

## PEI5J002 FIBRE OPTICS INSTRUMENTATION

### Institution Level(80%)

#### Module I(14 Hrs)

##### Optical Sources:

Light emitting diodes (LED), Materials for LED, Types of LEDs, Quantum efficiency, Light Intensity, Modulation capability, Output Power, LED drive circuits

Laser Diode: Laser fundamentals, Absorption and emission of radiation, conditions for amplification by stimulated emission, threshold condition for laser oscillation, resonant frequencies, quantum efficiency, semiconductor laser, modulation of laser diode, radiation pattern, optical transmitters, laser drivers

##### Optical Detectors:

PIN photodetector, impulse response and frequency response, avalanche Photodiode (APD), photodiode sensitivity, photodetector Noise, noise Sources, signal-to-noise ratio in a photodetector, speed of Response, photomultiplier tubes, Phototransistor, solar cells

#### Module II (12 Hrs)

##### Optical Fibre:

Fibre materials, modes in step index fibre (TE and TM modes only), numerical aperture in graded index ((GI)) fibres modes in GI fibre

Power launching and coupling:

Source-to-fibre power launching, power launching calculation, equilibrium numerical aperture, lensing schemes for coupling improvement

#### Module III (14 Hrs)

##### Fibre Sensors:

Classification of sensors, intensity modulated sensors, macrobend, micro bending, diffraction grating based IM Sensors, displacement sensors, Moire fringe modulation sensors for displacement measurement, hybrid pressure sensor, liquid level detector, flow sensor, acoustic wave sensor, temperature sensor, phase modulated sensor, interferometric sensors fibre based Fabrey-Parot interferometric sensors, Sagnac effect based optical gyroscope, phase and polarization modulation based fibre sensors, stress sensor, current sensor, magnetic field sensor, acceleration sensor, humidity sensor, pH sensor, laser Doppler velocimeter, optical time domain reflectometry, optical frequency domain reflectometry, distributed fibre optic sensors

Optical Fibre Measurements and Optical Components: (At college level)

Classification of Optical Couplers, biconically tapered directional coupler, offset butt joint

## B.Tech (E&IE/AE&I) detail Syllabus for Admission Batch 2015-16

directional coupler, beam splitting directional coupler, star couplers, T-couplers, calculations on couplers, Splicers, power loss in joining technique, optical fibre connectors, polarizer, fibre polarizers, Optocouplers

Fiber attenuation measurement, total fiber attenuation, fiber absorption loss measurement, fiber scattering loss measurement, fiber refractive index profile measurement, interferometric methods, near field scanning method, refracted near field method, fibre cutoff wavelength measurement, fibre numerical aperture measurement, fibre diameter (core and outer diameter) measurements

### **Text Books:**

1. *John M. Senior, Optical Fibre Communications, Principles and Practice, 3<sup>rd</sup>Edn, Pearson, 2010*
2. *Gerd Keiser, Optical Fiber Communications, 2<sup>nd</sup>Edn., McGraw Hill, Inc.*
3. *R.P.Khare, " Fiber Optics and OptoElectronics, Oxford University Press,2015*

### **Reference Books:**

1. *ArunaTripathy, " OptoElectronics and Systems", Studium Press, New Delhi, 2016*