

ENGINEERING PHYSICS
(Common to CE,ME,IT,CSE-AIML,CSE-DS)

Course Code	23BS1103	Year	I	Semester	I
Course Category	Basic Science	Branch	ME	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	----
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Interpret the fundamental concepts of optical sources, structure and properties of various solid materials. (L2)
CO2	Apply the principles of lasers, optical fibers and semiconductors in engineering aspects. (L3)
CO3	Apply the concepts of quantum mechanics, Dielectrics, Magnetic materials and crystal physics for engineering applications. (L3)
CO4	Examine the nature of communication system, and semiconducting materials. (L4)
CO5	Analyze the theory of solids deduce various analytical parameters. (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2												1	
CO 2	3												1	
CO 3	3												1	
CO 4		3											1	
CO5		3											1	

SYLLABUS		
Unit No.	Contents	Mapped CO
I	<p>LASERS: Characteristics of lasers –Absorption, spontaneous and stimulated emission of radiation – population inversion – pumping mechanisms – Ruby, Helium-Neon & Semiconductor lasers -Applications of lasers.</p> <p>Fiber optics: Principle of optical fiber –structure of optical fiber-Acceptance angle and numerical aperture – Types of optical fibers-Attenuation in optical fibers – optical fiber in communication system-applications of optical fiber.</p>	CO1, CO2, CO4
II	<p>Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.</p> <p>X-ray Diffraction: Bragg’s law- X-ray Diffract meter–crystal structure determination by Laue’s and powder methods.</p>	CO1, CO3, CO5
III	<p>Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors-Types of polarizations-Electronic(Quantitative), Ionic(Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss</p> <p>Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferro magnetism & Domain walls (Qualitative)- Hysteresis-soft and hard magnetic materials.</p>	CO1, CO3, CO5
IV	<p>Quantum Mechanics: Dual nature of matter – Heisenberg’s Uncertainty Principle – Significance and properties of wave function–Schrodinger’s time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.</p> <p>Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy</p>	CO1, CO3, CO5
V	<p>Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature- Drift and diffusion currents–Einstein’s equation–Hall effect and its applications.</p>	CO1, CO2, CO4

Learning Resources
Text Books:
1. A Textbook of Engineering Physics, M. N. Avadhanulu, P. G. Kshirsagar & T V S Arun Murthy, S. Chand Publications, 11 th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and PoonamTandon, Oxford press (2015)
Reference Books:
1. Engineering Physics- B.K.Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics –Shatendra Sharma, Jyotsna Sharma, Pearson Education,2018.
3. Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics-M.R.Srinivasan, New Age international publishers(2009).
E-Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html