

AMAE-09 ENGINEERING MATERIALS AND METALLURGY

UNIT-1 ALLOYS AND PHASE DIAGRAMS

- 1.1 Constitution of alloys-
- 1.2 Solid solutions, substitutional and interstitial- phase diagrams,
- 1.3 Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions,
- 1.4 Iron- carbon equilibrium diagram.
- 1.5 Classification of steel and cast Iron microstructure, properties and application.

UNIT-2 HEAT TREATMENT

- 2.1 Definition- Full annealing, stress relief, recrystallization and spheroidizing- normalizing, hardening and tempering of steel.
- 2.2 Isothermal transformation diagrams- cooling curves superimposed on I.T. diagram CCR- Hardenability, Jominy end quench test
- 2.3 Austempering, martempering- case hardening, carburizing, Nitriding, cyaniding, carbonitriding
- 2.4 Flame and Induction hardening- Vacuum and Plasma hardening. .

UNIT-3 FERROUS AND NON-FERROUS METALS

- 3.1 Effect of alloying additions on steel- α and β stabilisers- stainless and tool steels- HSLA,
- 3.2 Maraging steels- Cast Iron- Grey, white, malleable, spheroidal- alloy cast irons, Copper and copper alloys-
- 3.3 Brass, Bronze and Cupronickel- Aluminium and Al-Cu- precipitation strengthening treatment- Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

UNIT-4 NON-METALLIC MATERIALS

- 4.1 Polymers- types of polymer, commodity and engineering polymers- .
- 4.2 Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers
- 4.3 Urea and Phenol formaldehydes)- Engineering Ceramics- Properties and applications of Al_2O_3 , SiC, Si₃N₄, PSZ and SiALON- Composites-Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT-5 MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

- 5.1 Mechanisms of plastic deformation, slip and twinning-
- 5.2 Types of fracture- Testing of materials under tension, compression and shear loads-
- 5.3 Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test Izod and Charpy, fatigue and creep failure mechanisms.

References Books:

1. Raghavan.V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 1999.
2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", 4th Indian Reprint, Prentice Hall of India Private Limited, 2002.