

AS 710 – OBSERVATIONAL TECHNIQUES – FALL 1999

Course Overview:

This course will provide practical experience with the equipment, methods, and considerations of observational astronomy. We will cover a broad range of wavelengths (gamma rays to radio) and observational techniques (photometry, imaging, spectroscopy, polarimetry, etc.). In addition, you will each undertake both optical and radio wavelength telescope observations and carry out each aspect of a complete and successful observational study. These activities will include: (1) composition and submission of an observing proposal to request telescope time to address your scientific objectives (radio project); (2) advance preparation for your observations; (3) data acquisition at the telescopes; (4) reduction of your data and data provided at other wavelengths for your observed objects; (5) analysis of the reduced data to derive valid scientific results, including the proper statistical treatment; and (6) written reports on your programs and results. In order to accomplish your observational programs, you will learn about the design and operation of telescopes and detector systems and the observational techniques specific to different wavelength regimes. You will make your optical observations with CCD detectors mounted on our 14" rooftop telescope, and you will make your radio observations at the MIT Haystack Observatory in Groton, MA (to which you will submit your observing proposals). You will be trained in the statistical analysis essential in astronomical observations and the operation of professional data reduction software such as IRAF and CLASS. Thus you will gain knowledge of the theory, hardware, and computing involved in observational astronomy.

Instructor: Prof. Lynne Deutsch

Required Texts: (available at the BU bookstore)

Astronomical Observations by Gordon Walker, Cambridge University Press, 1989.

Astrophysical Techniques, third edition, by C. R. Kitchin, Institute of Physics Publishing, 1998.

Data Reduction and Error Analysis for the Physical Sciences, second edition, by Bevington and Robinson, McGraw-Hill, Inc., 1992.

Reference Texts:

1. *Astronomical Optics* by Daniel J. Schroeder, Academic Press, Inc., 1987.
2. *Observational Astronomy* by D. Scott Birney, Cambridge University Press, 1991.
3. *Detection of Light from the Ultraviolet to the Submillimeter* by George H. Rieke, Cambridge University Press, 1996.
4. *An Introduction to Error Analysis* by John R. Taylor, University Science Books, 1997.
5. *Statistical Treatment of Experimental Data* by Hugh D. Young, Waveland Press, 1996.

Grading:

Your grades will be based on your homework assignments (20%), laboratory work and projects, including your laboratory notebooks (40%), and examinations (20% each for one midterm and one final exam). Your final class grade will also depend upon your level of participation and effort in all class activities (lecture, night labs, "field trips", etc.). Lack of participation or effort will result in a lower class grade.

You are expected to turn in ALL assigned work. Failure to complete assigned work can result in a failing grade in the class.

Night Laboratory Times:

You will work in small groups on your night laboratories. Group members will be rotated every few weeks. You must each learn to operate the telescope and cameras and make observations, and you will each be expected to demonstrate individually your proficiency in these tasks.

Maintaining an accurate written record of observations and data analysis is a crucial part of any observing program. You will be required to keep a laboratory notebook of your observations and data reduction work, which will be reviewed at various times during the semester and turned in for grading at the end of the semester.

Field Trips:

I will reserve two days at the MIT Haystack Observatory for your radio observations. We will talk more on the first day of class about scheduling your observations depending on your course and teaching schedules. We may also make a trip to the Oak Ridge Observatory in Harvard, MA, to tour the telescopes and possibly even take a look at the SETI (Search for ExtraTerrestrial Intelligence) facility.