ASTR 3L Course Outline as of Summer 2025

CATALOG INFORMATION

Dept and Nbr: ASTR 3L Title: STELLAR ASTRON LAB
Full Title: Stellar Astronomy Laboratory
Last Reviewed: 10/24/2022

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	1.00	Lecture Scheduled	0	17.5	Lecture Scheduled	0
Minimum	1.00	Lab Scheduled	3.00	6	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 0.00 Total Student Learning Hours: 52.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade or P/NP
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	ASTRON 3L

Catalog Description:
In this course, students will perform analysis and reduction of basic astronomical data concerning stars, nebulae, and galaxies. Using collaborative activities, photos, spectra, and direct observations, the student will arrive at conclusions concerning fundamental properties of the universe. Topics will include electromagnetic radiation, observed properties of stars, variable and binary stars, stellar evolution, black holes, the interstellar medium, star clusters, the Milky Way and other galaxies, cosmology, and the possibility of other life forms in the universe.

Prerequisites/Corequisites:
Course Completion or Current Enrollment in ASTR 3 (or ASTRON 3)

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: In this course, students will perform analysis and reduction of basic astronomical data concerning stars, nebulae, and galaxies. Using collaborative activities, photos, spectra, and direct observations, the student will arrive at conclusions concerning fundamental properties of

the universe. Topics will include electromagnetic radiation, observed properties of stars, variable and binary stars, stellar evolution, black holes, the interstellar medium, star clusters, the Milky Way and other galaxies, cosmology, and the possibility of other life forms in the universe. (Grade or P/NP)
Prerequisites/Corequisites: Course Completion or Current Enrollment in ASTR 3 (or ASTRON 3)
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;UC.
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**			Effective:	Inactive:
CSU GE:	**Transfer Area**			Effective:	Inactive:
	B3	Laboratory Activity		Fall 1998	
IGETC:	**Transfer Area**			Effective:	Inactive:
	5C	Fulfills Lab Requirement		Fall 1998	
CSU Transfer:	Transferable	Effective:	Fall 1997	Inactive:	
UC Transfer:	Transferable	Effective:	Fall 1998	Inactive:	

CID:

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Describe methods used to interpret observable astronomical phenomena.
2. Use astronomical tools to make accurate observations.
3. Employ critical thinking to evaluate observable data.

Objectives:
At the conclusion of this course, the student should be able to:
1. Describe the fundamental properties of electromagnetic radiation (EMR) and how these properties are used to discover the characteristics of stars, nebulae, and galaxies.
2. Discuss the observational techniques that are used to compute distances, temperatures, brightness, motions, compositions, and masses of stars.
3. Use exponential notation to numerically describe and compare the distances, temperatures, brightness, motions, compositions, and masses of stars.
4. Interpret, analyze, and graph information about the universe.
5. Describe the nuclear processes that power the stars.
6. Compute the ages of stars from the Hertzsprung-Russell (H-R) diagram.
7. Compute the distances to star clusters from the H-R diagram.
8. Compute the distances to galaxies from Hubble's law.
9. Identify the Hubble galaxy classes.

10. Compute the age of the universe using the Hubble Constant.

Topics and Scope:

I. Scientific Measurement Methods
   A. Distance units and scale
   B. Uncertainty and error analysis
II. Electromagnetic Radiation (EMR)
   A. The electromagnetic (EM) spectrum
   B. Spectroscopy
   C. The Doppler Effect
III. Stellar Distances
   A. Parallax
   B. Standard candles
      1. Cepheid variable stars
      2. Type Ia supernovae
IV. Stellar Properties
   A. Magnitudes/luminosities of stars
   B. Masses of stars
   C. The spectral classification system for stars
   D. The Hertzsprung-Russell (H-R) Diagram
   E. Motions
V. Stellar Structure and Evolution
   A. Nebulae and the interstellar medium
   B. Ages of star clusters
   C. Supernovae and the deaths of stars
   D. Neutron stars and black holes
VI. The Milky Way Galaxy
   A. Properties and appearance of the Milky Way
   B. The Solar System's location in the Milky Way
VII. Other Galaxies
   A. Hubble galaxy classification
   B. The Local Group
VIII. Cosmology
   A. The expansion of the universe and Hubble's Law
   B. The fate of the universe
IX. Life in the Universe

Additional topics may include:
X. Earth and Sky
   A. Celestial sphere
   B. Diurnal and annual motion
XI. Constellations and Mapping
   A. Star charts and planispheres
   B. Terrestrial and celestial coordinate systems
XII. Optical Systems
   A. Image formation
   B. Lenses and mirrors
   C. Telescope types
   D. Cameras

Assignment:

1. Weekly reading assignments (5-10 pages)
2. Laboratory assignments (10-20)
3. Outdoor observation report(s) (1-5)
4. Quiz(zes) (0-15)
5. Exam(s) (0-4)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Outdoor observation report(s)	Writing 10 - 40%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Laboratory assignments	Problem solving 20 - 70%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Exam(s), quiz(zes)	Exams 0 - 40%

Other: Includes any assessment tools that do not logically fit into the above categories.

Participation	Other Category 0 - 20%

Representative Textbooks and Materials:
Explorations: An Introduction to Astronomy. 9th ed. Arny, Thomas and Schneider, Stephen. McGraw-Hill Publishing. 2019
Observer's Handbook 2022. Edgar, James. Royal Astronomical Society of Canada. 2022
Foundations of Astronomy. 14th ed. Seeds, Michael and Backman, Dana. Brooks/Cole Publishing. 2018
A Workbook for Astronomy. 2nd ed. Waxman, Jerry. Quintessential Publishing. 2007 (classic)