June 2009

Astronomy 102 – Introduction to the Stars and Galaxies (4)
Course Outline GE B3

Prerequisites for ASTR 102 – None. Not open to students who have completed or are taking ASTR 112, ASTR 301, ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 4 lectures. Fulfills GE B3.

ASTR 102 is one of two introductory survey courses in astronomy and is designed to introduce students to our present knowledge about stars, galaxies, and the origin and evolution of the universe. The students will gain a better understanding of the scientific method, and will learn to solve astronomy problems using astronomical theories and simple mathematics. Aspects of astronomy which affect our daily lives will be covered, and students will learn to share their understanding of astronomy with others using the appropriate terminology.

Learning Objectives and Criteria:

Upon completion of the course the student is expected to:
a. Understand the language of astronomy and the physics and mathematics involved.
b. Understand the scientific method of hypothesis and modeling followed by experiment to prove or disprove.
c. Understand and use specific theories and models which have proven to be useful in astronomy.
d. Understand the limits of present knowledge in astronomy and efforts underway to extend present knowledge.

Text and References:
"**Explorations**" by Thomas Arny, McGraw Hill Publishers, 5th Ed.
"Cosmic Perspective" by Bennett, et al., Addison Wesley, 5th Ed.
"Universe" by Freedman & Kaufmann, Freeman, 8th Ed.

Content and Method:

Content: ASTR 102 will address the following topics:

Week 1: An introduction to astronomy to give students the big picture of planet, star, solar system, galaxy, galactic cluster, universe. Demonstrate the importance of astronomy through history, constellations, solstices, equinoxes, daily motions of the stars.

Week 2: The nature of light and matter including the speed of light, the electromagnetic spectrum, the various types of spectra, blackbody radiation, and Doppler shift all applied to astronomical measurements.

Week 3: The sun including its structure, magnetic cycles, and energy source.

Week 4: The nature of stars including distances, magnitudes, temperature, size, mass, composition, multiple star systems, and the main sequence lives of stars.

Week 5: The birth of stars including locations where new stars form, how they form, knowledge of star birth from star clusters, and processes which initiate star formation.

Week 6: Stellar evolution beyond the main sequence including red giants, horizontal branch stars, mass transfer in binary systems, and knowledge gained from star clusters.

Week 7: The deaths of stars including asymptotic branch stars, planetary nebulae, white dwarfs, supernova, neutron stars and pulsars, and black holes.

Week 8: Our home galaxy including its size and shape, spiral arms, composition, and central black hole.

Week 9: Galaxies in the universe including the different types of galaxies, evidence that the universe is expanding, the Hubble Law, galactic clusters, galactic superclusters, and the evolution of galaxies.

Week 10: Cosmology including our present understanding of the creation, evolution, and eventual fate of the universe. If time permits the very early universe can be described in more detail, and the possibility of extraterrestrial intelligence can be discussed and even quantified to some extent.

Method:
ASTR 102 is a 4-unit lecture course. An observing experience is provided in addition to the lecture through the Physics Department Observatory, which is operated by student assistants. ASTR 102 is taught as a lecture course with an enrollment of 70 students.

Methods of Assessment:

The primary method of assessment is by examination, usually two mid-term exams and a comprehensive final exam. Variations might include three or four quizzes and one mid-term exam. A paper or several short papers may be required reviewing astronomy articles the student has read or describing observing sessions at the observatory or observing done independently.

Examinations testing understanding of the concepts and models in astronomy, as well as some factual knowledge, provide an adequate assessment of student understanding.