

Grand Island Public Schools

ASTROPHYSICS

Course Length: Two semesters

Grade Levels: 11, 12

Prerequisite Courses: Enrolled in Physics and Algebra 3-4

Course Description:

This course addresses the known laws of physics to explore the content and mechanics within the physical universe.

Astrophysics Course Standards

As a result of their participation in this course, students will:

Strand 1: Inquiry and Other Integrated Science Components

- Use scientific inquiry to solve problems and conduct scientific investigations.
 - Formulate questions that guide scientific investigations.
 - Develop a testable hypothesis based on prior scientific knowledge.
 - Design and conduct a scientific investigation to test the hypothesis.
 - Use technology, observations and mathematics to improve investigations and communications.
 - Formulate and revise scientific explanations and models using logic and evidence.
 - Communicate and defend a scientific argument.
- Investigate and understand that scientists, past and present, have different abilities, technologies, qualities, theories, and scientific habits of mind (e.g., ethics).
- Use appropriate technology as a tool in problem solving.
- Describe the similarities and differences between science and technology and the impact they have on each other.
- Understand the role of science in making informed decisions.

Strand 2: Physical Science

- Describe and demonstrate Newton's laws of motion.
- Explain the scientific method and its value to the collection of knowledge about the physical universe.
- Investigate and analyze the properties found in visible light.
- Describe the four fundamental forces in nature and their application to the physical world.
- Explain the postulates of Special and General Relativity and describe how these postulates relate to our current understanding of the universe.
- Investigate and demonstrate an understanding of the structure of matter at the atomic and subatomic levels using the Standard Model of Particle Physics.
- Demonstrate an understanding of wave mechanics as it applies to electromagnetic radiation.

Strand 3: Life Science

- Distinguish the properties of life and develop an understanding of the specific ecosystem needed to support life.

Strand 4: Earth and Space Science

- Distinguish coordinate system used on the celestial sphere for celestial object location and size.
- Describe the history of Astronomy and Astrophysics and explain the importance of the Copernican revolution to the modern scientific investigation of the universe.
- Describe the stellar evolution of stars with different zero age main-sequence masses from formation to a final end state.
- Demonstrate an understanding of the particle physics during the radiation era.
- Investigate and explain observational evidence that currently supports the Standard Hot Big Bang Model.
- Demonstrate an understanding of the nucleosynthesis process in stars from the proton-proton cycle to iron.
- Distinguish different stellar spectra with an understanding of how spectroscopy is used in Astrophysics.
- Investigate and develop an understanding of the basic principles that apply to quantum physics.
- Distinguish galactic classification and demonstrate an understanding of galactic evolution.
- Demonstrate an understanding of the contents and overall structure to the universe at the macroscopic and microscopic levels.