

1 Modern Observational Techniques: Overview

In this class we will cover the planning, execution and reduction (including calibration) of astronomical data. The majority of the time will be spent on the basics of standard data reduction. There seems to be no better way to learn about how you SHOULD have taken data during a run than to reduce data and realize you have insufficient calibration frames or made some other mistakes. The focus will be on optical and near-IR data with only an introduction to radio and high-energy (x- and γ -ray) observations. The data reduction will be mostly discussed in the framework of IRAF as this is the most widely used package and the one I am most familiar with.

1.1 Class Format

The way to get the most out of this class is to do the homework exercises and read the most important references. The idea is NOT to provide cookbooks for the various types of data reduction as these details will change. Rather, we will discuss the general procedures, some of the important algorithms behind common tasks, important references and some of the IRAF tasks in class and, in the course of completing the homework, you will confront and conquer all the details.

1.2 Requirements

You will need access to a computer with IRAF or IDL installed, Latex or Word and a plotting routine (Supermongo, IDL). These are most likely to be found in a UNIX-type environment. Facility with all of these things will serve you well if you continue on in astronomy research.

1.3 Class Outline

1. S/N and integration time estimation
2. Planning an observing run
 - (a) Proposal writing
 - (b) Aircharts
 - (c) Calibration frames
 - (d) Checks during the run
3. Basic processing - overscan, bias, flat-fielding
4. Direct imaging
 - (a) Camera designs

- (b) Filter Systems
- (c) Point source photometry
- (d) Aperture corrections
- (e) Surface photometry
- (f) Calibration

5. Spectra

- (a) Spectrometer designs
- (b) Extraction of spectra
- (c) Wavelength calibration
- (d) Flux calibration
- (e) Radial velocity measurements
- (f) Equivalent width measurements
- (g) Index measurements
- (h) Multi-slit/fiber spectra
- (i) Echelle spectra

6. Observations at other wavelengths

- (a) Near-IR
- (b) UV
- (c) X-Ray