

CC VII : OPTICS AND SPECTROSCOPY

Unit I: Geometrical optics

Spherical aberration- Spherical aberration of a thin lens – Ray tracing - Methods of reducing spherical aberration – Coma – Aplanatic surface – Astigmatism – Curvature of the field – Meniscus lens - Distortion – Ramsden’s eyepiece – Huygen’s eyepiece.

Unit II: Interference

Air wedge – Newton’s rings – Haidinger’s fringes – Brewster’s fringes – Michelson Interferometer and its applications – Fabry perot Interferometer – Interference filter – Stationary waves in light – colour photography (ideas only) – Holography – Construction and reconstruction of a hologram – applications.

Unit III: Diffraction

Fresnel’s diffraction – Diffraction at a (1) circular aperture (2) Straight edge (3) narrow wire. - Fraunhofer diffraction at a single slit – Double slit – Missing orders in a Double slit, Diffraction pattern – Grating with theory – Oblique incidence – Overlapping of spectral lines – Diffraction pattern – Grating with theory – Oblique incidence – Overlapping of spectral lines

Resolving power of optical instruments

Resolving power – Rayleigh’s criterion of resolution. Resolving power of a (1) Telescope (2) Grating – Dispersive power and resolving power of a grating.

Unit IV: Polarization.

Nicol prism – Nicol prism as an analyzer and polarizer – Huygens’s explanation of Double refraction in uniaxial crystals – Double Image polarizing prisms – Elliptically and circularly polarized light – production and detection – quarter wave and half wave plate – Babinet’s compensator – optical activity – Fresnel’s explanation of optical activity – Laurent’s Half shade polarimeter.

Unit V: Spectroscopy Lasers

Types of spectra – Emission and absorption spectra – Continuous, band and line spectra – Solar spectrum – Fraunhofer lines – Raman effect – Characteristics of Raman lines – Experimental verification of effect – IR and uv spectroscopy – sources – Detection – Properties and applications – induced absorption – spontaneous emission – optical pumping – Ruby laser – He – Ne Laser – Applications of lasers.

Books for Study:

1. Optics by Brijlal and Subramaniam.
2. Optics by Khanna and Gulati.

Books for Reference

1. Optics – Jenkins and White, McGraw Hill.
2. Optics – Ajoy Chatak (TMH).