

**Course Title: Observational Techniques 1: Optical Astronomy**  
**Course Lecturers: Dr Rudi Kuhn (SAAO/SALT)**

### **1) Course overview:**

The aim of this course is to give a general introduction to optical observational astronomy, emphasising the techniques and instrumentation used. This includes discussion of basic telescope optics and design, active and adaptive optics, techniques for light detection and the principles and practices employed in photometry and spectroscopy.

### **2) Course breakdown:**

- **Observing basics**
  - Astronomical coordinate systems; spherical trigonometry; precession & nutation; parallax; proper motions; stellar aberration; atmospheric diffraction and dispersion; time systems
  
- **Telescopes**
  - Basic optics; aberration theory; telescope parameters and configurations; telescope lenses, mirrors, tubes, mounts, domes and enclosures; mirror coatings; active and adaptive optics (A-O); optical nature of the Earth's atmosphere; modern large telescopes
  
- **Detectors**
  - The human eye; the magnitude scale; photographic techniques; photoelectric effect; semiconductor basics; CCD principles; CCD design and operation; noise sources and signal to noise equation; cosmetic defects; practicalities of CCD data reductions
  
- **Photometry**
  - Absolute and bolometric magnitudes; colour index; blackbodies; filters and photometric systems; spectral energy distributions; two-colour diagrams; dust extinction and reddening; atmospheric extinction, absorption and emission; reducing photometric data; differential photometry
  
- **Spectroscopy**
  - Early history; dispersion and prisms; objective prism spectroscopy; diffraction gratings, the grating equation and grating parameters; échelle gratings; grisms; volume phase holographic gratings (VPHGs); spectrometer design