

# ASTR 0005 - INTRODUCTION TO STARS, GALAXIES, AND THE UNIVERSE

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## Catalog Description

Advisory: Completion of ENGL N with grade of "C" or better

Hours: 54 lecture

Description: General principles and fundamental facts of astronomy emphasizing stars, galaxies, and the universe. Includes historical developments of astronomy, basic principles of astronomical observations and analysis, and general concepts for interpreting the night sky with charts. Particular detail given to structure and evolution of stars, general characteristics of deep sky objects (star clusters, nebulae, and galaxies), large-scale structure of the Universe, and cosmology. (CSU, UC)

## Course Student Learning Outcomes

- CSLO #1: Analyze basic science and core physics, to discover how they apply to astronomy.
- CSLO #2: Relate core concepts in basic science to stellar astronomy, assessing the various factors that are important to stellar evolution.
- CSLO #3: Synthesize information from various sources (classroom instruction, online resources, etc.) to produce a coherent understanding of galactic/extragalactic astronomy.
- CSLO #4: Evaluate concepts in cosmology, relating concepts in underlying physics and observations to scientific frameworks of our universe's formation and evolution.

## Effective Term

Spring 2021

## Course Type

Credit - Degree-applicable

## Contact Hours

54

## Outside of Class Hours

108

## Total Student Learning Hours

162

## Course Objectives

Through tests, assigned tasks, classroom discussions, etc., the student will:

1. Discuss a variety of historical developments that have led to important discoveries in the science of stars and galaxies
2. Identify 20-30 celestial objects and/or groupings associated with stars and galaxies and found in the night sky and provide descriptive information about each
3. Apply physical principles (mechanics, gravitation, electromagnetism, atomic structure) to the natural behavior of stars and galaxies

4. Discuss the physical principles behind the overall structure and appearance of the Sun
5. List the principle properties of stars and the various techniques used to measure them
6. Describe the general physical processes associated with a given star as it evolves from its birth to its death
7. State the possible end states for stars
8. Draw a detailed picture of the overall structure of the Milky Way Galaxy and its content
9. Compare and contrast the various types of galaxies and their possible evolutionary associations
10. Describe the observed large-scale structure of the Universe
11. Use a star chart and a planisphere to determine the time and date of a variety of celestial events associated with stars and a variety of deep sky objects
12. Solve problems involving spatial relationships with regard to the stars and galaxies found on the celestial sphere
13. Use application software to retrieve and evaluate information and data of significance to stellar and galactic systems
14. Compute various performance measures of telescopes and other astronomical instrumentation

## General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Physical Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B1 Physical Science
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
  - IGETC - 5A Physical Science

## Articulation Information

- CSU Transferable
- UC Transferable

## Methods of Evaluation

- Classroom Discussions
  - Example: 1. Students are to write down or submit key lecture elements during the weekly lecture, graded on participation of the student Example: Velocity is not the same as speed.
- Objective Examinations
  - Example: 1. Standard midterm and final exams consisting of a variety of tasks and question formats, evaluating all levels of performance according to Bloom's taxonomy (knowledge, understanding, application, analysis, synthesis, and evaluation). Example exam question: List the three principle classifications of galaxies.
- Problem Solving Examinations
  - Example: 1. Homework exercises to evaluate student comprehension of weekly lectures and assigned reading. Example exercise question: A star cluster's age can be determined by noting the position of the "turnoff" point on its HR diagram. True or False?

## Repeatable

No

## Methods of Instruction

- Lecture/Discussion
- Distance Learning

### Lecture:

1. Students are taught Newton's Three Laws of Motion and then asked to predict the motion of a rolling ball across a spinning table used to simulate the Coriolis effect. A demonstration follows with student participation and further assessment is made based on their prediction and actual outcome. (Objective 3)
2. Students are asked to provide the times and dates of certain visible celestial events using star charts and/or software, the use of which is based on their reading of provided directions. (Objective 2)

### Distance Learning

1. The Students will watch a video made by the Instructor to help students complete Third Hours (Objectives 2,11,12 & 13)

## Typical Out of Class Assignments Reading Assignments

1. Reading from assigned text on a weekly basis. Example: Read chapter on cosmology. Prepares student for upcoming lecture. 2. Reading from supplemental handouts (included in required student handbook) on a regular basis. Read "The Celestial Sphere and the Star Charts" handout. Prepares student for the Third Hour.

## Writing, Problem Solving or Performance

1. Weekly online homework exercises in a multiple-choice, matching, ranking and short-answer format and directed at problem solving skills. Example question: In which part of the Milky Way Galaxy are Population I stars most likely to be found? 2. Two midterm-level exams, a sky quiz, and a final exam to demonstrate acquisition of critical thinking skills and astronomical knowledge. Example demonstration: A student uses a planisphere to determine what time the Andromeda Galaxy rises on September 4.

## Other (Term projects, research papers, portfolios, etc.)

1. In-class peer-led assignments on a weekly basis. Example group task: Students gather and plot velocity/distance data of galaxies and determine the Hubble constant.

## Required Materials

- Cosmic Perspective - Stars, Galaxies and Cosmology
  - Author: Bennett et.. al.
  - Publisher: Pearson
  - Publication Date: 2019
  - Text Edition: 9th
  - Classic Textbook?: No
  - OER Link:
  - OER:

## Other materials and-or supplies required of students that contribute to the cost of the course.

1. "Sierra College Astronomy 005 Student Handbook", updated each semester with supplemental reading materials and course assignments
2. Star Maps SC-001 (Equatorial Region) and SC-002 (North Circumpolar Region), both epoch 2000 3. A planisphere