

OPTICS OUTLINE (1)

- Maxwell's equations
 - ▷ Standard assumptions: Linear, homogeneous, isotropic medium; waves that can be described by a classical field
 - ▷ Vector boundary value problems; reciprocity
 - Vector waves at interfaces: Fresnel formulas, Brewster's angle, etc.
 - ▷ Polarization
 - ▷ Vector interference and diffraction theory
- Geometrical-optics limit of Maxwell's equations
 - ▷ Eikonal equation
- Ray optics
 - ▷ Ray optics at interfaces: Snell's law, etc.
 - ▷ Geometrical computation of image formation
 - ▷ Hamilton's formulation
 - ▷ Geometrical computation of aberrations in imaging systems

OPTICS OUTLINE (2)

- Physical optics
 - ▷ Interference phenomena
 - Interferometers
 - ▷ Diffraction
 - Diffraction gratings
 - Diffractive computation of image formation and aberrations
- Optical phenomena that break one or more of the standard assumptions
 - ▷ Crystal optics (anisotropic media)
 - Birefringence
 - ▷ Optics of confined or guided waves (inhomogeneous media)
 - Integrated optics, optics of small cavities, fibers, etc.
 - ▷ Nonlinear optics
 - ▷ Quantum optics
 - Photons

OPTICS OUTLINE (3)

- Optical materials
 - ▷ Glasses
 - ▷ Metals
 - ▷ Discrete crystals (example: LiNbO_3 , CaCO_3)
 - ▷ Materials with special properties (dichroism, photorefractivity)
 - ▷ Materials grown by semiconductor-process techniques
- Optical manufacturing
 - ▷ Surface forming
 - Abrasives and laps
 - Machine tools
 - ▷ Fiber, fiber-based devices, and connectors
 - ▷ Optical system assembly from discrete components
 - The big challenge: Alignment
 - ▷ Optoelectronic integrated circuits

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