

17BSP704					Structure and Properties of Materials					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	0	4	25	50	25	--	--	100

COURSE OBJECTIVES

- ☐ To develop the fundamental understanding of Materials
- ☐ To provide the knowledge of thermal and magnetic properties of solid materials
- ☐ To provide the understanding of electrical conduction in solids and devices

UNIT 1 Introduction to Atomic Structure**12 Hrs.**

Atomic structure, Force between atoms, cohesion atoms and cohesive energy, calculation of cohesive energy, bonding in solids: ionic bonding, covalent bonding, metallic bonding, Born Haber cycle, properties of solids, hybridization, Intermolecular bonds: dispersion bond, dipole bonds, hydrogen bonds.

UNIT 2 Imperfection in Solids**15 Hrs.**

Classification of solids, periodicity in crystals, crystal structure, crystal system, crystal symmetry, unit cell characteristics, atom position in unit cell, Crystal defects: point, line and planar. Diffusion: Diffusion Mechanisms, Steady-State Diffusion, Nonsteady-State Diffusion, Factors That Influence Diffusion Dislocations and Strengthening Mechanisms: dislocations and plastic deformation, mechanisms of strengthening in metals, recovery, recrystallization, and grain growth.

UNIT 3 Thermal and Magnetic Properties of Solids**15 Hrs.**

Heat Capacity, Thermal Expansion, Thermal Conductivity Thermal Stresses, classical Theory, Einstein Theory, Basic Concepts of Magnetism, Diamagnetism and Paramagnetism, Ferromagnetism, Anti-ferromagnetism and Ferrimagnetism, Hund's rule. The Influence of Temperature on Magnetic Behavior, Domains and Hysteresis, Magnetic Anisotropy, Soft Magnetic Materials, Hard Magnetic Materials, Magnetic Storage, Superconductivity.

UNIT 4 Electrical conduction and Devices**12 Hrs.**

Electrical conduction, drift velocity, band theory of solids, energy gap, classification of solids, energy band structure, electron distribution function, Semiconductor materials, charge carrier mobility, hall effect, electrical properties of polymers, Capacitance, Polarization, Dielectric materials, strength, ferroelectricity, piezoelectricity. Devices and applications

Max. 54 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Understand of atomic structure and crystal structure.

CO2 - Develop the knowledge of solid imperfections and their thermal behaviour.

CO3 - Explain the thermal and magnetic properties of materials

CO4 - Correlate and apply the obtained knowledge to understand and evaluate the materials electrical properties.

CO5 – Develop the fundamental understanding of the basic phenomenon of materials.

CO6 - Develop the skills in solving various real-world problems in material science and engineering aspects.

TEXT/REFERENCE BOOKS

1. V. Raghavan, Materials Science and Engineering, Prentice-Hall of India Private Limited (2003).
2. W.F. Smith, Principles of Materials Science and Engineering, McGraw Hill, New York (1994).
3. W.D.Callister, An Introduction to Materials Science & Engineering, John Wiley & Sons (2007).
4. L.H. Van Vlack, Elements of Materials Science and Engineering, Addison Wesley, New York (1985).

5. J.F. Shackelford and M.K. Muralidhara, Introduction to Materials Science for engineers, Pearson Education (2007).

6. S. O. Pillai. Solid State Physics, New age international publishers.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs

Part A/Question: 3 Questions from each unit, each carrying 3 marks

36 Marks

Part B/Question: 2 Questions from each unit, each carrying 8 marks

64 Marks