ASTR C100: INTRODUCTION TO ASTRONOMY

Item	Value
Top Code	191100 - Astronomy
Units	3 Total Units
Hours	54 Total Hours (Lecture Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)
Local General Education (GE)	• CL Option 1 Natural Sciences (CB1)
California General Education Transfer Curriculum (Cal-GETC)	• Cal-GETC 5A Physical Science (5A)
Intersegmental General Education Transfer Curriculum (IGETC)	• IGETC 5A Physical Science (5A)
California State University General Education Breadth (CSU GE-Breadth)	• CSU B1 Physical Science (B1)

Course Description

Origin; characteristics; and evolution of the solar system, the stars, the galaxies, and the universe. Historical milestones in the science of astronomy from ancient astronomers to current topics such as dark energy, dark matter, and cosmology. Transfer Credit: CSU; UC: Credit Limitation: no credit for ASTR C100L unless ASTR C100 is taken previously or concurrently.

Course Level Student Learning Outcome(s)

1. Describe the solar system members and the physical processes pertaining to the individual planets.
2. Compare and contrast nuclear fusion in different types of stars.
3. Differentiate among possible models of the Universe.

Course Objectives

- 1. Describe the daily, monthly, and annual motions of the sun, moon, planets, and stars.
- 2. Describe how telescopes are used to gather light and how light can be analyzed to determine the physical characteristics of heavenly objects.
- 3. Describe the observational and physical properties of the sun and other stars, and explain the process of nuclear fusion.
- 4. Explain the evolution of stars from birth to death.
- 5. Summarize the basic properties of the solar system as they relate to the nebular theory of the formation of stars and planetary systems.
- 6. Explain the concepts of dark matter and dark energy and their role in modern cosmology.
- 7. Describe the necessary conditions for life as we know it as they relate to astronomy, and the search for extra-terrestrial life.

Lecture Content

The Sky The Cosmos-Size and Scale Major Structures Distance Scale Size Relationships Scientific Method, Scientific Notation, Theories, Natural Law Sky and Sky Cycle: Ecliptic and Celestial Equator Seasons, Equinoxes and Solstices Retrograde Motion Celestial Sphere Constellations Moon Phases Eclipses Nodes Partial, Total, Annular Umbra and Penumbra History: Discoveries and Theories Hipparchus and Magnitude System Apparent Absolute Parallax Keplers 3 Laws Galileo Newtons Laws of Motion and the law of Universal Gravitation Astronomical Tools Types of Radiation Nature of Light - Wave-like Behavior, Photons Inverse Square Law Kirchoffs Laws and Spectroscopy Emission Spectra Absorption Spectra, Fraunhofer lines Continuous Spectra Doppler Effect Radiation Laws Wiens Law = Color vs. Absolute Temperature Stefan - Boltzman Law - Intensity Telescopes Reflector Refractor Resolution and Light Gathering Power Non-Visible Observations Radio Telescopes Satellites Atmospheric Transparency IR, X-ray , UV. Space Telescope The Stars The Sun Appearance Photosphere Prominences Granules Sunspots Sunspot Cycle Zeeman effect Maunder minimum Flares Atmospheres Corona Chromosphere i >Solar Wind Rotation, differential Aurora Borealis and Australis, Van Allen belts The Interior The Core and Nuclear Fusion Energy Transfer to Surface Starlight and Stellar Properties Absolute and Apparent Visual Magnitude Spectral Type Temperature Chemical Composition Distance Measurements Parallax Cepheid Variables: Mass Luminosity Relation Binary Stars Visual Spectroscopic Eclipsing Stellar Radii Hertzsprung-Russell Diagram Temperature vs. Luminosity or Absolute Magnitude Main Sequence Red giants and Supergiants White Dwarfs Abundance - Main Sequence Stellar Evolution Origin Birth of Stars Interstellar Medium and Molecular Clouds Gravitational Collapse Proto Stars Main Sequence Fusion Reactions Proton-Proton Chain Carbon-Nitrogen Oxygen Cycle (CNO) Hydrostatic Equilibrium Gas vs. Gravitational Pressures M. S. Lifetimes Old Age - Red Giants Helium Flash Red Giant Characteristics Synthesis of the Elements - Triple Alpha Alpha Capture Variable Stars Stellar Death White Dwarfs Chandrasekhars Limit Planetary Nebula Fate of the Sun Novas Supernovas Conditions Leading Toward Neutron Stars Pulsars Crab Nebula Pulsar Black Holes Relativistic Collapse Mass Limits Characteristics: Event Horizon, Singularity, Photon, and Sphere Cygnus X-1 : Evidence Accretion Disk X-rays Milky Way Galaxy Size, Shape, And Our Position In It Population I and II Stars Galactic and Globular Clusters Spiral Structure 21 Centimeter Line of Hydrogen Density Wave Theory Interstellar Molecules HI and HII Regions Origin and Formation Galaxies Hubble Classification Irregulars Spirals Ellipticals Distribution Peculiar Structure Local Group Evolutionary Sequence Galaxies with Active Nuclei Quasars Observational Characteristics Cosmological Redshift and Hubbles Law Gravitational Lens Supermassive Black Holes Rotating Black Holes Ergosphere M87 Galaxy Seyfert Galaxy Radio Galaxies Quasars Clusters of Galaxies Characteristics of Clusters of Galaxies Super Clusters Cosmology Expansion Observations of Edwin Hubble Cosmological Redshift Hubble Law of Recession Origin Big Bang Model Pros and Cons Wilson and Penzias Observations 3 K Background Radiation Matter and Anti-matter Destiny Open vs. Closed or Flat Critical Density Hubble Constant Hubble Time Positive vs. Negative Curvature Observations to determine the State of Universe Density measurements Deceleration parameter Abundance of deuterium Age Oscillating Universe Mini Black Holes Prim ordial (another name) Quantum Effects Evaporation and Explosion The Early Universe Grand Unified Theories (GUTS) Inflationary Universe Solar System Origin of the Solar System Nebular Hypothesis Planetary Accretion Theory Supporting Evidence The Detection of Planets Beyond the Solar System General Characteristics of

