

Course Type	Course Code	Name of Course	L	T	P	Credit
ESO	MEE201	Engineering Materials	3	0	0	9

Course Objective

The objective of the course is to gain knowledge in properties and structures of solids, acquire the knowledge about various phase diagrams of both ferrous and non-ferrous metals, attain knowledge in heat treatment of steels, properties of non-ferrous alloys and evaluate the mechanical properties of different metals and Impart the knowledge about the failure mechanism of ductile and brittle materials.

Learning Outcomes

- To distinguish the mechanical properties of metals, their alloys and various modes of failure
- To analyze the microstructures of ferrous and non-ferrous materials to mechanical properties
- To depict the processes of heat treatment of various alloys
- To get in depth knowledge of properties and potentialities of various materials available and material selection procedures
- To Know about composite materials and their processing as well as applications

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Classification and selection of engineering materials; Bonds in solids, Electron theory of metals, Crystal Geometry	5	Distinguishing different materials based on their chemical bonding, crystal structure and mechanical properties
2	Structure and Defects in crystals and methods of their determination, Electron theory of Metals, Diffusion in Solids	5	To know different defects in crystals and their effect of materials properties
3	Mechanical properties of materials and their assessment methods, Alloy Systems, Phase diagrams of common Engineering alloy systems, TTT Curves Heat Treatment Processes	10	To assess the mechanical strength via T-T-T diagrams and their usage in distinguishing different phases in materials.
4	Heat Treatment Processes, Strengthening Mechanisms of Materials, Basics of Thermal, Optical, Electrical and Magnetic Properties of Materials	10	Understating of heat treatment and basic knowledge for thermal, optical, electrical and magnetic properties for different materials.
5	Concepts of Creep, Fatigue, Fracture and Corrosion, Introduction to Semiconductors, Superconductivity	5	Brief introduction about mechanism and different modes of failure
6	Ceramics, Composites, Shape Memory Alloys, Met glasses, and Nanostructure Materials.	5	To gain knowledge and understand the properties of new age materials

TEXT BOOKS:

1. Materials Science and Engineering, William D Callister Jr, John Wiley & Sons, Inc.

Other References

1. Physical Metallurgy Principles, T. E. Reed-Hill & R Abbaschian, Thomson.
2. Elements of Materials science & Engineering, L.H. Van Vlack. Addison Wesley Pub. Company.
3. Mechanical Metallurgy, G.E. Dieter, McGraw-Hill, London.
4. Materials Science and Engineering, V. Raghvan, Prentice Hall of India.