ASTRONOMY 4880 / PHYSICS 5880
Astrophysical Measurements Laboratory

Fall 2004

Syllabus

Time: MW 7:20–8:35 PM  Instructor: Dr. N. D. Morrison
Rooms: RO 300, 304, & 501  Office: Ritter Observatory 205

Corequisite: ASTR 4810 / PHYS 5810 or equivalent preparation

Access to planetarium software such as *Starry Night Backyard* or higher version
(http://www.starrynight.com)

Format: three to six hours lecture / laboratory per week

- When conditions are suitable for observing, telescope operation and data acquisition will be
demonstrated and practiced. On some cloudy nights, class will include demonstration of
data reduction software, and/or computer laboratory sessions. Students should expect to
spend three hours (150 minutes) in class on those occasions.

- At other times, class sessions will include lecture-style presentation of the topic of the day.
Lecture sessions will last 75 minutes.

Objective: On completing the course, students should understand the operating principles of an
observatory and should be able to take research-grade stellar spectra, with little or no supervision
and with understanding of the main features of what they have obtained.

Requirements

- Assignments will be expected to take 2 to 3 hours per week outside of class. Periodically,
one or the other of the following will be assigned. Percentages give weights to be used in
computing final grade.
  - Short problem assignments, called, “Homework,” to provide practice in applying
    concepts developed in class. (20%)
  - Longer projects, called “Labs,” in which students will practice the research techniques
    they have learned in class. Students will have some responsibility for developing the
    procedure to be used in carrying out the lab.

Data reduction practice with the data analysis package IRAF, running on the Unix
machine astro1, will be included. Accounts on astro1 will be arranged for students who
do not already have them, and access to terminals will be provided. Full-length lab
writeups will be required. (35%)

For students taking the class for Writing Across the Curriculum, lab reports will
be graded for English grammar, usage, and organization. Revisions will be required as
needed. Homework problem solutions will be graded for layout, clarity, and
organization, and revisions may be required.
• Because of the importance of hands-on demonstrations of the equipment, class attendance is required (except in the case of illness or injury to the student). (10%)

• Because of the significant conceptual content of this class, there will be a short final examination beginning at 7:30 PM on Wednesday, December 15 and lasting about an hour. (35%)

• At the end of the semester, students will be expected to be able to pass the operation certification for the observatory.

• Students taking the course for graduate credit will carry out an additional project. Their work will also be graded according to higher standards.

• Students are required to be aware of any changes to this syllabus that may be announced.

Strongly recommended supplies

• Small flashlight
• Clipboard for taking notes in the dome
• Dress appropriate for outdoor activities

Lecture Topics

1. The charge-coupled device (CCD)
2. Introduction to image processing; IRAF
3. Signal and noise
4. Calibration
5. Spectrographs
6. Spectroscopic data reduction
7. Optical fibers
8. Astronomical telescopes
9. Celestial coordinates: practical aspects
10. Stellar spectra (brief introduction)
11. Measured quantities: radial velocities, equivalent widths, line profiles