

CORE COURSE VI – OPTO ELECTRONICS

Unit I – LIGHT SOURCES AND DETECTORS

Introduction – LED – The Processes involved in LEDs – Structures of LED – LED materials – Output characteristics of LED – Fibre – LED coupling – Modulation Bandwidth of LED – Spectral emission of LEDs. LASER: Laser operation – Semiconductor laser diode – Spatial Emission pattern of Laser – operation – Semiconductor laser diode – Spatial Emission pattern of Laser – Current Vs output power characteristics of Laser – White LED – Organic LEDs – OLED structure and operation – photo detectors – Characteristics of Photo – detectors photo emissive photo detectors - Photo conductive devices – Photo – Voltaic devices – Prejunction photodetector – PIN photo – diode avalanche photo – diode(APQ) – Photo transistor – Bit – Error rate.

Unit II - OPTICAL FIBRES

What are optical fibres? - Importance of optical fibres – propagation of light waves in an optical fibre – Basic structure of an optical fibre and propagation of light wave through it – Acceptance angle and acceptance core of a fibre – Application of fibres – Fibres classification – Stepped index fibre – Stepped – Index monomode fibre – Disadvantage of monomode fibre – Graded index multimode fibre – Plastic fibres.

Unit III - FIBRE FABRICATION, FIBRE LOSSES

Fibre fabrication – External CVD – Axial vapor deposition (AVD) – Internal Chemical Vapour Deposition (IVCD) – Characteristics of all these methods – Fibre drawing and coating – Double – Crucible method – Attenuation in optic fibres – Material loss – Absorption loss – Leaky modes – Bending losses radiation induced losses – Inherent defect losses - Inverse square law losses - Transmission losses – Temperature dependence of fibre losses – Core and cladding losses – Dispersion in optical fibres – Inter – modal dispersion – Mixing of modes.

Unit IV-OPTICAL COUPLERS – SPLICING AND MEASUREMENT ON OPTIC FIBRES

Types of optical couplers – Biconically tapered direction coupler – Beam splitting directional couplers – T Couplers – Calculations on couplers – Splicing – Mechanical splicing – Steps involved in splicing procedures – Loss comparison – Losses in splices and connectors Measurement of numerical aperture and its related terms – OTDR – Working of OTDR – Applications of OTDR – Fibre loss measurement by OTDR – Limitations – Advantages.

Unit V MODULATION AND DETECTION

Introduction – LED analog modulation – Digital modulation – Laser modulation (Analog and Digital) – formats of modulation – Pulse code modulation (PCM) – Merits and demerits of PCM. Intensity modulation (IM) – External optical

modulators – Electro optic modulator – Acousto optical modulator – Demodulation methods – Direct detection methods – Heterodyne detection receiver.

Books for Study:

Subir Kumar Sarkar – Optical fibres and fibre optic communication systems Fourth revised edition, S.Chand & Company Ltd.
M.Mukunda Rao – Optical Communication, (For Unit V)

Books for Reference:

Wilson and Hawkes – Optoelectronics, Prentice Hall of India, New Delhi.
Battacharya P. Semiconductor Opto Electronics, PHI, New Delhi.
Ajoy Ghatak and K.Thyagaran – Introduction to Fibre Optics.