

Metallurgy and Material Science

B. Tech. II Year I Semester

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	TOTAL
23ME303	Core	3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes:48			

Prerequisites: Metallurgy and Materials Science

Course Overview:

Identify the Crystal structure metallic materials analyze. the binary phase diagram of alloys fe-fe₃c,etc correlate, The microstructure with properties processing and performance of recognize. the failure metals with structural change select materials for design and construction .apply core concept in materials science to solve engineering problems.

Course Objectives:

- 1 Describe crystallography and distinguish basic imperfection in crystal structure
- 2 Analyze the mechanism of solidification and phase formation and transformation
- 3 Interpret the iron carbon system and describe the phase the phases formed in plain carbon steels and cast iron under equilibrium and non equilibrium conditions
- 4 Describe the behavior of metals under applied thermal and mechanical loads
- 5 Describe the effect of chemical composition on microstructure mechanical properties of steel cast iron, aluminum alloys copper alloys and composites

COURSE OUTCOMES

CO1: Recall the concepts of basic crystallography and imperfections of various crystals for improving the performance of materials and identify the atomic packing factor of unit cells of various crystal structures to study the properties of materials.

CO2: The students get the Knowledge of phase diagram and the basic terminologies associated

CO3: Metallurgy .Able to construct the phase diagrams and reactions and analyze the structure

CO4: Materials at different levels of crystalline materials, The students gets the knowledge on various heat treatment process and able to identify the between course and find the pear lite structure.

CO5 :The students get the knowledge on various surface treatment process and able to identify martensite and bainite micro structure.The students gets the knowledge on various alloys of ferrous and non ferrous metal for better performance at lower cost

III. SYLLABUS

UNIT-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

UNIT-II

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron-iron carbide phase diagram and microstructural aspects of ledeburite, austenite, ferrite and cementite, cast-iron

UNIT-III

Heat treatment of Steel: Annealing, Normalizing, Hardening, Tempering and Spheroidizing, so thermal transformation diagrams for Fe-Alloys and microstructures development.

UNIT-IV

Continuous cooling curves and interpretation of final microstructures and properties, austempering, martempering, casehardening, Carburizing, nitriding, cyaniding, carbon-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT-V

Alloying of steel, properties of stainless steel and tool steels, Maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloy (Brass, bronze and Cu-Ni)- Aluminum and Al-Cu-Mg alloys- Titanium alloys

TEXTBOOKS:

1. "V. Raghavan, Material's Science and Engineering", Prentice Hall India Private Limited, 1999.
2. W.D.Callister, 2006, Materials Science and Engineering- An Introduction, 6th Edition, Wiley India.

REFERENCE BOOKS:

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