COURSE OUTLINE

Astronomy 110
Astronomy of the Solar System

Catalog Statement

ASTRO 110 is a survey of the Sun, planets, moons, and other objects that make up the solar system with a consideration towards applying this knowledge to new findings in astronomy such as exoplanets. Topics may include the history of astronomy, the practice of modern science, solar system formation, planetary geology, planetary atmospheres, the physics of astronomy (gravity, light, conservation laws, etc.), telescopes and observational methods, exoplanets, and the search for life in the universe.

Total Lecture Units: 3.0
Total Laboratory Units: 0.0
Total Course Units: 3.0

Total Lecture Hours: 48.0
Total Laboratory Hours: 0.0
Total Laboratory Hours To Be Arranged: 0.0
Total Faculty Contact Hours: 48.0

Prerequisite: None.
Recommended Preparation: Eligibility for ENGL 101

Course Entry Expectations

Prior to enrolling in the course, the student should be able to:

- organize and write thesis-based essays;
- use detailed examples, facts, logical explanations, and other appropriate support for thesis statements;
- analyze critically selected works that deal with important contemporary issues;
- summarize, analyze and synthesize information, express and apply standards for judgment, compare and contrast, and evaluate evidence in order to form and state reasoned opinions;
- compile and organize information through library research;
- demonstrate a command of grammar, diction, syntax and mechanics sufficient for English 101 entrance: communicating (both orally and in writing) in standard English, with few major errors in grammar and punctuation.

Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

- identify, classify and compare the bodies of our solar system;
- recognize and explain the movements of the Sun, Moon and planets, as viewed from Earth, over the course of time;

- examine and critique both the geocentric and the heliocentric models of our solar system and explain them within a historical perspective;
- explain the production, transmission, refraction and reflection of electromagnetic radiation and the detection of this radiation by both Earth-based and space-based instruments.

Course Content **Total Faculty Contact Hours = 48.0**

The Copernican Revolution **(6 hours)**
- The geocentric model of Ptolemy
- The heliocentric model of Copernicus
- Galileo's telescope observations
- Kepler's Laws of Planetary Motion

The physics of astronomy **(8 hours)**
- Newton's Laws of Motion and Gravity
- Conservation laws in physics
- The properties of light
- The magnitude system
- The electromagnetic spectrum
- Doppler shifts
- Spectroscopy
- Atomic structure and spectral lines
- Using spectroscopy to learn about planets

Telescopes **(2 hours)**
- Refractors and reflectors
- Infrared and radio telescopes

Spacecraft exploration **(1 hour)**
- Spacecraft orbits
- Instruments carried by spacecraft

An overview of the solar system **(4 hours)**
- General properties and patterns
- The Sun
  - The gravitational influence of the Sun on the planets
  - The energy source of the Sun; nuclear energy
- Terrestrial and Jovian planets

Earth and the Moon **(8 hours)**
- Mapping the sky as seen from Earth
  - The zodiac; the ecliptic
  - The way the sky changes with the seasons
- Eclipses of the Sun and Moon
- Moon phases
- The atmosphere of Earth
- the magnetosphere of Earth; auroras
- The interiors of the Earth and the Moon
- the surfaces of the Earth and the Moon; impact craters

Mercury **(1 hour)**
- Bulk properties

Surface features; the findings of the Mariner 10 spacecraft

Venus **(1 hours)**
- Bulk properties
- Surface features; the findings of the Magellan spacecraft
- Atmosphere

Mars **(2 hours)**
- Bulk properties
- Surface features
- Atmosphere
- Satellites
- Recent discoveries and missions

Jupiter **(1 hours)**
- Bulk properties
- Surface features
- Atmosphere
- Satellites

Saturn **(1 hours)**
- Bulk properties
- Atmosphere
- Magnetosphere
- Ring system
- Satellites
- Recent discoveries and missions

Uranus, Neptune and Pluto **(1 hours)**
- The discovery of the outermost planets
- Bulk properties
- Atmosphere
- Ring system
- Satellites
- Recent discoveries and missions

Small objects in the solar system **(2 hours)**
- Meteoroids, meteors and meteorites
- Asteroids
- Comets
- Recent discoveries and missions

The formation of the solar system **(6 hours)**
- The solar nebular theory
- The giant impact origin of our Moon

Exoplanets **(2 hours)**
- Detection methods
- New findings

Life in the universe **(2 hours)**
- The origins of life on Earth
- The possibilities of life in our solar system
- The Fermi paradox and possible resolutions

Methods of Instruction

The following methods of instruction may be used in this course:

- classroom lecture and discussion;
- short educational videos on specific topics;
- use of online astronomy databases;
- planetarium demonstrations.

Out of Class Assignments

The following out of class assignments may be used in this course:

- reading assignments;
- web project (e.g. find the photo titled the Hubble Extreme Deep Field on the Hubble Space Telescope website and write a short summary of how the photo was taken, what it shows, and what we've learned from it);
- problem sets and short response questions;
- recognition of physical laws given actual astronomical data.

Methods of Evaluation

The following methods of evaluation may be used in this course:

- in-class exercises.
- in-class quizzes;
- two 1.5-hour examinations;
- one final exam.

Textbooks

Bennett, Jeffrey, O, et al. *The Cosmic Perspective: The Solar System*.8th ed. New York City: Pearson, 2016.
12th Grade Reading Level ISBN: 9780321841063

Prather, Edward E, Jack A. Dostal, and Colin S. Wallace. *Lecture-tutorials for Introductory Astronom*y. 3rd ed. Boston: Pearson, 2013. Print.
12th Grade Reading Level ISBN: 9780321820464

Student Learning Outcomes

Upon successful completion of the required coursework, the student will be able to:

- explain the methods astronomers use to study objects in the solar system;
- recognize the results of Earth-based and space probe studies of objects in the solar system.