Course Code	Course Name	Credits
26PH609	OPTO ELECTRONICS	04

Course Objectives

- Understand the basic optoelectronics including electromagnetism, light propagation in the waveguides, light amplification and detection, lasers, modulators and detectors.
- Be familiar with recent trends in optoelectronics.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Acquires the fundamental skills and knowledge for analysis and design of basic photonic, integrated optical and optoelectronic devices.
- Acquires knowledge on the working principles of the basic devices used in integrated optics and optoelectronics.

Unit 1 – (12 Hrs.)

Introduction Propagation of electromagnetic waves in dielectric wave guides – fibers – boundary conditions – phase velocity and group velocity – Dispassion – cut off frequencies - EM field in core and cladding – single mode and multimode fibers.

Unit 2 – (12 Hrs.)

Active Devices LED's lasers – Laser principles – spontaneous and stimulated emission – coherence – gain equation – three level, four level lasers- examples of lasers (He-Ne) Ruby, diode – homojunctioin and heterojunction diode lasers.

Unit 3 - (12 Hrs.)

Fibre Optics Communication LED and lasers source – Transmitter modulator – acousto – optic, electro optic modulator – AM, FM, DCM modulation – detection and demodulation radiation detection – PIN, APD and PM tube.

Unit 4 – (12 Hrs.)

Optical Fiber Sensors General features, types of OFS, intrinsic and extrinsic sensors, intensity sensors, shuttes based multimode OFS, simple fiber based sensors for displacement, temperature and pressure measurements – reflective OFS and applications, Fiber Bragg grating based sensors.

Unit 5 - (12 Hrs.)

Interferometric FOS Basic principles, interferometric configurations, Mach – Zendes. Michelson and Fabry – Perrot configurations – components and construction of interferometric FOS, applications of interferometric FOS, Sagnac interferometer, fibers gyro, OTDR and applications.

Reference Books:

1. *Fiber-Optic Communication Systems*- Govind P. Agrawal (2021)
2. Optical Fiber Communications – Gerd Keiser
3. Fiber Optic Communications – Joseph C. Palais
4. Optoelectronics – Wilson & Hawkes
5. Fundamentals of Photonics – Bahaa E. A. Saleh & Malvin Carl Teich
6. Introduction to Fiber Optics – Ajoy Ghatak & K. Thyagarajan

Websites and eLearning Sources:

1. https://nptel.ac.in/courses/115102103
2. https://youtu.be/PmEso20XuG4?si=wu8pJIkXNbN3dOTM
3. https://youtu.be/KW3HSJthFws?si=_jKcKov62acIJ1C2

COs and Bloom's Taxonomy Mapping – 26PH609		
Course Outcomes	**On successful completion of this course, students will be able to**	**BTL**
CO1	Recall and explain propagation of electromagnetic waves in optical fibers including modes, dispersion, and waveguide properties.	K1, K2
CO2	Apply principles of light sources such as LEDs and lasers in optical communication systems.	K3
CO3	Analyze optical communication systems including modulation, detection, and signal transmission techniques.	K4
CO4	Analyze optical fiber sensors including intensity-based and grating-based sensing mechanisms.	K5
CO5	Evaluate and design interferometric fiber optic systems and advanced sensing applications.	K6

BTL (Bloom's Taxonomy Level) - K1 – Remembering, K2 – Understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6 - Create

Relationship Matrix – 26PH609													
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**						**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	1	1	1	1	3	2	1	1	1	1	1.58
CO2	3	3	2	2	1	1	2	3	2	2	2	1	2.00
CO3	3	3	3	2	1	1	2	3	3	2	2	2	2.25
CO4	3	3	3	2	2	1	2	3	3	2	2	2	2.33
CO5	3	3	3	3	2	2	3	3	3	3	2	2	2.58
												Total	2.15

Mean Score: 3- High, 2- Medium/Moderate, 1-Low