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Alabama Department of Postsecondary Education

Representing Alabama's Public Two-Year College System

Jefferson State Community College

AST 220 Introduction to Astronomy

I. AST 220 Introduction to Astronomy - 4 Semester Hours

II. Course Description

This course covers the history of astronomy and the development of astronomical thought leading to the birth of modern astronomy and its most recent development. Emphasis is placed on the coverage of astronomical instruments and measuring technologies, the solar system, the Milky Way Galaxy, important extragalactic objects and cosmology. Lab is required.

III. Prerequisite

As required by program.

IV. Textbook

The Cosmic Perspective, 4th Edition, written by Bennet, Donahue, Schneider, and Voit, published by Addison Wesley, 2007.

V. Course Objectives

At the end of the course the student will be able to:

- A. Use a telescope
- B. Describe the major objects in the solar system
- C. Describe the major objects in the universe
- D. Define the terminology used in astronomy
- E. Identify the major contributors in astronomy
- F. Describe the major events in the origin of the universe
- G. Discuss current topics in space exploration

VI. Course Outline of Topics

- A. History and the development of astronomy
- B. Production and detection of the electromagnetic spectrum

- C. Theory, construction and use of telescopes
- D. The earth-moon system
- E. The solar system
- F. The sun's structure
- G. Properties and evolution of stars
- H. Properties and evolution of galaxies
- I. Structure and evolution of the universe

VII. **Course Objectives Stated in Performance Terms**

- A. The student will acquire understanding of the history and the development of astronomy and the scientific approach to observations and measurements that lead to the birth of modern astronomy and cosmology. The student will be able to:
 1. State the major historical events that lead to the birth of science and the development of ancient astronomy.
 2. Discuss the major events starting around the sixteenth century that lead to the theories and foundations of modern astronomy and cosmology.
 3. List the names, approximate dates, significant events and discoveries of all major contributors to the science of astronomy and cosmology.
 4. Explain the transition from ancient astrology-astronomy that was based on religion and superstitions to the scientific approach based on observations and measurement.
 5. Define and explain from an historical perspective, the implication and meaning of the term cosmos.

- B. The student will acquire understanding of the production and detection of the electromagnetic spectrum as it relate to astronomy. The student will be able to:
 1. Define electromagnetic energy and waveforms.
 2. Explain the electromagnetic spectrum as a function of wavelength, frequency, velocity, and energy.
 3. Discuss the physical basis of electromagnetic generation.
 4. Discuss the physical basis of electromagnetic detection.
 5. State and demonstrate the theories and applications of absorption and emission spectroscopy.
 6. Explain and demonstrate the production of the color spectrum from white light.
 7. Demonstrate the effect of the lens system of a telescope.

- C. The student will acquire understanding of the theory, construction, and applications of telescopes in astronomy as used today and planned for the future. The student will be able to:
 1. Explain the difference between visual and non-visual observations of astronomical objects.
 2. Differentiate between reflector and refractor telescopes.

3. List the types of visual telescope used by astronomers.
 4. List the types of non-visual telescopes used in astronomy.
 5. Discuss the imaging process and requirements of all types of telescopes.
 6. List all known celestial objects that are detectable by current technology.
 7. Purpose future methods of astronomical detection of celestial objects or energies that may be undetectable by current technology.
- D. The student will acquire understanding of the dynamics of the earth-moon system. The student will be able to:
1. Explain the probable origin of the earth-moon system.
 2. Discuss the moon's surface features, geology, rotation, revolution, and phases as seen from earth.
 3. Demonstrate the role of the moon in both lunar and solar eclipses.
 4. Explain the moon's role in causing the earth's tides.
 5. List the diameters and distances related to the earth-moon system.
 6. Discuss from both a historical and technical view the lunar landings.
- E. The student will acquire understanding of the solar system's evolution and structure, including its known planets and their satellites, asteroids, and comets. The student will be able to:
1. State several theories for the evolution and formation of the solar system.
 2. Name of the known object that make up the solar system.
 3. Define an astronomical unit and list the distances between objects in the solar systems using that unit.
 4. Locate all the known orbits of the solar system, and name the major objects in those orbits.
 5. Give, to a reasonably close value judged by the instructor, the size, structural composition, periods, masses, rotations, satellite descriptions, angles of inclination, and temperatures for all planets.
 6. List Kepler's three laws of planetary motion and explain their significance.
 7. Illustrate by drawing, the proof of Kepler's second law.
- F. The student will acquire an understanding of the sun's structure, energy, and relationship to the solar system and the Milky Way. The student will be able to:
1. Explain the role of the sun in the creation and maintenance of the solar system.
 2. Describe the origin and radiation of the sun's energy.
 3. Name the major layers of the sun's structure, and explain their apparent energy related functions.
 4. Discuss the concept that the sun must be a second or third generation star based on the presence of complex elements in its satellites.
 5. Safely observe sunspots and explain their significance.

