

ASTR 404/514 – Winter 2013, Term 1

Astronomical and Astrophysical Measurements

Course Description:

This course is designed to give students a familiarity with the principles of modern astronomical instrumentation and techniques, as a preparation for the practical experience in ASTR 405. The topics covered will include an introduction to radiation, imaging, spectroscopy, detectors, and telescope design over the full range of the electromagnetic spectrum. Concrete examples will be given from current astronomical research.

Instructor:

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Lectures:

Tuesday Thursday 11:00-12:15
Hennings 301

Office hours:

Wednesday 3:00-4:00 pm, drop-in, or email me for a specific appointment.

Text book:

[Observational Astronomy](#), 1st edition, E.C. Sutton, ISBN:9781107010468.

Course website:

<http://www.physics.ubc.ca/~hinshaw/a404/>

Homework and lecture slides will be posted there. Paul Hickson's 2002 course notes are posted there, as a supplement to the Sutton text.

Additional Reference Texts:

Walker: Astronomical Observations
Rybicki & Lightman: Radiative Processes in Astrophysics
Lang: Astrophysical Formulae
The Astronomical Almanac

Course Outline:

Radiation and photometry
Coordinates and time-keeping
Fourier transforms (review)
Detector systems
Statistics, stochastic processes & noise
Optics & telescope design
Interference & interferometry
Spectroscopy
Radio receivers
High energy (UV, X-ray, gamma-ray) systems
Modern statistical methods (time permitting)

Grading:

25% – homework assignments (about 6–7 assignments in total)
20% – project/short presentation on a particular telescope or instrument
25% – midterm exam
30% – final exam

Assignments:

You are encouraged to work together on the assignments, but each student must write up the problems in his/her own words. If you have done research in books or on the web, be sure to cite your sources as you would in any astronomical research paper (see *The Astrophysical Journal*, *Astronomical Journal*, *MNRAS*, etc. for sample citations). A 10% deduction will be taken off an assignment for every day it is late.

Project:

You will research the unique specifications of a telescope or instrument, along with the science drivers that motivated that particular choice of instrumental parameters. To avoid duplication and to get you thinking about it early on, a list of some suitable telescopes/instruments will be circulated early in the term. Much of the information needed for your project will be in instrument-specific papers located by ADS searches (see link on course web page), and on the project web sites. Your research is to be summarized in a short (5–8 page) report and a ~15 minute presentation to the class.