

ASTR 5760

Astrophysical Instrumentation

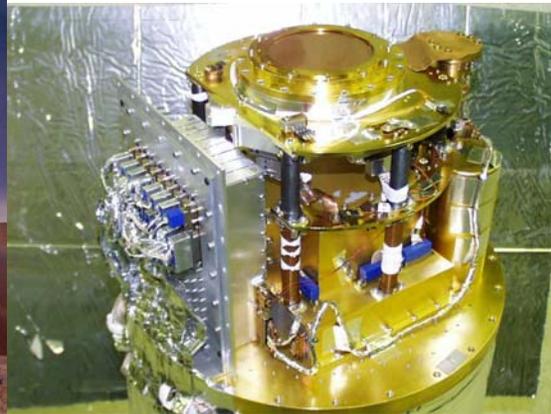
T-Th 2:00-3:15; Room E126

Professor Jason Glenn

Office: Room F913 & ARL 175E, (303) 735-5904, jglenn@casa.colorado.edu

Office Hours: By appointment

Examples of innovative astronomical instruments:



The 10.4-m Caltech Submillimeter Observatory The Bolocam millimeter-wave camera

Course Prerequisites:

Undergraduate degree in physics, astronomy, electrical engineering, or special permission.

Course Goal

My goal is to convey a physical understanding of modern astronomical instrumentation, from telescopes to detectors, across the electromagnetic spectrum.

Course Content

- Fundamental optics, telescopes
- Electromagnetics: diffraction, Gaussian beams
- Spectroscopy and polarimetry
- Detectors from the X-ray to the radio

Class Format

The class will consist of standard lectures, a couple of guest lectures by world experts, and student presentations.

Text

For the first half of the course, there is no required text, however, there will be recommended reading from various sources. For the second half of the course, the text

(required) will be the 2nd edition of Detection of Light From the Ultraviolet to the Submillimeter by G.H. Rieke.

Coursework and Grading

- Homework: 40%
- Group talk and paper: 20%
- Midterm: 20%
- Final Exam: 20%

Attendance & Additional Policies

You are expected to attend lectures. The exam materials will be drawn from the lectures and the reading. You are encouraged to work together on homework, however, copying and cheating will result in a minimum penalty of zero credit. If you work together, write on your homework who you have worked with so that it is clear when I grade it.

Students with Disabilities

If you have specific physical, psychiatric or learning disabilities and require accommodations, please let me know early in the semester so that your learning needs may be met. You will need to provide documentation of your disability to the Disability Services Department (303-492-8671) at the beginning of the semester.

Preliminary List of Course Topics

- Fundamentals of Optics
Snell's law, reflection and refraction, the thin lens equation, sign conventions, Fermat's principle, stops
- Fundamentals of Telescopes
Types of telescopes, aberrations
- Diffraction Theory
Single slit, double slit, circular aperture
- Spectrometers
Diffraction gratings, other types of spectrometers
- Introduction to Gaussian Beam (Diffraction-Limited) Optics
- Fundamentals of Radio Astronomy
- Polarimetry
- Photoconductors
- Photodiodes
- Amplifiers and Readouts
- CCDs
- Bolometers
- Heterodyne Receivers
- Cryogenics