Course Information Form (CIF)

Course Code: AST 102 (IAI P1 906L)

Course Title: Stars, Galaxies, and the Universe

Department: Natural Sciences
PCS Code: 1.1 - Baccalaureate/Transfer
CIP Code: 40.0201
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 3-2-4
Credit Hour Distribution:

Lecture: 3	Lab: 2	Clinical: 0	**Total: 4**

General Course Information

Catalog Description

Star distances, motions, structures, origin, and evolution; white dwarfs, neutron stars, and black holes; atoms and radiation; structures and evolution of galaxies (including the Milky Way) and the universe. Includes some evening telescopic observations.

General Course Objectives

Compare the Sun's properties to those of other stars.
Apply the scientific method to evaluate new ideas.
Identify basic navigational markers, constellations, and asterisms in the night sky.
Identify and describe the basic instrumentation and techniques astronomers use to study astronomical objects.
Describe the structure of the Universe and identify the forces at work in its past and future evolution.
Navigate the night sky in person.

Minimum Placement Levels

English	Reading	Math
Placement out of ENG 099	Placement out of CCS 098	None

Prerequisites

None

Methods of Evaluation

5-12 objective quizzes, 1 cumulative final exam, 13-14 laboratory exercises, 1 observation report, 1-2 sky quizzes, and 1 semester project (data collection, data analysis, evaluation). Online class replaces sky quizzes with 6-8 unit activities and class discussion board participation.

Instructional Materials and Additional Supplies

Astronomy, Second Edition. Published by OpenStax; last updated 2024 July 8; print edition also offered. 978-1-951693-50-3. On-campus students purchase a lab packet ($6).

Course Content

General Learning Outcomes (GLOs)

- Critical Thinking and Information Literacy: Students will demonstrate the ability to evaluate perspectives, evidence, and implications, and to locate, assess, and use information effectively.
- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Motions in the Night Sky	1. Identify basic motions of celestial objects. 2. Apply celestial navigation terminology. 3. Compare distance scales.	4	4	0
Science and the Scientific Method	1. Recognize steps of the scientific method. 2. Evaluate between scientific and pseudo-scientific viewpoints.	1	2	0
Sky Drills and Sky Quizzes	1. Identify basic navigational markers, stars, constellations, and asterisms in the night sky.	5	0	0
Light and Spectra	1. Describe the properties of the bands of the electromagnetic spectrum. 2. Identify types of spectra. 3. Describe the process by which emission/absorption lines are created. 4. Identify blackbody characteristics. 5. Explain how spectra are used to determine properties of astronomical objects.	4	2	0
Telescopes	1. Identify parts of and advantages/disadvantages of different telescope designs. 2. Identify telescope properties and calculate magnification for a telescope. 3. Evaluate the necessity for space-based telescopes and telescopes for non-visible wavelengths.	3	2	0
The Sun	1. Identify and describe features on the visible Sun. 2. Sketch the solar interior structure. 3. Describe the role of hydrostatic equilibrium throughout the Solar System. 4. Explain how the Sun generates energy and the supporting evidence. 5. Describe the solar atmosphere and effects of the solar wind.	3	2	0
Properties of Stars	1. Calculate distances to stars using trigonometric and spectroscopic parallax. 2. Compare the bulk properties of the Sun to those of other stars.	3	4	0
The HR Diagram and Binary Stars	1. Sketch the HR diagram and describe how it is used to group and understand stars with similar properties. 2. Classify stars based on their temperature and luminosity relation. 3. Employ main sequence cluster fitting. 4. Describe how binary star systems are used to determine stellar masses.	4	2	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Stellar Evolution and Death	1. List the stages by which stars form and evolve. 2. Examine the main sequence lifetime and the nuclear fusion chains that govern successive stages of a star's life. 3. Sketch evolutionary tracks on the HR diagram. 4. Evaluate ages of star clusters. 5. Evaluate how mass affects the death of a star. 6. Describe electron and neutron degeneracy. 7. Summarize properties of white dwarfs and neutron stars, planetary nebulae, and supernovae.	5	4	0
Relativity and Black Holes	1. Describe the effects of special and general relativity. 2. Describe the physical nature of black holes and relate it to physical concepts like the escape velocity. 3. Explain the existence of the event horizon using classical and general relativistic arguments. 4. List observational evidence for black holes.	3	2	0
Galactic Structure and Normal Galaxies	1. Sketch the basic structural elements of the Milky Way. 2. Compare Population I and II stars. 3. Describe the importance of 21-cm emission in studying galactic structure. 4. Explain the origin of spiral structure. 5. Analyze the rotation curve and explain its relationship to dark matter. 6. Compare and contrast the Milky Way with other normal galaxies. 7. Classify galaxies by their morphology. 8. Describe evolution and galactic cannibalism.	5	2	0
Active Galaxies and Cosmology	1. Sketch and describe the standard model for active galaxies and explain their power source. 2. Describe redshift and look-back time. 3. Inspect gravitational lensing and its use in determining the structure of the universe. 4. List the major stages in the history and evolution of the universe. 5. Relate the Big Bang theory and evaluate the supporting evidence for the theory. 6. Examine the cosmic microwave background radiation. 7. Describe the roles of gravity, expansion, and dark energy in the fate of the universe.	5	4	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
45	30	0