

Course Type	Course Code	Name of Course	L	T	P	Credit
ESO	PHE202	MATERIALS SCIENCE AND ENGINEERING	3	0	0	9

**Course Objective**

To know the fundamental concepts of structure of engineering materials at nanoscale and possible technological applications in various fields of science and engineering.

**Learning Outcomes**

Upon successful completion of this course, students will:

- The students are able to perform and communicate the results of research.
- They have expertise in a field of study in synthesis, processing, characterization, and/or applications of materials.
- The students are able to identify and formulate advanced problems in materials engineering and apply knowledge of engineering to solve those problems.
- Learn to think and work like professional material scientists and engineers.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Structure of materials – interatomic bonding, crystal structure, point coordinate, crystal direction, crystallographic plane, crystalline and non crystalline materials, crystal imperfection, XRD, SEM and TEM	10	Students will be familiar with different types of crystal structures. They can learn to analyze the phase transformation of the materials.
2	Phase transformation – diffusion, Fick's law, phase diagram, phase transformation, development of microstructure	5	This topic will help students learn about phase transformation in materials.
3	Properties of materials – mechanical, electrical, magnetic, thermal, optical and corrosion properties	11	Student will get knowledge about the different properties of materials.
4	Alloys, Ceramic, Polymer and Composite materials – classification, structure, characteristics, applications, and processing, advanced materials	8	This topic will help students know about different type of engineering materials, their structure, properties, processing etc.
5	Nanomaterials – fabrication, physical and chemical properties, applications, issues related to nanomaterials	5	In this topic, students will learn about the nanomaterials and applications.
6	Choice of material – performance, economic, environmental, and societal issues, reprocessing and reuse	3	Students will be familiar with economic and environmental issues for choice of materials, ways of reuse of materials etc.
	<b>Total</b>	<b>42</b>	

**Text Books:**

1. Solid State Physics, C. Kittel, 7th edition (Wiley Eastern)
2. Materials Science and Engineering, V. Raghavan (Prentice- Hall India)
3. Applied Physics for Engineers, Neeraj Mehta (PHI Learning, New Delhi)

**Reference books:**

1. Concept of Modern Physics, A. Beiser (Tata Mc-Graw Hill)
2. Solid State Physics, S.O. Pillai, 5th edition (New Age International)
3. Materials Science and Engineering: An Introduction, W.D. Callister, 6 th . Edn., Wiley, 2003
4. Introduction to Materials Science and Engineering Ralls, K., Courtney, T. H., and Wulff, J. John Wiley & Sons, 1976.