

Instructor: A. W. Shafter (P243; ashafter@sdsu.edu; x46170)

Supplemental Text: *The Physical Universe* by Frank Shu.

Course Description:

The purpose of this course is to provide students with a brief introduction to extragalactic astronomy. Roughly the first one-third of the course will be devoted to the historical development of extragalactic astronomy, including a discussion of the nature of spiral nebulae, followed by a discussion of galaxy classification and morphology. The middle third of the course will describe the extragalactic distance scale, and how distances to individual galaxies are determined. The final third of the course will cover observational cosmology – the origin and evolution of the Universe on large scales.

I. The Nature of Spiral Nebulae

- A. Historical Background
- B. Properties of Stars Review

II. Galaxy Morphology: Structure and Content

- A. Classification
- B. Stellar Populations

III. Interstellar Material

- A. Interstellar Extinction
- B. HII Regions & Nebulae

MIDTERM

IV. Galaxies & The Extragalactic Distance Scale

- A. Distances within the Milky Way
- B. Standard Candles
- C. Distances to Local Group and Nearby Galaxies

V. An Introduction to Observational Cosmology

A. Newtonian Cosmology

B. Big Bang

Grading:

Grading will be based on a midterm (25%), and a comprehensive final exam (40%). The remaining 35% of the grade will be based on Homework & Distance Scale Project.

Key Student Learning Outcomes:

By the end of the semester students should be able to:

- Describe the birth of Extragalactic Astronomy
- Describe the properties of Spiral, Elliptical and Irregular galaxies.
- Discuss how distance to galaxies are determined using a variety of extragalactic distance indicators (Cepheid stars, Novae, Supernovae, Tully-Fisher, Brightest Stars).
- Describe Hubble's Law, the Big Bang, Big Bang nucleosynthesis, and the cosmic microwave background (CMB) radiation.
- Explain the origin of cosmic structure, the cosmological constant, dark energy and the accelerating universe, and the ultimate fate of our universe.

Statement on Student Disability:

If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

Emergency Preparedness: <http://bfa.sdsu.edu/emergency/>