

## ME305ES: METALLURGY AND MATERIAL SCIENCE

B.Tech. II Year I Sem.

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### UNIT – I

**Structure of Metals:** Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods. **Constitution of Alloys:** Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

### UNIT – II

**Phase Diagrams:** Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

### UNIT –III

**Engineering Materials –I Steels: Iron-Carbon Phase Diagram and Heat Treatment:** Study of Fe-Fe<sub>3</sub>C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening, and Tempering of steels, Hardenability. Alloy steels.

### UNIT – IV

**Engineering Materials –II: Cast Irons:** Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. **Engineering Materials-III: Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

### UNIT – V

**Engineering Materials –IV: Ceramics, Polymers and Composites:** Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties, and applications of composites. Classification, Properties, and applications of Polymers.

### TEXT BOOKS:

1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R. Askeland / Thomson.

### REFERENCES:

1. Introduction to Physical Metallurgy / Sidney H. Avner.
2. Materials Science and engineering / William and Callister.
3. Elements of Material science / V. Rahghavan
4. Engineering Material and Metallurgy – Er Amandeep Singh Wadhva
5. Materials Science for Engineering Students- Traugott Fischer 2009 Edition.