CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

Astronomy C1001 – Introduction to Astronomy

3 hours lecture, 3 units

Catalog Description
This course introduces fundamental concepts of astronomy, including the Solar System, stars, supernovae, galaxies, black holes, and the expanding universe.

Students learn how to study the cosmos and what the latest discoveries reveal about the origins and fate of the universe. Formerly ASTR 110, not open to students with credit in ASTR 110.

Prerequisite
None

Course Content
Part 1:
1) Scientific Method
2) Observing the sky
3) History of astronomy across cultures
4) Gravity motion and physical laws
5) Light matter and spectra
6) Telescopes
7) Analysis of light
8) Earth, Moon, Sun system
9) The Solar System and exoplanets
10) The Sun
11) Stars and stellar evolution
12) The Milk Way
13) Galaxies
14) Cosmology
15) Life in the universe

Part 2:
1) Celestial Sphere, motion of the Sun and planets
2) Phases of the Moon, lunar and solar eclipses
3) Determining the physical properties of stars
4) Binary star systems
5) Interstellar medium
6) Neutron stars and black holes
7) Measuring the properties of galaxies
8) Peculiar galaxies
9) Origin of the Solar System
10) The geology of Earth
11) Meteoroids, asteroids and comets

Course Objectives
At the conclusion of this course, the student should be able to:
Part 1:

1) Apply fundamental theoretical principles and evidence-based reasoning to explain how observations and data inform our current understanding of the universe and everyday phenomena.
2) Distinguish and compare the size, scale, and structure of astronomical objects.
3) Describe the diverse perspectives and contributions that have shaped humanity's understanding of the universe through the field of astronomy.

Part 2:

1) Recognize and define the following terms: planet, Moon, comet, meteoroid, constellation, Celestial Sphere, precession, seasons, astronomical unit, parsec, light-year.
2) Compare and contrast synodic and sidereal time.
3) Describe and explain the phases of the Moon and how the Earth, Moon and Sun are positioned.
4) Describe the structure of the Solar System.
5) Analyze and evaluate the relationship between photons, atomic structure and spectral lines.
6) Use the Hertzsprung-Russell diagram to explain the evolution of a star.
7) Analyze and explain how stars evolve.
8) Compare and contrast absolute and apparent magnitude.
9) Analyze and evaluate parallax and distance indicators.
10) Compare and contrast current models of galaxy types and of the evolution of galaxies.
11) Investigate and delineate the structure of the Universe consistent with scientific observations.
12) Identify and evaluate the structure of the Universe as predicted by the Big Bang Theory.
13) Explore and evaluate a topic in astronomy by using the Internet and/or library
14) Apply scientific inquiry and research methods to investigate and evaluate topics in astronomy.

Method of Evaluation

Part 1:

Examples of potential methods of evaluation used to observe or measure students' achievement of course outcomes and objectives include but are not limited to quizzes, exams, activities, projects, research demonstrations, etc.

Methods of evaluation are at the discretion of local faculty.

Part 2:

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) Homework that measures students' ability to use the fundamental principles of astronomy and physics to answer questions concerning astronomical phenomena.
3) Research paper(s) in which students are required to analyze, interpret and draw conclusions from scientific sources.

Special Materials Required of Student

None

Minimum Instructional Facilities

Smart classroom with demonstration equipment

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) **Reading:** Lecture notes; assigned sections from the textbook; supplemental problem explanations; instructor-provided conceptual summaries and study guides. Students may also read articles or excerpts regarding astronomy topics.
2) **Writing / Problem Solving:** Problem sets requiring students to explain their answers; online practice questions developed by the instructor or taken from the textbook/software; research paper where students analyze, interpret and draw conclusions from scientific sources.
3) **Other:** None

Texts and References

Texts used by individual institutions and even individual sections will vary.

Representative texts:

- Fraknoi, A., Morrison, D., Wolf, S., et al. (2022). Astronomy 2e. OER: OpenStax.
- Frank, A. (2020). Astronomy: At Play in the Cosmos. 2nd ed.: W. W. Norton and Company.
- Bennett, J., Donahue, M. Schneider, N., & Voit, M. (2022). The Essential Cosmic Perspective. 9th ed.: Pearson
- Seeds, M., & Backman, D. (2025). Foundations of Astronomy. 15th ed.: Cengage.
- Palin, S., Blumenthal, G. (2022). 21st Century Astronomy. 7th ed.: W. W. Norton.

Exit Skills

Students having successfully completed this course exit with the following skills, competencies and/or knowledge:

1) Define and use the following terms: planet, Moon, comet, meteoroid, constellation, Celestial Sphere, precession, seasons, astronomical unit, parsec, light-year.
2) Use the inverse square law as it applies to light and gravity to calculate distance, mass and intensity.
3) Use synodic and sidereal time.
4) Identify the phases of the Moon and use them to predict time of sunrise and sunset.
5) Compare and contrast solar and lunar eclipses.
6) Diagram the structure of the Sun.
7) Describe how the Sun generates energy.
8) Diagram the structure of the solar system.
9) Analyze how astronomers obtain information about stars, what information can be obtained, and how the information is used.
10) Explain the relationship between photons, atomic structure and spectral lines.
11) Discuss stellar distances by using absolute and apparent magnitude and parallax.
12) Construct a Hertzsprung-Russell diagram and to use it to analyze the evolution of stars.
13) Compare and contrast stellar evolution models for different mass stars.
14) Discuss galactic distances by using various distance indicators.
15) Diagram the structure of galaxies.
16) Compare and contrast the classification of galaxies.
17) Evaluate models of the structure and evolution of the Universe.

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

1) Use solar system structure and dynamics to explain observed solar system phenomena.
2) Explain how a Hertzsprung-Russel diagram is constructed and what it reveals about the evolution of stars.
3) Describe the structure of the Universe consistent with the Big Bang Theory, and how scientific observations have placed important constraints on the theory.