ASTR 0011 - OBSERVATIONAL ASTRONOMY

Catalog Description

Prerequisite: Completion with grade of "C" or better or concurrent enrollment in ASTR 2, 5, or 10
Advisory: Completion of ENGL N with grade of "C" or better
Hours: 54 laboratory
Description: Basic interpretation of astronomical observations through telescopes, binoculars, computers, cameras, and other simple measuring equipment. Use of planetarium to facilitate recognition of constellations, stars, planetary motions, and study coordinate systems and celestial motions. Development of observational skills to study outdoor sky and outcomes of indoor laboratory experiments. Emphasis on quantitative and qualitative analysis of variety of astronomical data. (CSU, UC)

Course Student Learning Outcomes

- CSLO #1: Demonstrate knowledge and skill in observational astronomy, showing correlation of the observable sky to events in the cosmos.
- CSLO #2: Explain knowledge and skill in celestial navigation, evaluating the significance of important astronomical phenomena.
- CSLO #3: Operate a variety of optical systems, demonstrating proficiency in their use.
- CSLO #4: Relate core concepts in basic science to stellar astronomy, assessing the various factors that are important to stellar evolution.

Effective Term

Spring 2021

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

0

Total Student Learning Hours

54

Course Objectives

Through assigned tasks, hands-on activities, computer-simulated exercises, classroom/online discussions, and quizzes/exams, students will:
1. Identify at least 12 constellations
2. Identify and describe some of the properties of 24 stars
3. Locate and describe at least 10 "deep sky objects" including star clusters, galaxies, nebula, multiple star systems
4. Locate planets in the night sky utilizing computer software
5. Make computations making proper use of significant figures
6. Make computations utilizing scientific notation
7. Make computations utilizing calculators and computers
8. Determine the phase of the moon and predict its location on a star map via a computer
9. Explain why there are seasons
10. Properly set up a small telescope for observations of the night sky
11. Compute the magnification power of a telescope
12. Compute the light gathering of a variety of telescopes
13. Compute the resolving power of a variety of telescopes
14. Prepare an observing scenario using a robotic observatory, small telescope, binoculars, or unaided eye
with the aid of a computer
15. Identify and sketch planetary features using a small telescope
16. Use a computer to predict the orientation of the Jovian satellites
17. Use a reticule magnifier to measure features on astronomical photographs
18. Classify stellar spectra by observation of absorption lines
19. Plot a light curve and explain the nature an eclipsing binary system
20. Properly set up a telescope to safely observe the sun
21. Find celestial objects utilizing a planisphere
22. Demonstrate proper use of SC-001 (Equatorial Region) and SC-002 (North Circumpolar Region) star maps
23. Describe how to utilize a computer to generate a star map of selected regions of the sky
24. Process B&W and Color digital photographic data taken by a charged Couple Device using Image Processing software
25. Use an optical bench to determine optical parameters for mirrors and lenses
26. Construct and explain the operation of a sundial
27. Use simulator data to identify and measure direction and velocity of asteroids
28. Get students to Read the Lab so they can be better ready to complete it in the the time allotted
29. Determine image scale and actual size of objects in astrophotographs, including comets, and features on the moon
30. Calculate the sidereal and synodic period of the sun based on sunspot rotation data
31. Determine the spectral class, color and apparent magnitude of stars using a computer program
32. Determine the distance to star clusters using an H-R diagram

General Education Information

- Approved College Associate Degree GE Applicability
  - AA/AS - Physical Sciences
  - AS - Physical Science Lab
- CSU GE Applicability (Recommended-requires CSU approval)
  - CSUGE - B3 Lab Activity
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
  - IGETC - 5C Laboratory Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Objective Examinations
  - Example: 1. Standard quizzes, mid-term, 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 question: You are given a pair of binoculars which are labeled "7x50." What do the two numbers represent?)

- Problem Solving Examinations
  - Example: Midterm and Final Exams also contain problems to solve. (Ex. What is the scale of the star map in mm/deg, given that stars A and B are 15 deg apart)?
- Projects
  - Example: Each person will build or co-build a working sundial. Students are expected to submit a report and tell the class about how they constructed it.
- Reports
  - Example: 1. Laboratory exercises to evaluate student comprehension of weekly assignments and assigned reading (Example exercise: Find and determine the azimuth and altitude of Vega, Deneb and Altair (the summer triangle)).
- Skill Demonstrations
  - Example: 1. Use of the Meade Telescopes during observation nights, to look and examine several celestial objects for every evening.

Repeatable

No

Methods of Instruction

- Laboratory
- Distance Learning

Lab:

1. Critical Thinking: Students are taught what characteristics of a telescope and eyepiece determine magnification, light gathering power, field of view, and resolving power. Using this basic information, students must then answer questions relating different parameters to each other, and what external factors would limit the telescope performance – for example earth based telescopes vs space-base telescopes. (Objectives 11,12,13) Reading: Reading from the required course text is assigned on a regular basis. Weekly lab assignments require students to read procedures and expected analysis (Objectives 9,14,22,27,28). Writing: Term sundial project requires written report. (Objective 26) Field Trips: Students will be required to go on at least one field trip per semester or more (depending on weather and moon phase). (Objectives 1,3,4,10,15,20)

Distance Learning

1. Students will watch instructional video on how to complete a laboratory activity. At the end of the laboratory exercise, there are three particularly challenging analysis questions. Students will then interact with each other in a discussion board, where they are given a prompt to discuss one of the three challenging analysis questions in the lab. This discussion board is shaped with hints from the instructor, as to how to solve the problems. Answers to the problems are submitted individually by the students.

Typical Out of Class Assignments Reading Assignments

1. Reading from assigned text on a weekly basis. Example: Read the Chapter on "Stars for All Seasons". Be prepared to discuss in class. 2. Reading from supplemental handouts. Example: Read the "Meade LX-200 Telescope: Set-up and Take-down Procedure" handout. Students will then list the steps.

Writing, Problem Solving or Performance

1. Weekly laboratory reports. Example question: Calculate the magnification for the LX-200 telescope using a 40 mm eyepiece. 2. Written sundial project report. Example demonstration: Calculate, design and build a sundial which functions. 3. Quizzes, Midterm, and final exam to demonstrate acquisition of critical thinking skills and astronomical knowledge. Example exam question: Suppose that you live in Saint Louis, MO. What is the altitude of Polaris?

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

One assignment is given for each week of class. Each of these assignments will be of a nature that is reflective of the course outcomes. In particular, for assignments that are of a hands-on nature, our online students will acquire this experience through computer simulations, remote access to a robotic telescope, and/or visits to a public telescope observation site (either at a Sierra College Astronomy Department site or one owned by a local astronomy club). Example: Using the LX-200, locate and sketch the crater Copernicus on the Lunar surface.

Required Materials

- NightWatch
  - Author: Terence Dickenson
  - Publisher: Firefly Books
  - Publication Date: 2007
  - Text Edition: 4th
  - Classic Textbook?: No
  - OER Link:
  - OER:

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

1. Laboratory exercise packet prepared by instructors and updated every semester, printed and packaged on campus and distributed through the campus bookstore.* 2. Laboratory handbook prepared by instructors and updated every semester, printed and packaged on campus and distributed through the campus bookstore.* 3. Star Maps SC-001 (Equatorial Region) and SC-002 (North Circumpolar Region). 4. "Skygazer's Almanac" for the most current year (recommended). * Lab exercises and handbook are written with relevance to existing facilities, equipment, and current course content.