

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, BaTiO₃ 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 Kittel*), EEE Pbl
- 8) Concepts of Modern Physics – (*Arther Beiser*), Tata Mcgraw Hill

