

Physics 325 – Optics

Tentative Course Schedule [TH from 12:00 to 1:15 pm in room HA 305]

Geometric Optics

- Ray tracing
- Reflection, refraction and propagation of light
- Pinhole cameras
- Thin Lenses
- Thick Lenses
- Lens Systems
- Aberrations
- Color – addition and subtraction

Physical Optics

- Waves – superposition and interference
- Polarization
- Reflection II - Fresnel Equations
- Interferometry
- Diffraction
 - Far field: Fraunhofer Diffraction
 - Near field: Fresnel Diffraction

Optics Instrumentation and Image Processing

- Telescopes
- Microscopes
- Electron Microscopes
- Magnetic Resonant Imaging
- Image Processing Technics
 - Fourier Transform
 - Convolution Theorem

May 3: Study Day

May 5: PHYS 325 Final 2:00 pm

May 4 – 10: Final Exam Period

May 12: Commencement

Chapter readings are specified from the “*The Physics of Light and Optics*” your other texts give good concise conceptual descriptions. You may wish to check out an additional optics text from the library (or online) to serve as an additional reference.

Monday	Tuesday	Wednesday	Thursday	Friday
Jan 9	Lens Equation Exp: Optical Cloaking		Simple Lenses Quiz 0 - Refraction	Chap 0, Chap 2.A
Jan 16	MLK Jr. Day No School		Multiple Lenses	Chap 9
Jan 23	Thick Lenses Exp: Smartphone μ scope		Lens Systems Stops, $f\#$, NA and resolution ABCD Matrix	Resource Texts
Jan 30	Eyeglasses/Contacts (Myopia, Hyperopia and Presbyopia)		Quiz 1 – ABCD Matrix	Extra/Aux Papers
Feb 6	Aberrations Review	Camera - compound	Exam 1 Exp: Camera - pinhole	Chap 1
Feb 13	Wave Equation and E&M, Plane waves		Complex waves, index of refraction, Dielectrics	Chap 2
Feb 20	Boundary conditions, Fresnel Coefficients		Reflection, Refraction, metals and color	Chap 3
Feb 27	Multiple Interfaces Fabry-Perot Interferometer	Mid-Term	Interferometers Multilayers	Chap 4
Mar 6 No School	Spring Break No School	Spring Break No School	Spring Break No School	Spring No School
Mar 13	Anisotropic materials Crystals, Review		Exam 2 {Poynting Vector}	Chap 5
Mar 20	Polarization Malus' Law		Polarization Effects Jones vectors (matrix)	Chap 6
Mar 27	Superposition Group vs Phase velocity		Wave packet propagation Interference	Holiday No School Chap 7
April 3 Holiday No School	Coherence Exp: Michelson Interferometer		Fourier Spectroscopy Young's 2-slit interference	Chap 8
April 10	SAC Diffraction, Huygen's Principle, Review		Exam 3 Fresnel and Fraunhofer Approximation	Chap 10
April 17	Diffraction Applications Resolution of Telescope (refractor and reflector) Microscope – Confocal		Holography	Chap 11
April 24	Electron Microscope Microscope – Brightfield, Darkfield and Nomarski		Convolution Image Processing	Chap 12
May 1	Imaging – MRI and AFM	Study Day		Final

** lab activity/demo or computer work