MEPC2002 INTRODUCTION TO PHYSICAL METALLURGY AND ENGINEERING MATERIALS (3-0-0)

Course Objectives:"This course aims to equip students with fundamental knowledge of physical metallurgy and engineering materials so that students will understand the structure, properties, processing, and performance of various engineering materials, enabling them to select and apply appropriate materials in mechanical design and manufacturing processes."

MODULE-I(08hrs)

Philosophy behind study of material science, Classification and properties of engineering materials. Crystal structures, Mechanism of crystallization, Defects in crystal structure, Plastic deformation by slip and twinning, Effects of cold working on properties, Review of strengthening methods, Hot working

MODULE-II(06hrs)

Constitutions of Alloys: Pure metal, Intermediate alloy phase, solid solution: Substitutional and interstitial. Hume- Rothery Rules Phase Diagram: Binary phase diagram, phase diagram rules, iron-carbon equilibrium diagram, phase transformation in iron-carbon system, Lever rules

MODULE-III(05hrs)

Heat Treatment of Steels: Structure and properties of common engineering materials, Annealing: different types of annealing, Normalizing, Hardening

MODULE-IV(06hrs)

Time Temperature Transformation (TTT) diagram, different cooling curves and transformation on continuous cooling, Tempering, sub-zero treatment of steel, Defects due to heat treatment. Surface Hardening of Steels: Induction hardening, Flame hardening, Case hardening: Carburizing, Nitriding, Cyaniding, carbonitriding, Diffusion coating.

MODULE-V(05hrs)

Introductory Ideas on Ferrous Alloys, Effect of alloying elements on the properties of steels, general classification of steels, Steel designation, Cast Iron. Nonferrous Alloys: Plastics, Ceramics, Composite materials, Common applications of various materials

Course Outcomes:

Upon completion of the course, students will be able to:

CO1	Understand the crystal structure and classification of engineering materials.
CO2	Understand the classification of ferrous and nonferrous alloy and study their applications.
CO3	Interpret the phase diagrams of materials.

CO4	Understand heat treatment and surface hardening processes affecting mechanical properties of metals and alloys.
CO5	Understand the effect of alloying and composite materials.

Books:

- IntroductiontoPhysicalMetallurgybyAvner,TataMcGrawHill
- MaterialsScienceandEngineeringbyW.D.Callister,WileyandSonsInc.
- PhysicalMetallurgy:PrinciplesandPracticebyRagahvan,PHI