Course Code	**24PH201**	**Course Title:**	**PHYSICS FOR ELECTRONICS ENGINEERING(ECE&EEE)**
Credits:	**3**	**L – T – P**	**3-0-0**

Course objectives:

- To study the electrical properties of materials including electron theory of metals.
- To familiarize with the properties of semiconductors, determination of charge carriers and device applications.
- Equipping the students to understand the applications of magnetic materials and dielectric materials.
- To establish a sound, grasp of knowledge on different optical properties of materials, optical displays and applications.
- To inculcate an idea of significance of Nano structures, quantum confinement and the preparation of Nano materials.

UNIT I CONDUCTING MATERIALS	**[9 hours]**

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity, Wiede Mann Franz law, Merits & Demerits of classical free Electron Theory - Quantum free electron theory - Electron in a metal – degenerate and non-degenerate states – Fermi- Dirac statistics– Density of energy states – Energy bands in solids – Electron effective mass.

UNIT II SEMICONDUCTING MATERIALS	**[9 hours]**

Direct and indirect band gap semiconductors – Intrinsic Semiconductors - Carrier concentration in intrinsic semiconductors - Variation of Fermi level with temperature – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of Fermi level with temperature – Hall effect and devices- Ohmic contacts– Schottky diode.

UNIT III MAGNETIC AND DIELECTRIC MATERIALS	[9 hours]
Magnetic materials – Classification (Dia , Para & Ferro) – Hysteresis – Ferrites - BaTiO3 – Application of Nd-FeB magnets. Electric polarization – Different types of polarization – Temperature and frequency dependence –Dielectric loss and dielectric breakdown – dielectric materials applications - capacitors and transformers.	

UNIT IV MATERIALS FOR ELECTRONICS	[9 hours]
Classification of optical materials –Optical process in Semiconductors-Optical absorption and emission-carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - LCD-Photo Transistor- photo current in a P-N diode – Laser diodes -solar cell - LED – Organic LED.	

UNIT-V NANO MATERIALS	[9 hours]
Nanomaterials-Quantum Confinement-Quantum Structures-Density of states for quantum well-Wire-Dots-Preparation of Nano Materials- Ball Milling - Pulsed Laser Deposition-Sol -Gel Method-Electro Deposition Method- Plasma arc method.	

Course outcomes: On completion of the course, the student will have the ability to:

CO No	Course Outcomes	Level
CO1	Explain the electrical properties of materials.	K2
CO2	Apply semiconducting properties of materials in electronics.	K3
CO3	Infer the properties of magnetic and dielectric materials for relevant electrical and electronics engineering applications	K2
CO4	Apply the optical properties of materials in opto electronic devices.	K3
CO5	Apply the concept of Nano materials for Nano devices.	K3

TEXT BOOKS:

1.S.O. Kasap. Principles of Electronic Materials and Devices, McGraw Hill Education (Indian Edition), 2020.

2.R.F. Pierret. Semiconductor Device Fundamentals. Pearson (Indian Edition), 2006.

3. G.W. Hanson. Fundamentals of Nano electronics. Pearson Education (Indian Edition), 2009.

REFERENCE BOOKS:

1. Jasprit Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Education (Indian Edition), 2019.

2. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.

3. Mark Fox, Optical Properties of Solids, Oxford Univ.Press, 2001.