

**PPE3I102 MATERIAL SCIENCE**

**Module- I**

Classification of Engineering Materials. Engineering properties of materials. Selection of Materials. Electron theory of solids : Free electron theory of metals. Electrical conductivity; Thermal conductivity, Quantum theory of free electrons. Band theory of solids, Conductivity of metals. Conductors, Insulators, Semiconductors, Intrinsic and extrinsic semiconductors, Band theory of semi conductors Hall effect.

Super Conductors – Zero resistivity, Critical magnetic field and critical current density. Type I and II super conductors. Applications of Supercoductors.

**Module II**

Dielectric Materials : Microscopic Displacement of atoms and molecules in an external dc electric field, Polarization and dielectric constant, Dielectric \_nitially\_lity. Temperature dependence, Dielectric Breakdown. Ferro electric material Piezoelectrics, Pyroelectrics, Dielectric Materials as electrical insulators.

Magnetic Properties of Materials : Dia, Para and Ferro magenetic materials. Theory of magnetism, Ferro magnetic materials or Ferrites, Comparison of magnetic behaviour and magnetic parameters of Dia, Para and Ferro magnetic materials.

Optical Properties of Materials : Scattering, Refraction, Theory of Refraction and absorption, Atomic Theory of optical properties. Lasers, Optical fibres – Principle, structure, application of optical fibre.

**Module III**

Plastics – Types : Thermosetting and thermoplastics. Transfer moulding, injection moulding, extension moulding, Blow moulding, Welding of plastics; Rubber types, application. Ceramics : Types, Structure, Mechanical properties, applications

Composite Materials : Agglomerated Materials : Cermets, Reinforced Materials : Reinforced Concrete. Glass fibre reinforced plastics, Carbon fiber reinforced plastics. Whiskers, fiber reinforced plastics, Laminated plastic sheets. Tufnol, Properties of composites. Metal matrix composites, manufacturing procedure for fibre reinforced composites.

Environmental Degradation: Oxidation-Direct atmospheric attack, Aqueous corrosion-Electrochemical attack, Glavanic two –metal corrosion, corrosion by Gaseous reduction, Effect of mechanical stress on corrosion, method of corrosion prevention

**Text book:**

1. *Vijaya M. S., Rangarajan G, Materials Science, TMH*
2. *Introduction to Materials science for engineers by James.F.shackelford, Madanapalli.k.Muralidhara ,Pearson(sixth edition) Reference Book:*
3. *Rajendra V., Marikani A., Materials Science, TMH*
4. *Van Vlack L. H., Elements of Material Science and Engineering, Addison Wesley*
5. *Raghavan , Material Science*
6. *Callister W.D., Materials Science and Engineering, John Wiley & Sons.*
7. *Smith, Materials Science & Engineering. Mc. Graw Hill.*
8. *Processes and Material of manufacture : Lindberg, PHI.*