

ASTR 10L: ASTRONOMY LABORATORY

Foothill College Course Outline of Record

| Heading | Value |
|-------------------------|--|
| Effective Term: | Summer 2025 |
| Units: | 1 |
| Hours: | 3 laboratory per week (36 total per quarter) |
| Corequisite: | Completion of or concurrent enrollment in ASTR 10A, 10B or 10BH. |
| Degree & Credit Status: | Degree-Applicable Credit Course |
| Foothill GE: | Area 5: Natural Sciences w/ Lab |
| Transferable: | CSU/UC |
| Grade Type: | Letter Grade (Request for Pass/No Pass) |
| Repeatability: | Not Repeatable |

Student Learning Outcomes

- Apply geometric reasoning to infer the positions, motions, and size of astronomical objects.
- Build an understanding of how matter interacts with light and use that understanding to infer properties of objects in astronomical data.
- Identify and use patterns in data to evaluate and critique explanations for natural phenomena.

Description

A hands-on approach to the scientific method, using astronomical data and equipment. Divided into small lab groups, students will do experiments and observing projects about a range of astronomical topics, including the motions and geometry of the solar system, patterns in the behavior of the sun, and skeptical examination of astronomy-related misinformation. Students will use data from modern telescopes to measure and make inferences about the properties of astronomical objects, and write about their findings in ways suitable for communication with the general public.

Course Objectives

The student will be able to:

1. Make astronomical measurements
2. Summarize and look for patterns in images and data
3. Use astronomical observations to select among physical models
4. Communicate about astronomical phenomena to a general audience

Course Content

1. Make astronomical measurements
 - a. Make angular position measurements of objects on the sky
 - b. Sketch and describe objects seen through a telescope
 - c. Compare objects' brightness in multiple wavelength using spectra or images
2. Summarize and look for patterns in images and data

- a. Describe daily and yearly repeating motions of objects on the sky
 - b. Find patterns in temperature measurements across location and time on Earth
 - c. Describe repeating apparent motions of planets
 - d. Plot the number and position of sunspots
3. Use astronomical observations to select among physical models
 - a. Compare "top-down view" models of solar system with observations of positions on the sky
 - b. Compare temperatures across Earth with multiple hypotheses of the seasons in order to determine the specific ways that the Earth's tilt leads to seasons
 - c. Use images of the sun to infer properties such as its rotation speed and the speed of coronal mass ejections
 - d. Use types of light emitted by objects to infer properties and ongoing processes
 - e. Use continuous spectra and multi-band images to compare the temperature of objects
 - f. Use line spectra and narrow-band images to determine the composition of objects
 4. Communicate about astronomical phenomena to a general audience
 - a. Use step-by-step descriptions and analogies to explain the sun and sunspots to the public
 - b. Make color images from multi-band observations of astronomical objects
 - c. Describe objects and processes shown in astronomical images in an audience appropriate manner

Lab Content

1. Make astronomical measurements
 - a. Make angular position measurements of objects on the sky
 - b. Sketch and describe objects seen through a telescope
 - c. Compare objects' brightness in multiple wavelength using spectra or images
2. Summarize and look for patterns in images and data
 - a. Describe daily and yearly repeating motions of objects on the sky
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3. Use astronomical observations to select among physical models
 - a. Compare "top-down view" models of solar system with observations of positions on the sky
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 - e. Use continuous spectra and multi-band images to compare the temperature of objects
 - f. Use line spectra and narrow-band images to determine the composition of objects
4. Communicate about astronomical phenomena to a general audience
 - a. Use step-by-step descriptions and analogies to explain the sun and sunspots to the public

- b. Make color images from multi-band observations of astronomical objects
- c. Describe objects and processes shown in astronomical images in an audience appropriate manner

Special Facilities and/or Equipment

1. Celestial globes.
2. A room with good audio-visual facilities that can be darkened.
3. Equipment to show short videos.
4. Computers with internet access.
5. Software from a number of astronomical sources and an internet connection.
6. Demonstration equipment.
7. Telescope.

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Weekly written laboratory assignments, both individual and small-group

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Preparatory reading
Lecture
Step-by-step guides to new tools
Discussions
Demonstration
Telescope observations
Simulations

Representative Text(s) and Other Materials

Fraknoi, Andrew, David Morrison, and Sidney Wolff. [Astronomy 2nd ed. \(OpenStax\)](#). 2022.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

1. Each week, students will have preparatory reading to introduce them to basic concepts they will explore in lab.
2. In lab, they will have written instructions regarding tool use and guiding exploration of topics.
3. After they complete lab, they will have a series of written responses to make reflecting upon observations, patterns they noticed, and the reasoning leading to conclusions.

Discipline(s)

Physics/Astronomy