Subject Code : P8PYE5

EC V: NONLINEAR OPTICS

Unit 1: Lasers

Gas lasers – He-Ne, A_z^+ ion lasers – Solid state lasers – Ruby – Nd: YAG, Ti Sapphire – Organic dye laser – Rhodamine – Semiconductor lasers – Diode laser, p-n-junction laser, GaAs laser

Unit 2: Introduction to Nonlinear Optics

Wave propagation in an anisotropic crystal – Polarization response of materials to light – Harmonic generation – Second harmonic generation – Sum and difference frequency generation – Phase matching – Third harmonic generation – bistability – self focusing

Unit 3: Multiphoton Processes

Two photon process – Theory and experiment – Three photon process Parametric generation of light – Oscillator – Amplifier – Stimulated Raman scattering – Intensity dependent refractive index optical Kerr effect – photorefractive, electron optic effects

Unit 4: Nonlinear Optical Materials

Basic requirements – Inorganics – Borates – Organics – Urea, Nitroaniline – Semiorganics – Thiourea complex – X-ray diffraction FTIR, FINMR- Second harmonic generation – Laser induced surface damage threshold.

Unit 5: Fiber Optics

Step – Graded index fibers – wave propagation – Fiber modes – Single and multimode fibers – Numerical aperture – Dispersion – Fiber bandwidth – Fiber loss – Attenuation coefficient – Material absorption.

Books for Reference

Relevant Chapters in

1. B.B. Laud, Lasers and Nonlinear Optics, 2nd Edn. New Age International (P) Ltd., New Delhi, 1991
2. Robert W. Boyd, Nonlinear Optics, 2nd Edn., Academic Press, New York, 2003
3. Govind P. Agarwal, Fiber-Optics Communication Systems, 3rd Edn. John Wiley & Sons, Singapore 2003
4. William T. Silvast, Laser Fundamentals, Cambridge University Press, Cambridge 2003
5. Nonlinear Optics – Basic Concepts D.L. Mills, Springer, Berlin 1998.