

<b>COURSE TITLE</b>	<b>MATERIAL SCIENCE AND ENGINEERING</b>
<b>COURSE CODE</b>	<b>01CH1402</b>
<b>COURSE CREDITS</b>	<b>3</b>

**Objective:**

- 1 Course will cover various aspects related to material, their properties and manufacturing methods used in chemical industries.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Understand the basic concept of crystal system as well as defects
- 2 Analyze the various properties of the engineering materials.
- 3 Relate the practical importance and relevance of metals and alloys in chemical industry
- 4 Utilize the technological methods related to material strength and diffusion concepts

**Pre-requisite of course:**None

**Teaching and Examination Scheme**

<b>Theory Hours</b>	<b>Tutorial Hours</b>	<b>Practical Hours</b>	<b>ESE</b>	<b>IA</b>	<b>CSE</b>	<b>Viva</b>	<b>Term Work</b>
3	0	0	50	30	20	0	0

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Structure of Crystalline Solids</b> Amorphous & Crystalline solids, Unit cell, Crystal system and structure, , Coordination number, atomic packing factor,, Point coordinates, Crystallographic directions,, Crystallographic planes-Miller indices., Imperfections in solids: Defects and types of defects.	10
2	<b>Properties of Engineering Materials</b> Mechanical Properties: Isotropy, Anisotropy, Plasticity, Elasticity, Toughness, Resilience, Tensile Strength, Malleability, Ductility, Brittleness, Hardness, Fatigue, Creep, Mechanism of creep, wear resistance., Electrical Properties: Resistivity, Conductivity (ionic & electrical), Semiconductors, Superconductivity, Insulators, Ferro electricity, Energy Bands in solids, classification of materials based on band gap., Magnetic Properties: Magnetic moment, its origin, Ferro and Ferri-magnetism, dia- and para-magnetism, ferrites, use of magnetic materials.	6

<b>Contents : Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
3	<b>Phase Diagram and Processing of Metal-Alloys</b> Phase diagram: Binary phase diagram, phase diagram for iron-carbon system, Development of microstructure in iron-carbon alloys., Processing of Metal-Alloys: Ferrous alloys and nonferrous alloys, Fabrication of metals, Thermal processing of metals,, Corrosion in metal.	10
4	<b>Diffusion mechanisms</b> Diffusion mechanism, steady state diffusion, non-steady state diffusion, Factors that influence diffusion,, Diffusion in ionic and polymeric materials., Rubber, Lubricants and adhesives Definition, Characteristics, Types	6
5	<b>Ceramics and Composites</b> Ceramics: Ceramic structures, Properties of ceramics,, Types and applications of ceramics,, Fabrication and processing of ceramics. , Composite Materials: particle-reinforced composites, fiber-reinforced composites, structural composites, advantages and applications.	6
<b>Total Hours</b>		<b>38</b>

#### Textbook :

- 1 Callister's Material Science and Engineering, Balasubramaniam, Wiley India, 2021
- 2 Elements of Material Science and Engineering, Lawrence H, Van Vlack, Pearson Education, 2002

#### References:

- 1 The Science and Engineering of Materials, The Science and Engineering of Materials, Askeland and Pradeep P. Phule, Cengage Learning, 2010

#### Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
<b>Remember / Knowledge</b>	<b>Understand</b>	<b>Apply</b>	<b>Analyze</b>	<b>Evaluate</b>	<b>Higher order Thinking / Creative</b>
20.00	30.00	25.00	15.00	10.00	0.00

#### Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

**Instructional Method:**

- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

**Supplementary Resources:**

- 1 <https://nptel.ac.in/courses/113102080>
- 2 <https://nptel.ac.in/courses/112108150>