

## MATERIAL SCIENCE AND METALLURGY

<b>Subject Code</b>	<b>: 10ME32A /42A</b>	<b>IA Marks</b>	<b>: 25</b>
<b>Hours/Week</b>	<b>: 04</b>	<b>Exam Hours</b>	<b>: 03</b>
<b>Total Hours</b>	<b>: 52</b>	<b>Exam Marks</b>	<b>: 100</b>

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### PART – A

#### UNIT - 1

**Crystal Structure:** BCC, FCC and HCP Structures, coordination number and atomic packing factors, crystal imperfections -point line and surface imperfections. **Atomic Diffusion:** Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

**06 Hours**

#### UNIT - 2

**Mechanical Behaviour:** Stress-strain diagram showing ductile and brittle behaviour of materials, linear and non linear elastic behaviour and properties, mechanical properties in plastic range, yield strength offset yield strength, ductility, ultimate tensile strength, toughness. Plastic deformation of single crystal by slip and twinning.

**06 Hours**

### UNIT - 3

**Fracture:** Type I, Type II and Type III.

**Creep:** Description of the phenomenon with examples. three stages of creep, creep properties, stress relaxation.

**Fatigue:** Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

**07 Hours**

### UNIT - 4

**Solidification:** Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures.

Phase Diagram I: Solid solutions Hume Rothary rule substitutional, and interstitial solid solutions, intermediate phases, Gibbs phase rule.

**07 Hours**

## PART - B

### UNIT - 5

**Phase Diagram II:** Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

**06 Hours**

### UNIT - 6

**Heat treating of metals:** TTT curves, continuous cooling curves, annealing and its types. normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

**07 Hours**

### UNIT - 7

**Ferrous and non ferrous materials:** Properties, Composition and uses of

- Grey cast iron, malleable iron, SG iron and steel
- Copper alloys-brasses and bronzes.  
Aluminium alloys-Al-Cu,Al-Si,Al-Zn alloys.

**06 Hours**

## UNIT - 8

**Composite Materials:** Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

**07 Hours**

### TEXT BOOKS:

1. **Foundations of Materials Science and Engineering**, Smith, 4<sup>th</sup> Edition McGraw Hill, 2009
2. **Materials Science, Shackelford., & M. K. Muralidhara**, Pearson Publication – 2007.

### REFERENCE BOOKS:

1. **An Introduction to Metallurgy; Alan Cottrell**, Universities Press India Oriental Longman Pvt. Ltd., 1974.
2. **Engineering Materials Science**, W.C.Richards, PHI, 1965
3. **Physical Metallurgy;** Lakhtin, Mir Publications
4. **Materials Science and Engineering**, V.Raghavan , PHI, 2002
5. **Elements of Materials Science and Engineering**, H. VanVlack, Addison-Wesley Edn., 1998
6. **Materials Science and Engineering**, William D. Callister Jr., John Wiley & Sons. Inc, 5<sup>th</sup> Edition, 2001.
7. **The Science and Engineering of Materials**, Donald R. Asklund and Pradeep.P. Phule, Cengage Learning, 4<sup>th</sup> Ed., 2003.

## MECHANICAL MEASUREMENTS AND METROLOGY

<b>Subject Code</b>	<b>: 10ME32B /42B</b>	<b>IA Marks</b>	<b>: 25</b>
<b>Hours/Week</b>	<b>: 04</b>	<b>Exam Hours</b>	<b>: 03</b>
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## PART- A

### UNIT-1

**Standards of measurement:** Definition and Objectives of metrology, Standards of length-International prototype meter, Imperial standard yard, Wave length standard, subdivision of standards, line and