PH2320	07 PHYSICS FOR INFORMATION SCIENCE 3	0 0
	(COMMON TO IT, IOT, AI&DS, AI&ML)	
	(For the candidates admitted during the Academic Year 2024-2025)	
	SE OBJECTIVES	
o enab	ble the students to	
1	gain knowledge about the conduction properties of metals.	
2	correlate the different types of semiconducting materials.	
3	gain knowledge about the types of laser and optical properties of materials.	
4	introduce the different types of magnetic materials and its applications.	
5	realize the dual nature of light and learn the basics of quantum computing.	
J NIT I	ELECTRICAL PROPERTIES OF MATERIALS	9
COND	DUCTORS: Introduction to conducting materials-Merits and demerits of classical free electro	n theor
	um free electron theory Fermi -Dirac distribution function - Effect of temperature on Fermi	
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SUPE	y of energy states - Carrier concentration in metals. RCONDUCTORS: Introduction of Superconductivity, Properties of Superconductors, BC	
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involved in the growth of magnetic domains- Hysteresis -Explanation of hysteresis curve based on domain theory- Soft and hard magnetic materials - Ferrites -Magneto resistance-Colossal Magneto Resistance- Giant magneto resistance- Applications - Spintronics and devices.

QUANTUM MECHANICS AND QUANTUM COMPUTING UNIT V

Quantum mechanics : Wave particle duality- matter waves - de-Broglie wavelength; Wave function - Physical significance of the wave function- Einstein photoelectric effect - Schrodinger's time independent and time dependent equations - Applications: Particle in one dimensional box -degenerate and non-degenerate states. Quantum Computing: Introduction to Quantum Computation -Quantum bits, Bloch sphere representation of a qubit, multiple qubits - Quantum Circuits: Single qubit gates -X Gate, Y Gate, Z Gate, Hadamarn gate, Multiple qubit gates-controlled NOT gate.

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C O2		determine the carrier concentration and Hall co – efficient of semiconductor for optoelectronics applications.										Apply (K3)							
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PHYSICS FOR INFORMATION SCIENCE

(COMMON TO IT, IOT, AI&DS, AI&ML)

(For the candidates admitted during the Academic Year 2023-2024)

COURSE OBJECTIVES

To enable the students to

- gain knowledge about the types of laser and optical properties of materials.
- Realize the dual nature of matter and applications of Schrodinger wave equation
- correlate the different types of semiconducting materials.
- introduce the different types of magnetic and superconducting materials and its applications.
- learn the basic knowledge of quantum bits

UNIT I LASER AND OPTICAL FIBER

Laser: Characteristics of laser - Stimulated absorption, spontaneous emission and stimulated emission -Population inversion; Pumping methods; Types of lasers - Nd-YAG, CO₂ and semiconductor (Homo) lasers - Applications: Optical data storage devices, CD - DVD - Blue-ray disc, Holographic data storage, laser cutting - Welding - Bar code scanner - laser printer.

Optical fiber: Principle, propagation of light through optical fiber - expressions for numerical aperture and acceptance angle; Types of optical fibers; Fiber optical communication system (block diagram) - Applications.

UNIT II ELEMENTARY QUANTUM PHYSICS

Black body radiation - Photons and light waves - Planck's theory (derivation); Compton effect (derivation) Electrons and matter waves - de-Broglie wavelength; Wave function - Physical significance of the wave function; Schrodinger's time independent and time dependent equations - Applications: Particle in one dimensional box - degenerate and non-degenerate states.

UNIT III SEMICONDUCTING MATERIALS

Types of Semiconductors - Elemental and Compound semiconductor; Intrinsic semiconductor: Expressions for density of electrons, holes and carrier concentration - Fermi level - Variation of Fermi level with temperature; Electrical conductivity - Band gap determination; Extrinsic semiconductors: n-type and p - type semiconductors (Qualitative); Hall effect - Determination of Hall coefficient – Applications: LED - Solar cell.

UNIT IV MAGNETIC MATERIALS AND SUPERCONDUCTORS

MAGNETIC MATERIALS: Domain theory of ferromagnetism - Hysteresis - Soft and hard magnetic materials - Ferrites - Applications

SUPERCONDUCTORS: Introduction of Superconductivity, Properties of Superconductors, BCS theory (Qualitative); Type - I and Type II Superconductors - High temperature superconductors; Applications - Magnetic Levitation - SQUID.

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UNIT V QUANTUM COMPUTING

Introduction to Quantum Computation - Quantum bits, Bloch sphere representation of a qubit, multiple qubits - Quantum Circuits: Single qubit gates, Multiple qubit gates, design of quantum circuits.

TOTAL PERIODS: 45

COURSE OUTCOMES

At the end of the course, the students will be able to

- categorize the types of laser and fiber optics. predict the dual nature of matter, radiation and the application of the wave nature of particles.
- predict the dual nature of matter, radiation and the application of the wave nature of particles.
- discuss the basic idea of doping and determinations of Hall co efficient.
- apply the knowledge of magnetic and superconducting properties of materials and its applications.
- interpret on the various terms related to quantum computing.

TEXT BOOKS

- 1. A.Marikani, Material Science, PHI, New Delhi, 2017.
- 2. Md Nazoor Khan, S. Panigrahi, Principles of Engineering Physics 2, Cambridge University Press, 201

REFERENCE BOOKS

- 1. Umesh K Mishra & Jasprit Singh, Semiconductor Device Physics and Design, springer, 2008.
- 2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009.
- 3. P K Palanisamy, Material Science, SciTech Publications, 2015
- 4. Kasap, S.O. Principles of Electronic Materials and Devices, McGraw Hill Education, 2017.
- 5. S.O. Pillai, Solid State Physics. New Academic Science, Publishers, 2018.

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