ways does the distance between a planet and the sun affect the characteristics of that planet?
- How have we learned about the other planets and moons in our solar system?
- What conditions make a world habitable?
- What do we know about solar systems other than our own?



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## **Unit III: Tools of Astronomy**

- What can different types of electromagnetic radiation reveal about astronomical objects?
- What are the important properties of electromagnetic radiation, and how are they typically organized?
- How is the technology used to collect electromagnetic radiation and turn it into images?
- What can be learned from analyzing the light from astronomical objects?

## **Unit IV: Stars**

- How do stars differ from moons and planets, and from one another?
- How does the classification of stars help us understand how they evolve over their lifetimes? What happens when different types of stars die?

## **Unit V: The Universe**

- How did the universe come to be what we observe today?
- How do astronomers use astronomical objects and a distance ladder to estimate the size of the universe?
- How do standard candles help astronomers determine the distances to very distant objects in the universe?
- How do astronomers determine the size and age of the universe?

## **IV. Learning Objectives**

### **NGSS**

#### **Science and Engineering Practices**

- Using Mathematics and Computational Thinking
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Developing and Using Models
- Constructing Explanations and Designing Solutions

#### **Disciplinary Core Ideas**

- ESS1.B: Earth and the Solar System
- ESS1.A: The Universe and Its Stars
- PS4.A: Wave Properties
- PS2.B: Types of Interactions
- PS4.B: Electromagnetic Radiation
- PS1.C: Nuclear Processes
- PS3.D: Energy in Chemical Processes and Everyday Life



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## **Crosscutting Concepts**

- Patterns
- Systems and System Models
- Cause and Effect
- Energy and Matter
- Scale Proportion and Quantity

## **V. Instructional Materials**

### **Texts:**

Asbell-Clarke, J.E., Barder, E. M., Edwards, T. E., and Lockwood, J.F. (2010). Investigating Astronomy. Cambridge, MA: It's About Time, Herff Jones Education Division.

### **Supplemental Materials:**

Internet Resources (WebQuests, tutorials, animations, and simulations)

Starry Night Software

Current Events Magazines and Newspapers Assorted Videos and Software programs available through CHS collection

## **VI. Key Performance and Benchmark Tasks**

### **Unit I: Motions of the Sky within the Earth-Moon-Sun System**

- Formulate testable questions related to the daily path of the sun across our local sky and the sky at different locations around the Earth. Use the evidence gathered to develop explanations for the motions of the sun, stars, and planets across the sky.
- Construct and models that support the motion of celestial bodies around the Earth.
- Explain the nature of the controversy in the development of the ideas governed the motions of celestial bodies.
- Identify the relationships among the Earth, Moon, and Sun while arguing for a theory in how the Earth-Moon-Sun System was created.

### **Unit II: Planets**

- Explain the nature of the controversy surrounding the acceptance of the heliocentric model (from a geocentric model) of the universe and explain how emerging technology provided new evidence to support the heliocentric model.
- Identify key characteristics of the planets in the solar system while tracing these characteristics back to the origin of the solar system 5 billion years ago.
- Using knowledge of accepted scientific theories and linking that knowledge to models and evidence, explain how our solar system can be used as a tool for locating planetary systems elsewhere in the universe.
- Critically engage with a current scientific text that describes the process of locating extrasolar planetary systems.



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## Unit III: Tools of Astronomy

- Identify the bands of electromagnetic energy and describe how these bands can be used in astronomy to collect information about the universe.
- Observe a variety of images of celestial objects taken from tools that collect energy in different bands of electromagnetic energy and highlight characteristics of those objects only seen in those particular bands.

## Unit IV: Stars

- While systematically analyzing star data, note features, patterns or contradictions in observations and ask questions about them.
- Recognize patterns of stellar data in H-R Diagrams that suggest a relationship between temperature, luminosity, and mass; and explain how this relates to various stages of a star's life. • Provide causal explanations for the fate of stars of different sizes.

## Unit V: The Universe

- Apply mathematical formulas and other techniques to determine the distance and size of objects in the universe.
- Analyze simulated and/or real data to estimate the number of stars in our galaxy and the number of galaxies in our universe.
- Discuss the limitations and precision of the Big Bang theory as the representation of an explanation of the origin of the universe.