SCIENCE DEPARTMENT **ASTRONOMY COURSE #456**

Contact Information

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The Department's Educational Philosophy

We believe that students should be exposed to the process of scientific inquiry so they can acquire and interpret scientific knowledge, and begin to realize the wider applicability of scientific problem-solving methods. By making the laboratory the focal point of learning, we seek to foster students' appreciation for the experience of doing science.

Guiding Principles

- Students must be able to collect and analyze data and formulate hypotheses.
- Inductive and deductive problem-solving skills are central to science education.
- An effective program in science addresses the limitations of data and conclusions.
- Students should be able to use or design a strategy for testing scientific concepts.
- A comprehensive science program will emphasize the delicate checks and balances in man's abiotic and biotic environments and the stresses upon these ecosystems, which could affect the destiny of the world.
- Science is integrally related to mathematics.
- An effective science program builds students' ability to communicate accurately and precisely.
- An effective science program stresses both cooperative and independent learning.

ASTRONOMY: COURSE #456

Course Frequency: Semester course, 6 times per 6-day cycle

Credits Offered: Two and a half

Prerequisites: Open to grades 10-12

Background to the Curriculum

Astronomy, a field that is of great interest to students and the community, uses various branches of science and technology in an interdisciplinary way. This elective course will teach students the current and evolving scientific understanding of the universe through lessons that highlight the observations and techniques that astronomers use to answer questions about the past, present, and future of the universe. Students will learn some fundamental mathematical approaches to astronomy; however, this course is not math-intensive and is designed to be accessible to students with a wide range of math backgrounds. Students will also learn to use various software packages for accessing and understanding astronomical observations.

Course-End Learning Objectives

Learning Objectives	Corresponding state standards (Earth and Space Science), *where applicable*
I: The night sky	
1] Locate features on the celestial sphere, using coordinate systems, and describe how some features change position over time.	
2] Describe the historical and scientific significance of constellations.	
3] Use parallax to measure distances to nearby stars.	
4] Describe how telescopes work, compare and contrast telescope designs	
II: Motions of the Earth and Moon	
1] Use parallax and angular measure to find distances to and sizes of nearby planets and the Sun.	
2] Explain the cause of the seasons on Earth.	4.2
3] Explain the cause of the change in phases of the Moon.	4.2

III: Solar system	
1] Describe the formation of the solar system.	4.3
2] Explain how Kepler's laws of orbital motion describe the path of the planets.	4.2
3] Explain gravity and its relevance to planetary motions.	4.2
4] Compare and contrast the planets of the solar system.	
5] Describe how other solar system bodies are categorized as comets, asteroids, and dwarf planets.	
IV: Electromagnetic radiation and the Sun	
1] Explain the properties of waves and the electromagnetic spectrum.	4.1
2] Explain how the Doppler effect can reveal motion.	
3] Explain the solar cycle.	
4] Describe the layers of the Sun, how they interact, and how they affect us on Earth.	
V: Stars and relativity	
1] Explain how astronomers find distances to faraway objects.	4.1
2] Show that the study of spectra can reveal the temperature, luminosity, magnitude, size, and age of a star.	4.1
3] Describe the life cycle of stars.	4.3
4] Explain how the concepts of special and general relativity explain astronomical phenomena.	
VI: Galaxies and the Universe	
1] Describe the methods astronomers use to find our position within the Milky Way.	4.1
2] Describe the structure of the Universe and how it is changing.	4.1
3] Explain the evolution of the Universe from the Big Bang, through the present, to the future.	
4] Explain the probability of the existence of life elsewhere in the Universe.	

Assessment

Quarter grades

50% Tests and quizzes

50% Labs, projects, activities, homework, and participation

Final grade

50% First quarter

50% Second quarter

Technology Learning Objectives Addressed in This Course

(This section is for faculty and administrative reference; students and parents may disregard.)

Course activity: skills &/or topics taught	Standard(s) addressed through this activity
1] Excel spreadsheets, data analysis, and graphing 2] Starry Night (planetarium simulation) 3] Deep Space Explorere (planetarium simulation) 4] Internet-based data analysis applets 5] Identification, retrieval, and analysis of astronomical data from internet sources	

Materials and Resources

Comins, Neil F. and Kaufmann, William J., 2005, Discovering the Universe, 7th Ed. New York: W. H. Freeman, 494 p.

Various other sources are utilized, such as Internet, films, and video.