BSP403					Material Science					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	2	5	6	25	50	25	--	--	100

COURSE OBJECTIVES

- To develop the fundamental understanding of material sciences
- To provide the knowledge of electric properties of metal and insulator
- To provide the understanding of semiconductor properties and their relation to band structure
- To provide the understanding of mechanical properties and their relation to crystal structure

UNIT 1 Elementary Material science concepts **14 Hrs.**

Atomic Structure and atomic numbers, Atomic Mass and mole, type of bonding, kinetic molecular theory, thermally activated processes, crystalline state, Unit cell, Crystal system, crystal structure for material elements, inter-planar spacing, order & de-order structure, defects and their significance.

UNIT 2 Electrical and dielectric conduction **14 Hrs.**

Classical theory, temperature dependence of resitivity, matthiessen' and Nordheim,s Rules, resistivity of porous materials, thermal conduction, Skin effect: HF resistance of conductors, Dielectric material, Frequency dependence: dielectric constant and loss, dielectric strength and insulation breakdown, capacitor materials, piezoelectricity, ferroelectricity and pyroelectricity.

UNIT 3 Semiconductor materials **14 Hrs.**

Basic of modern quantum mechanics, quantum theory of metals, density of states, Fermi-dirac statistics, Fermi energy significance, metal- metal contact, intrinsic, extrinsic semiconductors, temperature dependence of conductivity, mobility, schottky diodes, ohmic contancts.

UNIT 4 Mechanical properties **16 Hrs.**

Concepts of Stress and Strain ,Stress-Strain Behavior, Elastic Properties of Materials ,Tensile Properties, True Stress and Strain, Elastic Recovery after Plastic Deformation, Compressive, Shear, and Torsional Deformation, Hardness, characteristics of Dislocations, Slip Systems, Slip in Single Crystals, Plastic Deformation of Polycrystalline Materials, Deformation by Twinning, Fundamentals of Fracture, Ductile Fracture, Brittle Fracture, Principles of Fracture Mechanics, Impact Fracture Testing, Cyclic Stresses, S–N Curve, Crack Initiation and Propagation, Factors That Affect Fatigue Life, Environmental Effects, Generalized Creep Behavior, Stress and Temperature Effects, Data Extrapolation Methods, Alloys for High-Temperature.

Max. <58> Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify and understand the crystal structure, detects and it's correlation with physical properties.

CO2 - Interpret the electrical properties of conduct or and insulators by using free electron theory and it's application in life.

CO3 - Understand and identify the basic concept of quantum mechanics in material science.

CO4 - Interpret and apply basic quantum mechanics for deriving density of states in conductor and semiconductor.

CO5 - Identify and correlate the mechanical properties of materials.

CO6 - Apply the knowledge of material sciences in solving day to day problem of life.

TEXT/REFERENCE BOOKS

1. Principal of electronic materials and devices, S.O. Kasap
2. Materials Science and Engineering: An Introduction, W. D. Callister, (WILEY)
3. Materials Science by G.K. Narula; K.S. Narula; V.K. Gupta, Tata McGraw-Hill
4. Material Science by O.P. Khanna, Dhanpat Rai Publishing
5. Introduction to Materials Science For Engineers by James F. Shakelford & Madanapalli K. Murlidhara, Pearson Education

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