Laboratory Contact Hours: 48-54; Homework Hours: 0; Total Student Learning Hours: 48-54

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

ASTRONOMY 112 – GENERAL ASTRONOMY LABORATORY

3 hours laboratory, 1 unit

Catalog Description
Planet, stellar and lunar studies; acquaintance with constellations and astronomical coordinates; and use of astronomical instruments.

Prerequisite
"C" grade or higher or "Pass" in ASTR 110 or equivalent or concurrent enrollment

Entrance Skills
Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:
1) Define and use the following terms: planet, moon, comet, constellation, Celestial Sphere, precession, seasons, astronomical unit, parsec, light-year.
2) Use synodic and sidereal time.
3) Use the inverse square law as it applies to light and gravity to calculate distance, mass and intensity.
4) Identify the phases of the moon and to use them to predict the time of sunrise and sunset.
5) Compare and contrast solar and lunar eclipses.
6) Diagram the structure of the solar system.
7) Explain the relationship between photons, atomic structure and spectral lines.
8) Discuss stellar distances by using absolute and apparent magnitude and parallax.
9) Construct a Hertzsprung-Russell diagram and use it to analyze the evolution of stars.
10) Compare stellar evolution models for different mass stars.
11) Discuss galactic distances by using various distances indicators.
12) Evaluate models of the structure and evolution of the Universe.

Course Content
1) Celestial Sphere, coordinate systems (right ascension and declination)
2) Lunar and solar eclipses
3) Planet retrograde motion
4) Planet orbits (study ellipses)
5) Lunar features
6) Lunar topography
7) Sidereal time, local mean time, mean solar time and Universal time
8) Apparent and absolute magnitude and parallax
9) Observe and identify the spectra of atoms and some molecules
10) Classify stars according to their spectra
11) Blackbody radiation curve
12) Hertzsprung-Russell diagram
13) Proper motion
14) Spiral arm indicators
15) Red shift and the expansion of the Universe
16) How to use a telescope
17) Observe the phases of the Moon and/or observe the Sun
18) Observe Jupiter and/or Saturn

19) Observe phases of Venus
20) Observe Mars
21) How to use star charts
22) Observe stars and multiple star systems
23) Observe Messier object

Course Objectives
Students will be able to:
1) Recognize and define the right ascension and declination coordinate system.
2) Use a telescope to observe the various astronomical objects such as the Sun, Moon, Venus, Mars, Jupiter and its Galilean moons, Saturn, stars, star clusters, nebula and galaxies.
3) Explain why astronomers believe some theories to be correct, some speculative and others invalid by analyzing and evaluating the evidence that has been gathered.
4) Identify and describe surface features of the moon.
5) Use parallax to determine the distance to an object.
6) Calculate the absolute magnitude of a star.
7) Use absolute magnitude to determine the distance to a star.
8) Identify elements by observing their spectra.
9) Classify stars using their spectra.
10) Construct and use a Hertzsprung-Russell diagram.
11) Use distance indicators to obtain a mental image of the structure of the Universe.
12) Write a lab report using proper English to record data and its analysis with the appropriate astronomical concepts and vocabulary.
13) Design experiments using the scientific method.
14) Demonstrate laboratory technique by collecting data using both traditional and computer data acquisition methods; use computers to interpret and analyze numerical data and generate a visual representation of the data.
15) Evaluate the experimental results using techniques presented in class.

Method of Evaluation
A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.
1) Quizzes and exams that measure students' ability to recognize astronomical and physical concepts, situations, and the vocabulary associated with them.
2) Lab technique as demonstrated by students' ability to design an experiment, set up the equipment, make the appropriate measurements, and maintain a safe work environment.
3) Lab reports that demonstrate students' ability to use the English language; to record, interpret and analyze data; and to draw conclusions from the results.

Special Materials Required of Student
Calculator, planisphere

Minimum Instructional Facilities
1) Smart lab with demonstration equipment, computers
2) Dark site for telescope observations

Method of Instruction
1) Integrated lecture, demonstration and discussion
2) Small and large group discussion
3) In-class activities and independent homework, research projects
4) Auxiliary use of study groups, peer tutoring and/or instructional office hours
5) Computer-facilitated instruction

Out-of-Class Assignments
1) Practice in identifying constellations
2) Practice in the use of a planisphere
3) Planisphere worksheet
4) Completion of classroom projects/exercises begun in class

Texts and References
1) Required (representative example): Instructor developed laboratory exercises and supplementary materials
2) Supplemental: None

Student Learning Outcomes
Upon successful completion of this course, students will be able to:
1) Use a telescope to observe the various astronomical objects within the solar system, within the Milky Way Galaxy and beyond.
2) Demonstrate how luminosities of particular astronomical objects are determined and used to find distances to luminous astronomical objects in general, and how these distances are used in delineating the structure of the Universe.
3) Identify elements in stellar spectra, and use stellar spectra to classify stars.
4) Based upon an experimental scientific investigation conducted in class, write a well-organized formal laboratory report, utilizing proper scientific terminology and English grammar/composition, that presents and analyzes data, and draws appropriate conclusions that demonstrate understanding of basic concepts and terms in astronomy.