

Course Code	CE 207
Course Title	Materials Science I
No. of Credits	3
Pre-requisites	None
Compulsory / Optional	Compulsory for mechanical engineering
Aim(s) : To introduce the students to the fundamentals of the behaviour materials	
Intended Learning Outcomes : At the end of the course the student should be able to: <ol style="list-style-type: none"> 1. get familiar with binary alloy systems and predict equilibrium microstructures 2. design heat treatment methods to control microstructure and hence the properties of materials 3. design castings of metals using solidification theories 4. get hands on experience on how to observe microstructures of castings, effects of heat treatment on properties of medium carbon steels, case hardening process and its effects 	
Time Allocation (Hours) : Lectures 38 , Assignments 14	
Course content / Course description : <ul style="list-style-type: none"> • Important binary alloy systems: Introduction to course and course policies, Re-visit course contents of GP 109, Defects of materials, Introduction of Binary alloy Systems • Casting and solidification of metals: Solidification Theory, Nucleation and Growth, Homogeneous and Heterogeneous nucleation, Planar and dendritic growth, casting, rate of transformation • Elementary deformation theory, Plastic deformation of materials, dislocation and deformation theory: Introduction to mechanical properties and plastic deformation concepts in solids, theory of dislocation motion, slip systems in crystalline solids, mechanisms of plastic deformation and dislocation generation • Strengthening mechanisms and treatments: Work hardening, solid solution strengthening, precipitation strengthening, Grain boundary strengthening and quenching • Physical metallurgy of steels: Fe-C diagram, TTT and CCT diagrams, Heat treatment of steels: Introduction to Fe and C elements, different phases in Fe-C alloy system and their microstructures, Heat treatment methods, TTT, CCT diagrams, Bainitic and Martensitic transformations, Predicting microstructures • Corrosion and corrosion prevention: Introduction to types of Corrosion, Electrochemical corrosion theories, prevention of corrosion. • Materials selection: Introduction to materials property charts, optimization techniques in materials selection in design, motivation to find new materials, group studies on use of new materials 	
Recommended Texts (if any) :	

Assessment	Percentage Mark
Lab assignments, tutorials	30
Mid-semester examination	20
End-semester examination	50