OPTI 518- Introduction to Aberrations

Grading Policy:

Two take-home exams, one mid-term exam and one final exam will be given. Homework will be corrected, but not graded. The final grade will be based on the exams.

Schedule

- Two 75-minute lectures per week, T/TH
- Class Notes will be used

Outline

Advanced First-Order Tools (4)

- Matrix methods.
- The y, ybar diagram.

Chromatic Aberrations (2)

- Chromatic aberrations as variations in first-order properties.
- Application of the y,ybar diagram to systems of two lenses.

What are Aberrations? (13)

- Wave aberrations: definitions and parameters; classification and description.
- Transverse ray aberrations; relation to wave aberrations; vector description; ray fans.
- Change of reference sphere; zonal diagrams; spot diagrams; caustics.
- Distortion and field curvature.
- Astigmatism.
- Coma.
- Spherical aberration.
- Interferometric representation.
- Aberrated spread functions.
- Aberrated transfer functions.
- Combined aberrations.

Where Do Aberrations Come From? (3)

- Petzval curvature.
- Spherical aberration.
- Field-dependent aberrations.
How Do We Calculate Them? (2)

- Seidel coefficients; stop shift; special surfaces; special systems.
- Structural aberration coefficients.

Simple Systems (5)

- The simple thin lens.
- Single mirrors; aspherics; corrector plates.
- Thin lenses in contact; the achromatic doublet.
- Compound lens systems; the Lister objective; the dyalite; the triplet.
- Compound mirror systems.