# Lassen Community College Course Outline

## ASTR-1 Introduction to Astronomy 4.0 Units

## I. Catalog Description

A survey of astronomy including the solar system, stars and stellar evolution, the Milky Way, galaxies, the universe and cosmology. This course has been approved for online and correspondence delivery.

**Recommended Preparation**: Successful completion of ENGL105 or equivalent multiple measures placement.

Transfers to CSU
51 Hours Lecture, 51 Hours Lab
Scheduled: Spring, Fall, Summer

## II. Coding Information

Repeatability: Not Repeatable, Take 1 Time
Grading Option: Graded or Pass/No Pass
Credit Type: Credit - Degree Applicable
TOP Code: 191100

## III. Course Objectives

### A. Course Student Learning Outcomes

Upon completion of this course the student will be able to:

1. Analyze the impact of current and future astronomical discoveries on humanity.
2. Apply methods of scientific inquiry to analyze a problem in astronomy, collect relevant data, and clearly express the solution.
3. Explain astronomical theories and concepts.

### B. Course Objectives

Upon completion of this course the student will be able to:

1. Understand the celestial sphere, its coordinates, motions, and equatorial and ecliptic systems.
2. Show the differences between latitude and longitude, declination, right ascension, hour angles, solar time and sidereal time.
3. Identify, describe and illustrate, by example, methods of celestial navigation.
4. Identify and explain lunar phases and eclipses.
5. Describe how astronomical spectra can be used to measure physical properties of objects in space.
6. Use the inverse square and radiation laws by applying them to specific applications.
7. Identify the parts of both reflecting and refracting telescopes and explain their functions.
8. Infer the history of the surface of Mars from observed surface features.
9. Comprehend the scale of the solar system from data obtained from observations.
10. Explain why the gas giants are much larger than the terrestrial planets.
11. Identify the safety problems when observing the sun.
12. Describe the cause and appearance of the solar activity cycle.
13. Explain how parallax can be used to measure the distance to stars.

14. Identify and describe proper motion techniques and Doppler Shifts.
15. Explain, and demonstrate by example, the technique and photometry and the magnitude scales.
16. Use the Hertzsprung-Russell Diagram in stellar and spectral classification of stars.
17. Identify and critically assess the practical and theoretical values of classification of galaxies and intergalactic distance indicators.
18. Apply Hubble's Law to the expansion of the universe.
19. Describe each of the three cosmological parameters and how they relate to the size, shape, and evolution of the universe.

# IV. Course Content

**Lecture Content**

1. Constellations
2. The celestial sphere
3. Celestial motions
4. Moon phases and seasons
5. Historical development of astronomy
6. Electromagnetic radiation and spectroscopy
7. Optics, telescopes and photography
8. The planets, their motions, distances and physical properties
9. The minor planets, comets, meteors, meteoroids, and meteorites
10. Exoplanets
11. The Sun
12. Stellar properties
13. The Hertzsprung-Russell Diagram
14. Stellar evolution
15. Interstellar gas and star clusters
16. The Milky Way Galaxy
17. Galaxy classification
18. Dark matter
19. Expansion of the universe
20. Cosmology - the age, origin and overall structure of the universe.

**Laboratory Content**

1. Make a Star Wheel
2. Forensic Astronomy
3. Small Angle Equation
4. Observe a Satellite
5. Kepler’s Laws
6. The Tools of Astronomy
7. Through a Telescope
8. Build a Spectrometer
9. Geology of the Moon and Mars
10. Asteroid Discovery Lab
11. Tracking Solar Activity
12. HR Diagrams
13. Mapping Globular Clusters
14. Cosmic Distances
15. Hubble’s Law

16. Black Holes

## V. Assignments

**A. Readings & Lectures**
Students will be required to read and study the assigned passages and engage with all lecture materials.

**B. Quizzes, Tests, and Exams**
Students will complete regularly scheduled quizzes and tests to demonstrate their grasp of concepts from the course.

**C. Laboratory Assignments**
Students will make observations and collect data, submitting a written lab report and completing an associated lab quiz.

**D. Discussions**
Students will interact with one another and their instructor as they discuss and debate issues related to the study of astronomy.

**E. Specific Assignments that Demonstrate Critical Thinking**
1. Mixed-format examinations are designed to challenge students to analyze and synthesize information presented in the text and during lecture and lab.
2. Critical thinking developed by the clarification of major concepts using definitions and examples.

**F. Expected Outside Assignments**
1. Reading out of the textbook on a regular basis.
2. Out of class research projects involving the collection, compilation and interpretation of data, including composition of written or oral reports.

## VI. Methods of Evaluation

**Traditional Classroom Evaluation:**
A student's grade will be based on multiple measures of student performance, including quizzes, tests, lab activities, discussions, and exams.

**Online Evaluation:**
A variety of methods will be used, such as: research papers, asynchronous and synchronous discussions (chat/forum), online quizzes and exams, postings to online website, and email communications.

**Correspondence Evaluation**
Same as face to face with the exception of the desired use of proctored exams and exclusion of participation in classroom activities. Students will be expected to complete assignments and activities equivalent to in-class assignments and activities. Written correspondence and a minimum of six opportunities for feedback will be utilized to maintain effective communication between instructor and student.

## VII. Methods of Delivery

Check those delivery methods for which, this course has been separately approved by the Curriculum/Academic Standards Committee.

☒ **Traditional Classroom Delivery** ☒ Correspondence Delivery

☐ Hybrid Delivery ☒ Online Delivery

**Traditional Classroom Delivery:**
Lecture, discussion, slides, films-multimedia. Outside lecturers and local field trips may also be used.

**Online Delivery:**
Online written lectures. Participation in forum-based discussions. Online exercises/assignments contained on website. Discussion papers, email communications, postings to forums, and web-links will comprise the method of instruction.

**Correspondence Delivery**
Assigned readings, instructor-generated typed handouts, typed lecture materials, exercises and assignments equal to face to face instructional delivery. Written correspondence and a minimum of six opportunities for feedback will be utilized to maintain effective communication between instructor and student.

## VIII. Representative Texts and Supplies

Required Text
Fraknoi, Morrison, and Wolff; "*Astronomy*", 2021, OpenStax, ISBN: 9780998625737. https://openstax.org/details/books/astronomy

**Lab Manual:**

A Laboratory Manual Book will be prepared and delivered by instructor: VandenHeuval, A., 2021

**For Correspondence Delivery:**
Lecture-tutorials (for introductory astronomy,) Edward E. Prather et al., 3rd edition, Pearson, ISBN 10:0-321-82046-0, 13: 978-0-321-82046-4

## IX. Discipline/s Assignment

Physics/Astronomy

## X. Course Status

Current Status: Active
Original Approval Date: 10/22/1991
Revised By: Andrew VandenHeuvel
Curriculum/Academic Standards Committee Revision Date: 05/05/2021
Board Approval Date: 10/18/2022