AMME10 MATERIALS SCIENCE

UNIT-1 MECHANICAL PROPERTIES

- 1.1 Introduction to mechanical properties tensile test
- 1.2 Plastic deformation mechanisms slip and twinning
- 1.3 Role of dislocations in slip strengthening methods strain hardening
- 1.4 Refinement of the grain size solid solution strengthening precipitation hardening creep resistance - creep curves - mechanisms of creep - creep-resistant materials – fracture
- 1.5 The Griffith criterion critical stress intensity factor and its determination fatigue failure fatigue tests - methods of increasing fatigue life – hardness
- 1.6 Rockwell and Brinell hardness Knoop and Vickers microhardness. tion of Enginee

UNIT-2 PHASE DIAGRAMS

- 2.1 Solid solutions- Hume Rothery's rules
- 2.2 Free energy of solid solution- intermediate phases
- 2.3 The phase rule- single component system- one-component system of iron
- 2.4 Binary phase diagrams- isomorphous systems- the tie-line rule- the level rule- application to isomorphous system- eutectic phase diagram- peritectic phase diagram
- 2.5 Other invariant reactions- microstructural change during cooling.

UNIT-3 FERROUS ALLOYS AND HEAT TREATMENT

- 3.1 The iron-carbon equilibrium diagram
- 3.2 Phases, invariant reactions- microstructure of slowly cooled steels eutectoid steel, hypo and hypereutectoid steels
- 3.3 Effect of alloying elements on the Fe-C system- diffusion in solids- Fick's law- phase transformations - pearlitic transformations - T-T-T-diagram for eutectoid steel
- 3.4 Baintic and martensitic transformations- tempering of martensite- heat treatment of steelsannealing - normalizing - quenching and tempering
- 3.5 Case hardening- induction, flame and laser hardening- carburizing, cyaniding, carbonitriding and nitriding.

UNIT-4 ELECTRONIC MATERIALS

- 4.1 Classification of solids- energy bands- concept of Fermi level- conductor, semiconductor, insulator- Semiconductors: intrinsic, extrinsic
- 4.2 Carrier concentration expression (qualitative)- compound semiconductors (qualitative)dielectric materials- polarization mechanisms- dielectric breakdown
- 4.3 Magnetic materials- ferromagnetic materials & hysteresis- ferrites- superconducting materials, properties, types and applications.

UNIT-5 NEW MATERIALS AND APPLICATIONS

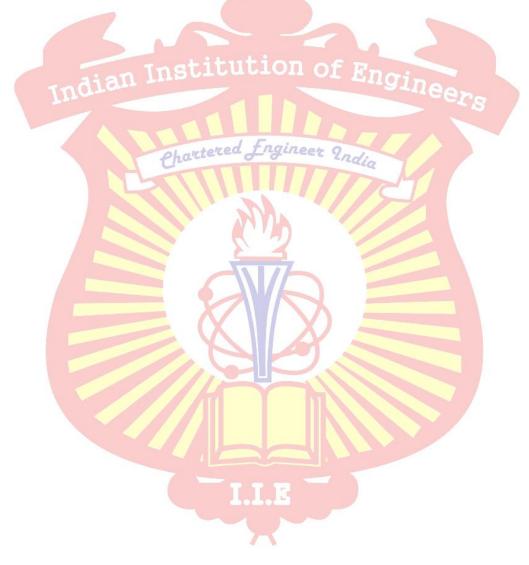
- 5.1 Introduction to Ceramics and its applications
- 5.2 Ceramic Fibres- Fibre reinforced Plastics- Fibre reinforced Metal
- 5.3 Metallic glasses- Shape memory alloys

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- 5.4 Copper base alloys- Nickel- Titanium alloys
- 5.5 Relaxor- Ferroelectric materials- Electro and magneto rheological fluids
- 5.6 Sensors and Actuators polymer semiconductos photoconducting polymers liquid crystals
- 5.7 Bio- sensors- Scintillation detectors (Position sensitive)-
- 5.8 Bio materials hydroxyapatite PMMA- Silicone.

Reference Books:

- 1. Calister, W.D., Materials Science and Engineering an Introduction, John Wiley, 2003.
- 2. Rajendarn V and Marikani A, Materials Science, Tata McGraw Hill, 2006.



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