PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY
KANURU ,VIJAYAWADA -520007
(AUTONOMOUS)
PVP 12 REGULATION

ENGINEERING PHYSICS

(COMMON FOR EEE,ECE,MECH,CIVIL,CSE,IT,AE)
(COMMON FOR CE2T3,EE2T2,ME2T2,EC1T2,CS1T3,IT1T5,AE2T4,EM1T3)

Credits: 4

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES

The entire course is designed to have the basic concepts of quantum mechanics and properties of different types of materials including nano materials

1) To have knowledge and to solve problems in quantum mechanics .
2) To study the structure of crystal and X-ray diffraction techniques .
3) To know the electrical properties of conducting materials and band theory of solids
4) To study the properties of Dielectric materials
5) To have the knowledge about the magnetic materials and super conductivity
6) To learn the theory of semiconductors and solar cells
7) To learn about the theory with applications of lasers and fundamentals of optical fibers.
8) To understand the production properties and application of nano materials.

COURSE OUTCOMES

After completion of the course the student will be able to

CO1) Acquire the knowledge of quantum mechanics and by which he can solve the problems in quantum mechanics .

CO2) Learn about the crystal structure and X-ray diffraction techniques by which he will learn to determine crystal structure .

CO3) Gain the knowledge about the materials (conductors, semi-Conductors, insulators and magnetic materials) .

CO4) Comprehend the basic concepts of Advanced topics such as lasers , Optical fibers and super conductivity.

CO5) Examine the advances in material science such as nano – materials.

UNIT-I: Quantum Mechanics

Introduction - Plank's black body theory of radiation - Debroglie hypothesis – Properties of matter waves – Davison and Germer experiment – G.P. Thomson experiment – Heisenberg uncertainity principle - Schrödinger wave equation – physical significance of wave function – particle in a one dimensional box.

UNIT-II: Crystal Structure& X-ray Diffraction

Introduction – Space lattice – Basis - unit cell - Lattice parameters – Bravais lattices – Crystal systems – Structure and packing fraction of simple , bcc , fcc crystals . Directions and planes in crystals – miller indices – separation between successive (h,k,l) Parallel planes – Diffraction of X rays – Bragg's law -Laue method and Powder method.

UNIT-III: Free Electron Theory of metals

Classical free electron theory- Drift velocity – Relaxation time – Relation between relaxation time and mean collision time - Quantum free electron theory- Fermi Dirac distribution functions- causes of electrical resistance. Bloch theorem- Kronig penny model(qualitative treatment)- Classification of materials – effective mass of an electron.

UNIT-IV: Dielectrics

Dielectric constant – Types of Dielectrics- electronic, ionic and orientation polarizations– internal fields in solids – Clausius Mossotti relation –Frequency dependence of dielectric constant and polarizability- Ferro electricity and piezoelectricity – Applications .

UNIT-V: Magnetic Properties & Superconductivity

Origin of magnetic moment – classification of magnetic materials – domain and weiss field theory – Hysteresis curve – soft and hard magnetic materials- applications.
Superconductivity – general properties – meissner effect – penetration depth – Type I & Type II superconductors – BCS theory – applications of superconductor.

UNIT-VI: Semiconductors

Introduction – intrinsic semiconductor and carrier concentration- Fermi level in intrinsic semiconductor - equation for conductivity – extrinsic semiconductor - Fermi level in extrinsic semiconductor – Drift and diffusion current – Einstein's relation – continuity equation – Recombination –Direct and Indirect band gap semiconductors. Solar radiation and conversion efficiency – p-n junction – solar cells- Hetro junction – interface and thin solar cell – applications.

UNIT-VII:- Lasers & Fibre Optics:

Characteristics of lasers – spontaneous and stimulated emission of radiation – Einstien coefficients – population inversion – pumping – Ruby, Helium-Neon & Semiconductor lasers. Applications of lasers.

Fiber optics: Principle of optical fiber – Acceptance angle and numerical aperture – types of fibers and refractive index profile – Attenuation in optical fibers – applications of optical fibers.

UNIT-VIII: Physics of Nanomaterials

Introduction – Surface to volume ratio- Quantum confinement effect- properties and preparation of nanomaterial – quantum wires – quantum dots – quantum wells - nanotubes – SWNT- MWNT- Fabrication of AFM, SEM, TEM, STM, MRFM, - Applications of nanomaterials.

TEXT BOOKS :

1. Solid state Physics by S.O.Pillai. (New Age International Publications).
2. Physics of Semiconductors by S.M.Sze.

Reference Books:

1. Engineering physics by Gaur and Gupta. (Dhenpat Rai Publications).
2. Engineering physics by D.K.Bhattacharya and A.Bhaskaran. (Oxford Publications).
3. Engineering physics by M.R.Srinivasan (New Age International Publications)