Subject Code : MBEAP2

MAJOR BASED ELECTIVE II - MATERIALS TECHNOLOGY

Unit I: ENGINEERING METERIALS

Properties of engineering materials – Electrical, mechanical, magnetic, optical, thermal, dielectric, chemical and physical criteria for selection of materials for engineering applications.

Steels and cast iron: Classification – Effect of carbon, other alloying elements and heat treatment on mechanical properties.

Applications: Applications and importance of nonferrous metals: Alloys of copper, nickel, chromium, lead, magnesium and zinc

Unit II: ELECTRICAL AND MAGNETIC PROPERTIES

Conduction in metals – Effect of temperature on the electrical conductivity of metals-Thermal conductivity of metals-High conductivity materials – Nonmetallic conductors.

Delectrics – Dielectric materials – Ferroelectrics – Classification of magnetic materials –Origin of ferromagnetism – Ferromagnetic domains –Ferrites – Magnetostriction – Magnetic resonance.

Superconductivity – Cryogenic or hyperconductors.

Unit III: MODERN ENGINEERING MATERIALS

Ceramics, polymers, plastics and high temperature materials- Electrical properties of polymeric materials – Types of polymeric materials, polythene, polystrone, polyvinyl chloride, Teflon polystors, bakelite-Application of polymers.

Varnishes and enamels – Types –Applications

Unit IV: MECHANICAL BEHAVIOUR

Creep: Fundamental components-Transient and viscous creep- Creep properties of metals and nonmetals –Stress relaxation.

Fatigue: Mechanism of fatigue – Fatigue properties – Fatigue damage – Fatigue stress concentration.

Hardness: Hardness and structure – Hardness measurement

Unit V: CHOICE OF MATERIALS

Elastic materials – Materials for spring , bellows, diaphragm – Bourdon tube – Selection criteria – materials for piping, pipe fittings, choice of materials for different operating conditions like temperature, pressure, humidity and corrosion – Materials for control valve body and trim –Selection Criteria – Materials for strain gauges, RTD' s, thermistors, orifice plates and rotameter – Corrosion – Prevention and Control.

BOOKS FOR STUDY AND REFERENCE

1. An Introduction to electrical engineering materials - C.S. Indulkar – Chand & Co–1981.
2. Engineering material science – C.W. Richards – PHI
3. Elements of material science – L.H. Van Vlack – PHI
4. Material science - M. Arumugam – Anuradha Agencies, - 612 606, Kumbakonam.
5. Standards and practices for instrumentation – ISA HandBook – ISA 1986.