

B.Sc. PHYSICS SYLLUBUS UNDER CBCS
w.e.f. 2015-16 (Revised in April 2016)
For Mathematics Combinations
Semester –VI
Paper VII-(B) Elective (Materials Science)
Elective Paper –VII-(B): Materials Science

No. of Hours per week: 04

Total Lectures:60

UNIT-I (12 hrs)

1. Materials and Crystal Bonding: Materials, Classification, Crystalline, Amorphous, Glasses; Metals, Alloys, Semiconductors, Polymers, Ceramics, Plastics, Bio-materials, Composites, Bulk and nanomaterials. Review of atomic structure – Interatomic forces – Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal.

UNIT-II (12 hrs)

2. Defects and Diffusion in Materials: Introduction – Types of defects - Point defects- Line defects- Surface defects- Volume defects- Production and removal of defects- Deformation- irradiation- quenching- annealing- recovery - recrystallization and grain growth. Diffusion in solids- Fick's laws of diffusion.

UNIT-III(12 hrs)

3. Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep – Fracture – Technological properties – Factors affecting mechanical properties of a material – Heat treatment - Cold and hot working – Types of mechanical tests – Metal forming process – Powder – Misaligning – Deformation of metals.

UNIT-IV (12 hrs)

4. Magnetic Materials: Dia-, Para-, Ferri- and Ferromagnetic materials, Classical Langevin theory of dia magnetism, Quantum mechanical treatment of paramagnetism. Curie's law, Weiss's theory of ferromagnetism, Ferromagnetic domains. Discussion of B-H Curve. Hysteresis and energy Loss.

UNIT-V (12 hrs)

5. Dielectric Materials: Dielectric constant, dielectric strength and dielectric loss, polarizability, mechanism of polarization, factors affecting polarization, polarization curve and hysteresis loop, types of dielectric materials, applications; ferroelectric, piezoelectric and pyroelectric materials, Clausius -Mosotti equation.

Reference books

1. Materials Science by M.Arumugam, Anuradha Publishers. 1990, Kumbakonam.
2. Materials Science and Engineering V.Raghavan, Printice Hall India Ed. V 2004. New Delhi.
3. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India
4. Solid State Physics, M.A. Wahab, 2011, Narosa Publications

Elective Paper-VII-B Practical: Materials Science

2hrs/Week

Minimum of 6 experiments to be done and recorded

1. Measurement of susceptibility of paramagnetic solution (Quinck's Tube Method)
2. Measurement of magnetic susceptibility of solids.
3. Determination of coupling coefficient of a piezoelectric crystal.
4. Measurement of the dielectric constant of a dielectric Materials
5. Study the complex dielectric constant and plasma frequency of metal using surface plasmon resonance (SPR)
7. Study the hysteresis loop of a Ferroelectric Crystal.
8. Study the B-H curve of 'Fe' using solenoid and determine energy loss from hysteresis.