Course Type	Course Code	Name of Course	L	T	P	Credit
OE	PHO401	INTRODUCTION TO QUANTUM DEVICES	3	0	0	9

Course Objective

The objective of the course is to discuss the basic concepts related to the function of important quantum devises. Different quantum devises used in in the field of physics, electronics and optics have been highlighted.

Learning Outcomes

Upon successful completion of this course, students will:

- have an conceptual understanding of quantum mechanical principles.
- have a high-level understanding of instrumentation based on quantum mechanical principles.
- be able to know the applications of different quantum devises used in various research fields
- be able to familiar with the newly developed quantum computation and information technology.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Basics of quantum mechanics, Schrodinger wave equation, some potential well problems, tunneling and its applications	4	This topic covers the basic principles of quantum mechanics and few of its applications.
2	Electronic and optical properties of quantum solids: concepts of electron, phonon, excitons in quantum structures, DOS, energy bands, superlattices, Bloch oscillations, electronic transport in quantum structures, coulomb blockade, optical properties of quantum structures.	9	This unit will help student to understand basis solid state theory and the underlying principles used to explain different properties of solid, especially electronic and optical properties..
3	Quantum electronic devices: resonant tunneling diode, high electron mobility transistors, single electron transistor, Graphene FET.	7	In this topic, students will learn about the basic features of solid-state electronics and transport phenomenon.
4	Quantum optical device: Optical nanoresonators, double heterostructure laser, quantum cascade laser, quantum well LASER and LED, quantum dot infrared photodetectors, single photon detectors.	7	This topic focuses on the basic phenonemenon of light-matter interaction resulting in amazing concepts such as LASER, LED, Photodetectors, used in advanced optical devices.
5	Quantum magnetic device: Superconducting Quantum Interference Device, Superconducting Quantum Circuits, Superconducting Quantum Bits.	8	This part will help to understand the concept of different magnetic devices based on quantum mechanical principles and working at low-temperature. These devices are very much essential to measure different properties of superconducting and topological matters.
6	Introduction to quantum information processing: quantum bit, processing of qubit and their applications.	7	In this topic, students will learn about fundamental principle of quantum computation and information; the basics of the next-generation computer and communication technology..
	Total	**42**	

Text Books:

1. Physics of semiconductor devices, S.M. Sze.
2. Nanotechnology for Microelectronics and Optoelectronics, J.M. Martínez-Duart, R.J. Martín-Palma and F. Agulló-Rueda
3. Physics of Quantum Well Devices, B.R. Nag.

Reference Books:

1. Quantum Physics, H C Verma
2. The Physics of Low-Dimensional Semiconductors: An Introduction, John H. Davies