Practical Adaptive Optics

General Emphasis:

1. Present and future of Adaptive Optics
2. Elements of AO
3. AO observations and data.

Why Practical “AO”?

1. General scaling rules for systems and data.
2. Extract useful knowledge with wider application:
   a. Optics and Imaging
   b. Statistical Processes
3. Useful approaches to AO observations

Course Outline

1. Introduction (1)
   a. Basic AO ideas
   b. Imaging systems.
2. Geometric optics (2)
   a. Pupil and focal planes
   b. Aberrations
3. Physical optics. (3-4)
   a. Scalar Diffraction
   b. Fourier Optics (N)
4. Image Quality (5)
   a. Measures of image quality
   b. Integrating geometric and physical optics (N)
5. The Atmosphere (6-7)
   a. Effects of Turbulence
   b. Turbulence profiling.
   c. Describing turbulent phase errors
   d. Statistical concepts.
      i. Power spectrum
      ii. Structure function
      iii. Scintillation
6. Elements of Adaptive Correction:
   a. Strategies (8)
      i. Shack-Hartmann Systems
      ii. Curvature Systems
   b. Wave Front Sensing (9-10)
      i. Slope Measuring Wave Front Sensors
      ii. Curvature Wave Front Sensors
   c. Wave Front Correction (11-12)
i. Traditional deformable mirrors  
ii. Curvature deformable mirrors  
iii. MEMS deformable mirrors  
d. Control Theory (13)  
e. Residual wave front errors. (14)  
   i. Measurement Noise  
   ii. Fitting errors  
   iii. Non-Common path errors  
   iv. Bandwidth induced errors  
   v. Chromatic errors  
7. The Future of AO (15)  
   a. Science Drivers  
   b. Multi-Conjugate AO  
   c. Multi-Object AO  
   d. Ground Layer AO  

Numbers in parentheses refer to class number and N refers to supplemental notes.