Course Type	Course Code	Name of Course	L	T	P	Credit
DE	PHD400	PHOTONICS AND OPTOELECTRONICS	3	0	0	9

Course Objective

Overall aim of this course is to give underlying physics principles of photonics and optoelectronics materials and devices. This course encompasses integration processes for optical, electrical and optoelectronic components for applications in present and future technologies in the areas of solid-state lighting, light wave communication, display, sensing etc. Further, technology and operation of a wide range of laser semiconductor devices will be discussed for their applications in optical telecommunications

Learning Outcomes

Upon successful completion of the course, students understand material optical properties and how it can be exploited to developed devices in the area photonics and optoelectronics. Student will also understand the functioning of most important optoelectronic devices, operational modes of photonic devices, which will enable to select suitable type of photonics and optoelectronics device for the given applications.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Light polarization, analysis of polarized waves, Optics of a single homogeneous and isotropic media, optics of periodic layer media, optics of anisotropic media, birefringence in anisotropic media, quarter- and half-wave plates	9	This unit will provide the basic knowledge
2.	Optical waveguide theory- asymmetric dielectric slab waveguides, couple mode theory. Introduction to photonic and plasmonic waveguides.	10	This unit will enable students to understand the basic theory of optical waveguides that includes photonic crystal, plasmonic waveguides.
3.	Optics of semiconductor quantum well and super lattice structure	2	The unit will introduce optical properties on 2D semiconductor nanostructures
4.	Interferometry: Fabry-Perot, thin-Film structures, holographic interferometry, Dielectric Mirrors, Optical Resonators, Negative refractive index and Metamaterials.	7	This unit will provide the basic knowledge of interferometry and optical resonators.
6.	Organic and inorganic semiconductor sources: photodiode, light emitting diodes, solar cells, quantum cascade lasers, photonic crystal laser.	8	This unit will provide the basic knowledge of Organic and inorganic semiconductor based optical sources.
7.	Quantum well photodetector, Organic and polymeric based photodetectors, Photo-emissive detectors, Thermal detectors.	6	This unit will provide the basic knowledge of Organic and inorganic semiconductor based optical detectors.
	Total	**42**	

Textbooks:

1. Physics of Optoelectronic Devices, Chuang, S. L., Wiley-Interscience, 1995.
2. Fundamentals of Photonics, Bahaa E. A. & Malvin Carl Teich, Wiley-Interscience, 2007

Reference Books:

1. Optics and Photonics:An Introduction, 2nd ed. , F. Graham Smith, Terry et. al, Wiley & Sons Ltd; 2007.
2. Optoelectronics and Photonics: Principles and Practices, S.O. Kasap, Prentice-Hall; 2001.
3. Optics, Eugene Hecht, Addison-Wesley, 2001.
4. Optical waves in layered media, Pochi Yeh, Wiley, 2005.