**Course Description**

**Title:**
Introduction to Astronomy

**Description:**

This course provides students with a comprehensive, practical introduction to astronomy with an emphasis on critical thinking about humanity’s place in the universe. This course aims to foster lifelong learning with key concepts within a big picture context to provide conceptual understanding and to simplify scientific jargon while building skills and knowledge of the subject matter. The course covers modern theories and observations as well as ideas regarding nature, the evolution of galaxies; quasars, stars, black holes, planets and the solar system.

This course starts with understanding the modern view of the universe with supporting theories and observations and defining the science behind astronomy. Then key concepts of astronomy will be discussed and explored such as motion, energy, gravity and light. The course then goes into detail about the formation of the Solar System, Earth and terrestrial worlds, the Jovian Planet Systems, asteroids, comets and other planetary systems to galaxies like the Milky Way galaxy, dark matter and deep space objects such as black holes, quasars, and supernovae and life beyond Earth. This course also provides supporting scientific data and information for students such as the periodic table, constellations, star charts and more. This course aims to educate students to understand some of the theoretical and experimental methods used to observe and learn about the universe ranging from Newton’s laws to Einstein’s theory of relativity, and from Galileo’s telescope to WMAP and LIGO. This course also provides students with examples of claims made about the universe that were either supported or debunked by scientific evidence. This course establishes a personal connection between students and the cosmos to think critically about the meaning of what students have learned in this introduction to astronomy and future studies. This course can help students determine areas of specialization within the physics major or fulfill a physical science requirement at the undergraduate level.

**Learning Objectives:**After completing this course, students will be able to:

* Understand the principles, processes and techniques that form the basis of modern astronomy.
* Understand how to apply scientific knowledge to astronomical phenomena and use analytic and problem-solving skills.
* Describe the Solar System and Earth in relationship to other planetary systems and galaxies.
* Understand that astronomical events can occur on timescales much longer than human lifetimes, making it difficult to track the evolution of individual objects through space.
* Analyze and debate scientific theories on the evolution of the universe.
* Understand Kepler's Three Laws of Planetary Motion and their relationship to the underlying force of gravity.
* Explain how light, motion, energy and gravity affect objects in space, orbits of planets, and seasons on Earth.
* Understand how planets formed and compare and contrast the atmospheric evolution of Earth, Mercury, Venus, Mars and the Moon.
* Understand how outer planets differ in size, composition, mass and density, looking at Jovian Planets and how tidal forces transfer heat, making them potential environments to support life.
* Explain the concept of a wave in relationship to light, frequency and energy and the electromagnetic spectrum.
* Understand the Hertzsprung-Russell diagram, becoming comfortable reading and plotting it to learn more about stars, white dwarfs and planets.
* Learn about the lifecycle of neutron stars, taking a look at supernovas.
* Understand what a black hole is and the effect of an increasing gravitational force of a black hole.
* Explain what galaxies are, taking a closer look at the Milky Way and scientific theories about the expansion of the universe and life on other planets beyond Earth.
* Critically evaluate information and data with scientific principles and to evaluate and debate articles and news on astronomy issues.

[Additional Details]

**Course Notes:**
This one semester course, when taken for a letter grade, meets the General Education requirement for Physical Sciences and serves as a core requirement for the Physics major.

**Recommended Prep:**

This course presumes some basic knowledge in some fundamentals of physics, earth sciences and mathematics at the high school level.

**Textbooks:**

The Essential Cosmic Perspective

by Bennet, Donahue, Schneider and Voit

**Department:** Astronomy

**Units/Credits:** 4

**Course Component:** Lecture with Powerpoint slides

**Course Level:** Undergraduate students

**General Education:** Physics

**Divisional/Major Distribution:** Physics and Astronomy