Course Code	Course Name	Credits
26PH101	OPTOELECTRONICS AND ELECTRONICS	04

Course Objectives

- To familiarize students with basic principles optical devices.
- Understand the basic physics on working of such devices.

Learning Outcomes

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

- Understand the knowledge of optoelectronic devices.
- Understand the different applications of it.

Unit 1 - Optoelectronic Devices (12 Hrs.)

Classification of Photonic Devices, Interaction of Radiation and Matter, Radiative Transition and Optical Absorption, Light Emitting Diodes, Construction, Materials and Operation, Semiconductor Laser, Condition for Amplification, Laser Cavity, Heterostructure and Quantum Well Devices, Charge Carrier and Photon Confinement, Line Shape Function, Threshold Current, Laser Diode.

Unit 2 – Photo detectors (12 Hrs.)

Photoconductor, Photodiodes and Photo Transistors, Quantum Efficiency Photomultiplier Tube. Solar Cell: Construction, Working and Characteristics, LCD Displays: Types of Liquid Crystals, Principle of Liquid Crystal Displays, Applications, Advantages over LED Displays.

Unit 3 - Introduction to Fiber Optics (12 Hrs.)

Evolution of Fiber Optic System, Element of Optical Fiber Transmission Link, Optical Fiber Modes and Configurations, Mode Theory of Circular Wave Guides, Overview of Modes-Key Modal Concepts, Linearly Polarized Modes, Single Mode Fibers and Graded Index Fiber Structure.

Unit 4 – Power Electronics Devices (12 Hrs.)

Need for Semiconductor Power Devices, Power MOSFET (Qualitative), Thyristors, Silicon Controlled Rectifier (SCR), Structure, I-V Characteristics, TurnOn and Turn-Off Characteristics, Ratings, Gate Triggering Circuits.

Unit 5 - Insulated Gate Bipolar Transistors (IGBT) (12 Hrs.)

Basic Structure, I-V Characteristics, Switching Characteristics, Device Limitations and Safe Operating Area (SOA),Diac and Triac, Basic Structure, Working and I-V Characteristics, Application of Diac as Triggering Device for Triac.

Reference Books:

1. Khare, Fiber Optics and Optoelectronics, Oxford
2. Wilson and Hawkes, Optoelectronics: An Introduction, Pearson.
3. Kasap, Optoelectronics and Photonics: Principles and Practices, Pearson.

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc20_ph24/preview
2. https://youtu.be/GzHaStaC3ds?si=ZtioECNGBoXvLCrp
3. https://youtu.be/1oRJf54zBRU?si=cbcbVoA2i2bI3gEP

COs and Bloom's Taxonomy Mapping – 26PH101		
Course Outcomes	**On completing U.G. program the students will be able to**	**BTL**
CO1	Recall and explain fundamental concepts, laws, and principles of optoelectronic devices, including classification, operation, and construction of light-emitting diodes and lasers.	K1, K2
CO2	Apply theoretical principles and mathematical techniques to analyze the operation of semiconductor lasers and calculate key parameters like threshold current and optical gain.	K3
CO3	Analyze experimental data from optoelectronic devices, identifying patterns and relationships that illustrate the principles of charge carrier confinement and optical absorption.	K4
CO4	Evaluate recent advancements in optoelectronic devices by assessing the effectiveness of various experimental methods and theoretical models found in scientific literature.	K5
CO5	Design and propose an independent research project involving the development of a novel optoelectronic device or improvement of existing technologies, incorporating hypotheses and experimental setups.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6 - Create

Relationship Matrix – 26PH101													
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	3	1	1	1	3	2	3	1	1	1	1.83
CO2	3	3	3	1	1	1	2	2	3	3	1	1	2.00
CO3	2	3	3	3	1	1	1	2	3	3	3	1	2.17
CO4	2	3	2	2	1	1	1	1	3	2	2	2	1.83
CO5	2	2	3	1	1	3	1	1	1	1	2	3	1.75
												Total	1.92

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