Planets Terrestrial and Jovian Atmospheres Surface Features Satellites Natural Moons Rings Historical Overview The Earth Seasons Stellar Parallax Magnetic Field Plate Tectonics and Continental Drift Atmosphere Oceans Primordial and Present Greenhouse Effect Ozone Layer The Moon Geology Apollo findings Highlands and Maria Characteristics and Origins Dust and Debris Impacts Vulcanism Origin Theories and Observations Comets and Asteroids Cometary Orbits Composition and Structure "Dirty Snowball" Origins Oort-Cloud Main Belt Meteors, Meteorites, and Meteoroids Origin Meteor Showers and Comets Extra Terrestrial Life Nature of Life Origin of Life Life in Our Solar System Habitable Zones SETI The Drake Equation i

Method(s) of Instruction

- Lecture (02)
- DE Online Lecture (02X)
- Video one-way (ITV, video) (63)

Instructional Techniques

A variety of instructional techniques will be employed to encompass different student learning styles. These may include, but are not limited to, lecture, discussion, and small group activities. Instruction will be supplemented, where appropriate, by PowerPoint presentations, videos, simulations, and other electronic resources and technologies.

Reading Assignments

Students will complete reading assignments from the textbook as well as any supplemental reading based upon handouts, Internet resources, and assignments from the Coastline Library.

Writing Assignments

Quiz and Test questions, and Discussions will require the student to demonstrate and communicate a qualitative understanding of scientific concepts.

Out-of-class Assignments

Outside of the classroom, students will do the required reading, study for quizzes and exams, and conduct research, where applicable, to prepare for discussions.

Demonstration of Critical Thinking

Students will demonstrate critical thinking through problem solving as well as written work such as active participation in class discussions.

Required Writing, Problem Solving, Skills Demonstration

Problem-Solving will be emphasized in the class through homework assignments, quiz and test questions, and testing predictions based on simulations. Writing and/or oral communication skills will be demonstrated by essay questions and participation in discussions.

Eligible Disciplines

Astronomy: See physics/astronomy Masters degree required.

Textbooks Resources

1. Required Bennett, J.O.; Donahue, M.O.; Schneider, N.; Voit, M. The Essential Cosmic Perspective, 8th ed. Pearson, 2020 Rationale: - 2. Required Fraknoi, A.; Morrison, D.; Wolff, S. Astronomy, ed. OpenSTAX, 2022

Other Resources

1. Coastline Library