I Year-II Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (BS1204)					

Prerequisite Course: Fundamentals of Basic physics

Course Objectives:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.
- To impart the knowledge of materials with characteristic utility in appliances.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Apply the knowledge of wave optics in operating various instruments with high resolution for different applications.	2
2	Understand the characteristics of the microscopic particles influenced by its wave nature.	1
3	Apply the knowledge of quantum views for understanding the formation of energy bands in solids and their classification.	2
4	Understand the physics of charge transport mechanism in semiconductors for various applications.	1
5	Gain the knowledge of magnetic and dielectric behavior of various materials to apply in industry and engineering.	3

Syllabus:

UNIT-I:

WAVE OPTICS: Principle of Superposition - Interference of light - Conditions for sustained Interference - Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry).
Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N -slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating (qualitative)

Unit Outcomes:

The students will be able to

- Explain the need of coherent sources and the conditions for sustained interference.
- Analyze the differences between interference and diffraction with applications.
- Illustrate the resolving power of various optical instruments.

UNIT-II:

QUANTUM MECHANICS: Introduction – Matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainty Principle –interpretation of wave function – Schrödinger Time Independent and Time Dependent wave equations – Particle in a potential box.

Unit Outcomes:

The students will be able to

- explain the fundamental concepts of quantum mechanics.
- analyze the physical significance of wave function.
- apply Schrödinger's wave equation for energy values of a free particle .

UNIT-III:

FREE ELECTRON THEORY & BAND THEORY OF SOLIDS : Introduction – Classical free electron theory (merits and demerits only) - Quantum Free electron theory – electrical conductivity based on quantum free electron theory – Fermi Dirac distribution function – Temperature dependence of Fermi-Dirac distribution function - expression for Fermi energy - Density of states .

Bloch's theorem (qualitative) – Kronig-Penney model(qualitative) – energy bands in crystalline solids – E Vs K diagram – classification of crystalline solids – effective mass of electron – m* Vs K diagram - concept of hole.

Unit Outcomes:
The students will be able to

- explain the various electron theories.
- calculate the Fermi energy.
- analyze the physical significance of wave function .
- interpret the effects of temperature on Fermi Dirac distribution function.
- summarise various types of solids based on band theory.

UNIT-IV:

SEMICONDUCTOR PHYSICS: Introduction – Intrinsic semi conductors - density of charge carriers - Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers - Dependence of Fermi energy on carrier concentration and temperature – Hall effect- Hall coefficient - Applications of Hall effect - Drift and Diffusion currents – Einstein's equation.

Learning Outcomes:
The students will be able to

- classify the energy bands of semiconductors.
- outline the properties of n-type and p-type semiconductors.
- identify the type of semiconductor using Hall effect.

UNIT-V:

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr magneton – Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Introduction - Dielectic polarization – Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation - Frequency dependence of polarization – Applications of dielectrics.

Unit Outcomes:
The students will be able to

- explain the concept of polarization in dielectric materials.
- summarize various types of polarization of dielectrics .
- interpret Lorentz field and Claussius- Mosotti relation in dielectrics.
- classify the magnetic materials based on susceptibility and their temperature dependence.
- explain the applications of dielectric and magnetic materials .
- Apply the concept of magnetism to magnetic devices.

TEXT BOOKS:

1. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand Publications, 2017.
2. "Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. "Engineering Physics" by R.K Gaur. and S.L Gupta., - Dhanpat Rai publishers, 2012.

REFERENCE BOOKS:

1. "Engineering Physics" by M. R. Srinivasan, New Age international publishers (2009).
2. "Optics" by Ajoy Ghatak, 6th Edition McGraw Hill Education, 2017.
3. "Solid State Physics" by A. J. Dekker, Mc Millan Publishers (2011).