

AST/GLG 598 – Astronomical Instrumentation and Data Analysis
Fall 2006
SLN: 62417, 61979
MWF 9:40am-10:30am, PSH 460

Instructor: Dr. Paul Scowen, 480-965-0938, paul.scowen@asu.edu, PSF 254
Office Hours: Mon 10:30am-11:30am; Wed 2pm-3pm

Class Syllabus

Telescopes: theory of optics, fundamental design issues, aberrations, standards of measure, real world examples – Arizona especially for graduate work access. Pros and cons of differing approaches and designs.

Imaging and Detectors: fundamentals of semiconductor operations, fundamentals of imaging design and theory, fundamentals of spectroscopic design and theory. Introduction to CCD's – operation, calibration, use, measurement, limitations, noise and signal, statistics, preliminaries to data reduction. Real world examples.

Fourier Optics: use of optical systems as Fourier engines. Estimation and prediction of optical performance. Deconvolution. Using the uv plane to process the data. Radio Astronomy – aperture synthesis, partially sampled data, reconstruction.

Practical Observing: filter choice and design. Planning your observing run. Bringing your data home – remembering to get all the data you need. Calculations related to CCD imaging with telescopes. Calculations related to CCD spectroscopy with telescopes. Photometry. Astrometry. Calibration.

Data Reduction: primers in both IRAF and IDL. Introduction to simple computer-based data reduction. Scientific measurements, limits, noise, statistics. Accuracy versus knowledge. Scripting. Automatic and batch procedures. Design of GUI's in IDL. Specific examples from instruments on AZ scopes.

Class Project – fundamental reduction and measurements using computers. Making a simple measurement and estimating the accuracy of the measurement.

Proposal Writing: use of knowledge of Arizona telescopes to choose projects and hardware and write proposals intended to acquire observing time. Assessment of limits, appropriate use, sky darkness, observing limits, exposure times. Being your own harshest critic.