6. Locate the sun's position in the Milky Way and describe its orbital motions as part of the greater system.
- G. The student will acquire an understanding of the evolution properties, structure, and lives of stars. The student will be able to:
1. List the events required to create and maintain a star as an entity in the universe.
 2. Name the stages and nuclear fusion reactions sequences that all stars pass through after their creation.
 3. Identify the stages of stars as they relate to the main sequence concept and the Hertzsprung-Russell diagram.
 4. List the names and explain the physical characteristics of all star remnants and the events that precede them.
 5. Explain the relationship to a star's mass that predicts the appearance, life span, and terminal event of the star.
 6. Connect the periodic table of the elements to the events that occur in stars.
- H. The student will acquire an understanding of the evolution, properties, and structure of galaxies. The student will be able to:
1. List the events required to create and maintain a galaxy as an entity in the universe.
 2. Name the various types of galaxies as classified by observation of their structure, shape, luminosity, or other characteristics.
 3. Define the terms, local group, cluster, and supercluster.
 4. Discuss the events that may be occurring in the core of galaxies, and predict the outcome of this process.
 5. List and define the units used by astronomers in measuring distances of the magnitude found between stars and galaxies.
 6. Give typical examples of distances between stars and galaxies, especially those concerning the Sun, Milky Way and the local group.
- I. The student will acquire an understanding of modern science's concept of the universe's creation, current status, and eventual fate as predicted by mathematical theories and calculations. The student will be able to:
1. Explain the relationship between space and time as originally proposed by Albert Einstein.
 2. State the mathematical relationship between energy and matter.
 3. List the events occurring before, during and after the Big Bang.
 4. Demonstrate Hubble's law and the calculations used in determining the current rate of expansion and the age of the universe.
 5. Define cold dark matter, and explain its role in the eventual fate of the universe.
 6. Suggest possible origins of the energy source of the quasars.
 7. Outline all of the possible "final fates" of the universe and explain the mathematical basis of each theory.

VIII. Evaluation and Assessment

Grades will be given based upon A = 90 - 100%, B = 80 - 89%, C = 70 - 79%, D = 60 - 69%, and F = below 60%.

IX. Attendance

Students are expected to attend all classes for which they are registered. Students who are unable to attend class regularly, regardless of the reason or circumstance, should withdraw from that class before poor attendance interferes with the student's ability to achieve the objectives required in the course. Withdrawal from class can affect eligibility for federal financial aid.

X. Statement on Discrimination/Harassment

The College and the Alabama State Board of Education are committed to providing both employment and educational environments free of harassment or discrimination related to an individual's race, color, gender, religion, national origin, age, or disability. Such harassment is a violation of State Board of Education policy. Any practice or behavior that constitutes harassment or discrimination will not be tolerated.

XI. Americans with Disabilities

The Rehabilitation Act of 1973 (Section 504) and the Americans with Disabilities Act of 1990 state that qualified students with disabilities who meet the essential functions and academic requirements are entitled to reasonable accommodations. It is the student's responsibility to provide appropriate disability documentation to the College. The ADA Accommodations office is located in FSC 300 (205-856-7731).

Revised on 1/31/2004

