

Syllabus

PANJAB UNIVERSITY, CHANDIGARH

B.Sc. Part-II [SEMESTER-IV]

PAPER-B : OPTICS AND LASERS-II (30 Hrs.)

UNIT-I

Laser Fundamentals :

Interaction of light with matter : Absorption, spontaneous emission, Stimulated emission, Wave mechanical explanation, Properties of Spectral Lines, Temporal and spatial coherence, Characteristics of stimulated emission, Einstein coefficients and their relations, Light amplification and Threshold condition, Population inversion, Kinetics of optical absorption (qualitative account only), Qualitative account of Collisional broadening, Doppler broadening & Natural broadening, Mechanism of Luminescence.

Lasing action, Components of Laser, Elementary theory of optical cavity, Longitudinal and transverse modes, Principal schemes, Three level and four level laser schemes.

UNIT-II

Laser Systems :

Types of lasers, Ruby and Nd : YAG lasers. He-Ne, Dye and CO₂ lasers-construction, Mode of creating population inversion and output characteristics.

Applications of lasers—a general outline, Holography. Principle, recording of hologram and reconstruction of image.

Fiber Optics :

Photonics, Optical fibre, Construction, Numerical aperture, Acceptance angle, Skip distance, Step index fibre—single mode and multimode, Graded index fibre, Losses in optical fibre, Material losses and Rayleigh scattering, Bending losses, Intermodal and Intramodal dispersion.

Splicing techniques, Optical fibre based communication system, Medical applications.