Applied Physics – I

F.E. Sem. I

EVALUATION SYSTEM

	Time	Marks
Theory Exam	2 Hrs.	60
Practical Exam	–	–
Oral Exam	–	–
Term Work	–	25

SYLLABUS

1. Crystal Structure

Crystallography: Space lattice, Unit Cell, Lattice parameters, Bravais lattices and Crystal systems, Cubic crystal system & lattices; Density & Packing Fraction; Miller indices of crystallographic planes & directions; interplanar distance; Diamond structure, NaCl structure, HCP structure, $BaTiO_3$ structure; Ligancy and Critical radius ratio; Determination of crystal structure using X-ray diffraction techniques viz. Laue method, rotating crystal method (Bragg method) & powder method; Real crystals & point-defects; photonic crystals; Liquid crystal phases and application in LCD (with brief introduction of optical polarization).

2. Semiconductor Physics

Energy bands of solids and classification of solids; Concepts of holes, effective mass; drift mobility and conductivity in conductors, intrinsic semiconductors and extrinsic semiconductors; Fermi-Dirac distribution function and Fermi energy level in a conductor, insulator, intrinsic & extrinsic semiconductor; Effect of impurity concentration and temperature on the Fermi Level; Hall Effect (applied electric field along x-axis and applied magnetic field along z-axis) and its application.

Drift and Diffusion of charge carriers across the Energy band structure of P-N Junction leading to formation of depletion region and potential barrier; concept of carrier current densities in p-n junction in equilibrium, forward bias and reverse bias; Uses of p-n junction in Light emitting diode (LED), photoconductors & photovoltaic solar cells.

3. Dielectrics & Magnetic Materials

Dielectric material, dielectric constant, polarization, polarizability & its types; relative permittivity; Piezoelectrics, Ferroelectrics, Applications of dielectric materials - Requirement of good insulating material, some important insulating material.

Origin of magnetization using Atomic Theory; classification of magnetic materials based on Susceptibility value; Qualitative treatment of Langevin's and Weiss equation for Dia, Para and Ferro magnetic materials (no derivation); Microstructure of ferromagnetic solids- Domains and Hysteresis loss; Soft & hard magnetic materials and their uses; Magnetic circuits and microscopic Ohm's Law.

4. Acoustics & Ultrasonics

Introduction to architectural acoustics; reverberation and Sabine's formula; Common Acoustic defects and Acoustic Design of a hall

Ultrasonic Waves and their applications; Methods of production of ultrasonic waves (Piezoelectric Oscillator & Magnetostriction Oscillator)

Mumbai University Question Paper Format

1) Question paper will comprise of 6 questions, each carrying 15 marks.
2) Total 4 questions need to be solved.
3) Q.1 will be compulsory, based on entire syllabus wherein sub question of 2 to 3 marks will be asked.
4) Remaining question will be randomly selected from all the modules.
5) In question paper weightage of module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Reference Books

1) A Textbook of Engineering Physics – (*Avadhanulu & Kshirsagar*), S. Chand
2) Applied Solid State Physics – (*Rajnikant*), Wiley India
3) Engineering Physics – (*Uma Mukherji*) (third edition), Narosa
4) Engineering Physics – (*R.K. Gaur & S.L. Gupta*), Dhanpat Rai publications
5) Solid State physics – (*A.J. Dekker*), Macmillan Student Edition
6) Modern Engineering Physics – (*Vasudeva*), S. Chand
7) Solid State Physics – (*Charles kittle*), EEE Pbl
8) Concepts of Modern Physics – (*Arther Beiser*), Tata Mcgraw Hill

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