Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD506	Photonic Sensors	3	0	0	3

Course Objective

The objective of the course is to deliver a concine introduction of optical fiber and optoelectronics sensors. Itprovide high sensitivity and detection accuracy along with the additional benefits of remote sensing, miniaturization, low cost and online monitoring. The objective of this course is to introduce the students the field of photonic sensors and its application.

Learning Outcomes

Upon successful completion of this course, students will:

- To describe the concept used in the designing of sensors.
- To explain the working principle of various optoelectronic sensors.
- To explain the applications of various types of optical sensors

Module No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Introduction: Use of optical fiber as sensor. Sensing using optoelectronics. Advantages of fiber optic sensors, few examples. Intensity, phase and polarization based fiber optic sensors for measurement of temperature, pressure, strain, acceleration, displacement and velocity. Evanescent field absorption based sensors, different probing techniques and derivation of sensitivity in each cases. Characteristics and components of optical fiber sensors. Fibre types and materials for optical fibre sensing (silica based, polymer based, etc.). Intensity based Reagent mediated sensors for humidity, pH level etc. and their experimental set-ups.	12	Acquire an understanding fiber sensors.
2.	Interferrometry based and FBG based sensing technology: LPG, SPG, microfibres/nanowires, Mach-Zhender, Sagnac, Michelson Interferrometers - Design, fabrication and characterization of sensors.	9	Get an understanding of the theory and concept of Interferrometry based and FBG based sensing technology.
3.	Hydrogen leakage sensing in cryo engines. Fiber Optic Gyroscope for navigation application.	3	Learn about the Hydrogen leakage sensing.
4.	Physics of plasmons, surface plasmons at semi-infinite metal-dielectric interface, excitation of surface plasmons, surface plasmon resonance (SPR) condition, Theory of SPR based optical fiber sensors, N-layer model, excitation by meridional rays: on axis excitation, performance parameters: sensitivity, detection of accuracy and figure of merit. SPR based FBG sensor.	9	Acquire an understanding of Physics of plasmons, SPR.
5.	Electro-optic sensors and its applications. Micro-opto-electro-mechanical Systems (MOEMS): MOEM overview, MOEM scanners, MOEM technology and applications to telecom, CMOS compatible MOEMS, optics specific issues for MOEMS, micro-optics, automation and sensing, shape.	6	Acquire an understanding of Electro-optic sensors and its applications. Micro-opto-electro-mechanical Systems (MOEMS.
6.	Principles and application of optical fibre sensors in medicine and life sciences, civil engineering, e.g. structural monitoring and aircraft navigation.	3	Learn about the optical fibre sensors in medicine and life sciences, civil engineering, e.g. structural monitoring and aircraft
	Total	**42**	

Textbook:

1. Fiber Optic Sensors – Principle and Applications by B. D. Gupta, New India Publishing Agency 2006.

Reference Book:

1. Fiber Optic Sensors, An Introduction for Engineers and Scientists edited by Eric Udd, William B. Spillman, Jr., John, Wiley and Sons Inc. Publication 2011