ASTRON 3 Course Outline as of Fall 2009

CATALOG INFORMATION

Dept and Nbr: ASTRON 3 Title: STELLAR ASTRONOMY
Full Title: Stellar Astronomy
Last Reviewed: 1/25/2021

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		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: 105.00 Total Student Learning Hours: 157.50

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:	

Catalog Description:
A description of the universe, concentrating on celestial bodies and phenomena beyond the Solar System. Topics will include electromagnetic radiation, observed properties of stars, variable and binary stars, extra-solar planets, stellar evolution, black holes, relativity, the interstellar medium, star clusters, the Milky Way and other galaxies, cosmology, and the possibility of other life forms in the universe.

Prerequisites/Corequisites:

Recommended Preparation:
Completion or Concurrent Enrollment in Math 150A AND English 100 or ESL 100.

Limits on Enrollment:

Schedule of Classes Information:
Description: A description of the universe, concentrating on celestial bodies and phenomena beyond the Solar System. Topics will include electromagnetic radiation, observed properties of stars, variable and binary stars, extra-solar planets, stellar evolution, black holes, relativity, 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:
Recommended: Completion or Concurrent Enrollment in Math 150A AND English 100 or ESL 100.
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:
	C	Natural Sciences	Fall 1981	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 1981	
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 1981	

CSU Transfer:	Transferable	Effective:	Fall 1981	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1981	Inactive:

CID:

Certificate/Major Applicable:
Major Applicable Course

COURSE CONTENT

Outcomes and Objectives:
Upon completion of this course, students will be able to:
1. Define and apply the scientific method.
2. List the regions of the electromagnetic spectrum, discussing how each varies in terms of wavelength, frequency, and energy.
3. Define and cite examples of the properties of waves: reflection, refraction, and diffraction.
4. Describe how continuous, emission, and absorption spectra are created.
5. Discuss the methods of determining the distances to stars and calculate the distance to a star if its parallax is given.
6. Summarize how the mass of a star is derived and list the stellar properties which can be determined if its mass is calculated.
7. Construct a Hertzsprung-Russell Diagram and discuss what each region represents in the stellar evolutionary cycle.
8. Summarize the processes which occur as stars of various mass evolve from birth to death, including their possible core phases: white dwarfs, neutron stars, and black holes.
9. Explain Einstein’s theories of Special and General Relativity.
10. Identify and describe the components of the Interstellar Medium.
11. Label the parts and discuss the structure of the Milky Way Galaxy.
12. Identify and describe the characteristics of the Hubble Types of galaxies.
13. Discuss active galaxies, gravitational lensing, and the possible phenomena which create gamma ray bursts.

14. Summarize the cosmological models which have been proposed from the time of Edwin Hubble to the present.

Topics and Scope:

I. Overview of the universe
  A. Science and the scientific method
  B. Celestial bodies in the universe
  C. Distance units and scales
II. Electromagnetic radiation (EMR)
  A. Electromagnetic spectrum
  B. Wave model of EMR
    1. Wavelength
    2. Frequency
  C. Quantum model of EMR
    1. Photons
    2. Energy
  D. Properties of EMR and waves
  E. Radiation Laws
  F. Spectra
    1. Continuous spectrum
    2. Emission spectrum
    3. Absorption spectrum
III. Stellar distances
  A. Units of angular measure
  B. Method of triangulation
  C. Distance modulus
IV. Stellar brightnesses
  A. Photometry
  B. Apparent magnitude
  C. Absolute magnitude
V. Variable stars
  A. Period-luminosity relation for cepheid variable stars
  B. Discovery of other galaxies using the period-luminosity relation
VI. Stellar masses
  A. Determination of the mass of a star by observing binary star systems
  B. Stars with varying masses and their distribution
  C. Discovery of extrasolar planets
VII. Stellar evolution
  A. Stellar spectral sequence
  B. Hertzsprung-Russell Diagram
    1. Nebulae
    2. Main sequence stars
    3. Giant (Red Giant) stars
    4. Supergiant stars
    5. White dwarf stars
  C. Life cycle of a 1 solar mass star
  D. Life cycle of a high mass star
  E. Deaths of stars and mass loss
    1. Planetary nebulae

2. Supernovae
a) Type I supernovae
b) Type II supernovae

VIII. The core phase of stellar evolution
A. White dwarfs
B. Neutron stars (pulsars)
C. Black holes

IX. Albert Einstein's Theories of Relativity
A. General relativity
B. Special relativity
C. Twin paradox and time dilation

X. The interstellar medium
A. Dust
B. Gas
1. HI Regions
2. HII Regions

XI. Star Clusters
A. Open clusters
B. Globular clusters

XII. The Milky Way Galaxy

XIII.Other galaxies
A. Hubble Types of galaxies
B. Active Galactic Nuclei (AGN'S)
C. Clusters of galaxies
D. Gravitational lensing

XIV. Cosmology
A. Edwin Hubble and his discovery of universal expansion
1. The Hubble Law
2. The Hubble Constant
B. Evidence for the Big Bang and other theories
C. Possible geometries of space-time
D. String theory
E. Dark matter and dark energy

XV. Life in the universe
A. Claims versus actual evidence that extraterrestrials have visited Earth
B. Using the Drake Equation to estimate the number of civilizations in the Milky Way Galaxy and the universe

Assignment:

1. Reading from the textbook or instructor prepared materials (averaging one chapter per week, roughly 20-30 pages).
2. Homework assignments, 5-11 per semester, which may include independent research, group projects, problem sets, written work, visits to Santa Rosa Junior College Planetarium, and/or reaction papers to selected scientific movies or articles. Reaction papers should be 1 to 1.5 pages long and typed. One 1000-2500 word typed research papers (using at least two outside sources) on instructor approved subjects may also be assigned.
3. In-class exercises/activities, 5-15 per semester, on subject matter presented that day in class and/or pertaining to videos watched. Exercises/activities may be done individually or with group discussion.

4. Exams, 3-5 per semester.

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.

Written homework, research paper and/or reaction papers	Writing 10 - 30%

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

Homework problems, in class exercises	Problem solving 10 - 30%

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.

Multiple choice, completion, true/false, matching items, problem solving, essay questions	Exams 60 - 80%

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

Attendance and participation (in class activities), individual/group projects	Other Category 0 - 10%

Representative Textbooks and Materials:
Voyages To The Stars and Galaxies: Fraknoi, Morrison, and Wolff, Thomson-Brooks/Cole, 2006
Discovering The Universe: Freedman and Kaufmann, Freeman, 2007
Pathways To Astronomy: Schneider and Arny, McGraw Hill, 2007