

AMPTE03 MATERIALS ENGINEERING

UNIT-1 MECHANICAL BEHAVIOR OF MATERIALS

- 1.1 Stress- Strain curve, Elastic deformation
- 1.2 Characteristics of elastic deformations, atomic mechanism of elastic deformation,
- 1.3 Inelastic deformation,
- 1.4 Strain-Time curves, Damping capacity,
- 1.5 Viscous deformation, Plastic deformation,
- 1.6 Mechanism of plastic deformation- slip & twinning, Schmidt's law, critical resolved shear stress.

UNIT-2 MECHANICAL TESTING AND FRACTURE OF MATERIALS

- 2.1 Tensile test, stress-strain curves for ductile and brittle materials- mild steel, copper, proof stress, yield point phenomena,
- 2.2 Luder's bands, compression test, and hardness test- various hardness tests.
- 2.3 Impact test - ductile brittle transitions.
- 2.4 Fatigue- Stress cycles for fatigue testing, endurance limit, and fatigue limit, S-N curve,
- 2.5 Creep-curve, primary creep, secondary creep, and tertiary creep.
- 2.6 Fracture - ideal fracture stress, brittle fracture
- 2.7 Griffith's theory- fracture toughness, ductile failure, cup & cone type fracture, fatigue failure.

UNIT-3 PHASE DIAGRAM

- 3.1 Solid solutions, inter metallic compound, cooling curves, non-equilibrium cooling, phase rule, equilibrium diagrams - Isomorphous diagrams, Eutectic, Peritectic and eutectoid reactions with examples.
- 3.2 Ferrous and non-ferrous alloys - Fe-C diagram,
- 3.3 Effect of alloying elements on properties of steel, tool steel, heat resisting and die steel.
- 3.4 Alloys of copper, aluminium, magnesium, nickel and zinc - compositions and their uses, Polymeric and composite materials, metal matrix composites, refractories, abrasives, shape memory materials.

UNIT-4 SPECIAL DIFFUSION PROCESS

- 4.1 Aluminizing, Siliconising,
- 4.2 Boriding- Laser hardening,
- 4.3 Electroplating-hard chrome & nickel plating- Hard dip coating,
- 4.4 Cladding- Physical and chemical vapor deposition
- 4.5 Metal spraying - Plastics and rubber coating
- 4.6 Conversion coating- Coating of tools- TiC, TiN,
- 4.7 Alumina and diamond coating of tools
- 4.8 Selection of coating of tools
- 4.9 Selection of coating for wear and corrosion resistance
- 4.10 Elastic materials- Applications.

UNIT-5 CERAMICS

5.1 Types- Bonding and their structure

5.2 Defects- calcinations, grain growth and solid liquid phase sintering;

5.3 Ceramic coatings and their deposition;

5.4 Properties of photonic, electro-optic, magnetic and superconducting ceramics ferrites;

5.5 Applications of electronic ceramics in various devices including sensors for gases, temperature, pressure and voltage, and in optical communication, magnetic and oxide electronics, and electric power and energy storage devices.

References Books:

1. R. C. Buchanan, Ceramic Materials for Electronics, Marcel Dekker, 1986
2. J. C. Anderson, K. D. Leaver, R. D. Rawlings, J. M. Alexander, Material Science, Donald
3. S. Clark and Wilbur R Warney, Physical metallurgy, Affltd. East west press.
4. C. W. Richards, Engineering material Science, Prentice Hall Of India

