

PEI312: ULTRASONIC AND OPTO-ELECTRONIC INSTRUMENTATION

L	T	P	Cr
3	1	0	3.5

Course Objectives: To understand the concepts of Ultrasonic and Opto-Electronics based instrumentation, to enable selection and design of Ultrasonic and Opto-Electronics based instrumentation

Ultrasonic based Instrumentation System: Physics of sound, Ultrasonic waves, Generation and detection, Ultrasonic transducers, Pulse-echo method, Doppler method, Focusing system, industrial and medical application of Ultrasound.

Introduction to Opto Electronics: Principle, Advantages and disadvantages of Fiber optics, Fiber optic transducers, Extrinsic and Intrinsic Fiber optic transducers, Multimode polarization sensors, Multimode grating sensors, Industrial applications of fiber optic transducers in measurement of current, Voltage, Pressure, Temperature, Vibration, flow, Fluid level.

Optical Instrumentation: Principle, Advantages and disadvantages of fiber optics, Wavelength isolation devices, Optical filters, Arc, Spark and Flame sources, Mono-chromators, Radiation sources and their uses in Spectrometers, Fiber Optics: Analog and digital signal transmission, Modulation, Electro-optic modulators, Magneto Optic Devices.

Optical Techniques and Spectrometric Applications: working, Principle and Construction of Turbidimetry, Nephelometry, Polarimetry and Refractory, Atomic absorption spectrometry, Absorption spectrometry, Emission spectrometry, spectro-photometry, Mass spectrometry.

Lasers Based Instrumentation System: Principles of operation, properties, optical resonators, emission and absorption of radiation in a two level systems, Axial and transverse Laser modes, Device fabrication, Measurement of laser characteristics, Application of laser in biomedical science, Defense systems, Instrumentation systems and Robotics

Laboratory Work: Ultrasonic characterization of materials, Experiments around , Pressure, Temperature, Vibration, flow, Fluid level, current, Voltage using laser and optical fiber.

Minor Project : Nil

Course learning outcome (CLO):

1. Use ultrasonic based instrumentation

Use opto-electronics for signal conditioning.

Use optical techniques and spectrometric methods of analysis

Use optical techniques and spectrometric methods of analysis

Handle lasers based instrumentation system.

Recommended Books:

1. *Gerd, K., Optical fiber communication, McGraw-Hill (2007) 4th ed.*
2. *Luxon, T. and Parker, D.E., Industrial Lasers and Their Applications, Prentice-Hall of India Private Limited (2005) 2nd ed.*
3. *Pataranabis, D., Principles of Analytical Instrumentation, Tata McGraw-Hill Publishing Company (2003) 2nd ed.*

Evaluation Scheme:

S.No	Evaluation Elements	Weightage (%)
1.	MST	30
2.	EST	45
3.	Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	25