COURSE OUTLINE

Astronomy 120
Astronomy of Stars and Galaxies

Catalog Statement

ASTRO 120 is a survey of the methods astronomers use and findings they have made in their studies of the stars and galaxies.

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:

- understand the methods astronomers use to study stars and galaxies;
- know what astronomers have learned about stars and galaxies;
- know what unanswered questions drive current research programs dealing with stars and galaxies.

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

Early ideas about the stars **(2 hours)**
- Constellation outlines and stories
- Star names
- Mapping the sky by right ascension and declination

Basic physics used in studying stars and galaxies **(9 hours)**
- Newton's Laws of Motion and Gravity
- Properties of light
- Spectroscopy and Kirchhoff's laws

Telescopes **(2 hours)**
- Refracting vs. reflecting telescopes
- Instrumentation

The Sun **(2 hours)**
- Bulk properties
- Nuclear energy
- The solar atmosphere
- The solar interior

Properties of the stars **(6 hours)**
- The distance to the stars
- The motions of the stars
- The sizes of the stars
- Stellar luminosities
- Stellar masses
- Hertzsprung-Russell diagrams

The interstellar medium **(2 hours)**
- Emission nebulae
- Dark nebulae

Stellar evolution **(11 hours)**
- Protostars
- Main sequence stars
- Red giant stars
- The final stages of stellar evolution
  - White dwarfs and planetary nebulae
  - Neutron stars and pulsars
  - Black holes and Einstein's General Theory of Relativity

The Milky Way Galaxy **(3 hours)**
- The structure of the Milky Way
- Motions of stars within the Milky Way
- The central region of the Milky Way
- Dark Matter

Normal Galaxies **(3 hours)**
- The Hubble classification scheme
- The Hubble Law

Active Galaxies **(2 hours)**
- Radio galaxies
- Seyfert galaxies

Starburst galaxies
Quasars

Cosmology **(6 hours)**

The Big Bang model and the expanding universe
Large-scale structures in the universe: voids, walls and bubbles
The geometry of space-time
Cosmic background radiation
Dark Energy

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:

- research and writing assignments (e.g. using appropriate online resources, write a brief biography of Hubble, Humanson or another astronomer, or write a review of an exhibit visited while on a field trip at the Griffith Observatory);
- problem sets and short response questions;
- a written interpretation of astronomical data with respect to a physical laws.

Methods of Evaluation

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

- quizzes;
- two 1.5-hour examinations;
- one final exam.

Textbooks

Comins, Neil. *Discovering the Essential Universe*, 6th edition, W.H. Freeman Publishing, 2012, ISBN-10: 1464124027, ISBN-13: 978-1464124020

Student Learning Outcomes

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

- identify, classify and compare the stars on the Hertzsprung-Russell diagram;
- identify, classify and compare the objects in the Universe, including, but not limited to atoms, nebulae, stars, stellar clusters, galaxies, clusters of galaxies, quasars;
- examine and critique the expansive and dynamic nature of our Universe, within a historical perspective;

- explain the evolution of stars as well as of the large scale structure of the Universe.