

For Syllabus, Question Papers, Notes & many More

## **ME6403 ENGINEERING MATERIALS AND METALLURGY**

### **DETAILED SYLLABUS**

#### **UNIT I ALLOYS AND PHASE DIAGRAMS**

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

#### **UNIT II HEAT TREATMENT**

Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening.

#### **UNIT III FERROUS AND NON-FERROUS METALS**

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

#### **UNIT IV NON-METALLIC MATERIALS**

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub>, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites.

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## **UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS**

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

### **TEXT BOOKS**

1. Avner, S.H. "Introduction to Physical Metallurgy", McGraw Hill Book Company, 1994.
2. Williams D Callister, "Material Science and Engineering", Revised Indian edition, Wiley India Pvt Ltd, 2007.

### **REFERENCES**

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.
3. Upadhyay. G.S. and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt.Ltd., New Delhi, 2006.
4. U.C.Jindal: Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012.

### **OBJECTIVES**

To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.