

FPYE 406PHYSICS IV (3-0-0)

FPYE-406 OPTICS AND QUANTUM MECHANICS

UNIT-I(7)

Fermat's principle, reflection and refraction at plane interference, cardinal points of a coaxial optical system, cardinal points of (i) combination of two thin lenses and (ii) thick lens, elementary ideas of monochromatic aberrations and remedies, chromatic aberration, achromatic combination, removal of chromatic aberration in a separated doublet, Ramsden's and Huygens's eyepieces,

UNIT-II(8)

Wave theory of light, Huygen's principle, reflection and refraction at plane surfaces, condition of interference, division of wave front, biprism, interference by plane parallel thin film illuminated by a point source, colour of thin films, Newton's ring, determination of wave length of monochromatic light by Newton's ring.

UNIT-III(7)

Diffraction of light, Fresnel and Fraunhofer diffraction, Fresnel's half period zones, Zone plate act as a convex lens. Fraunhofer diffraction by a single slit, double slit Plane transmission grating.

Electromagnetic nature of light, Polarized and unpolarized light. Plane polarized, circularly polarized and elliptically polarized light. Polarization by reflection and refraction, Brewster's law, Malus's law. Double refraction, ordinary and extraordinary rays, construction, working and uses of Nicol prism. Half wave plate and quarter wave plate.

UNIT -IV(8)

Inadequacy of classical physics: review of black body radiation. Particle nature of wave, photoelectric effect, Compton effect, dual nature of radiation. Wave nature of particle – De Broglie hypothesis and wave-particle duality. Superposition of two waves, group velocity and phase velocity, wave packet. Experimental confirmation of matter waves (Davisson – Germer experiment). Heisenberg's uncertainty principle and applications (Ground state energy of harmonic oscillator and hydrogen atom. Time dependent Schrodinger equation in one and three dimension. The wave function, equation of continuity, probability current density and probability density. Normalization of the wave function, Expectation value of an observable

(6)

References:

1. optics- A.K. Ghatak
2. Principle of optics – B.K.Mathur
3. Optics – P.K. Chakravarty
4. Physics for degree students – VOL III and IV (SrikrishnaPrakashan)