17BSP304					Introduction to Modern Physics (Subsidiary)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To provide the basic understanding of atomic spectroscopy
- To develop the fundamental understanding of materials science.
- To provide the comprehensive knowledge of wide range of materials characterization techniques.
- To introduce various techniques for the synthesis of nanomaterials and its and applications.

UNIT 1 ATOMIC SPECTROSCOPY **14 Hrs.**

Basics of Quantum Physics: Postulates and operators. Introduction to hydrogen atom spectrum, Bohr Magneton Larmor's precession, Stern Gerlach experiment, Electron Spin and gyro magnetic ratio, Vector atom model, spin orbit interaction and fine structure, total angular momentum for many e atom; L-S & J-J coupling(in brief)

UNIT 2 CRYSTALLOGRAPHY **16 Hrs.**

Crystalline and amorphous solids-Fundamental crystallographic parameters-primitives-inter Facial or interaxial angles-Bravais lattices and crystal systems-Miller indices-Characteristics of unit cell-Simple cubic, BCC and FCC structures-Atomic radius-Co-ordination number-Hexagonal close-packed structure-Number of atoms per unit cell-continuous and characteristic x-rays-X-ray diffraction and Bragg's law in crystals. Problem solving.

14 Hrs.

UNIT 3 BASIC ANALYTICAL INSTRUMENTATION

Classification of analytical methods - Spectroscopic Characterizations: Introduction to Spectroscopic Techniques - UV-Vis Infra-Red and FTIR, AAS, NMR Spectroscopy, X-ray Diffraction (XRD). Microscopic Characterizations: Basic principle, Instrumentation and Applications of SEM, TEM and AFM. Thermal Characterization: The basis of thermal analysis-DTA, DSC and TGA.

UNIT 4 PHYSICS OF NANOMATERIALS **12 Hrs.**

Nanoscale-Surface to volume ratio- Quantum Size effect- Electron confinement - one two and three dimensional Nanoparticles - Properties of Nanomaterials - Disadvantages of Nanomaterials - Carbon Nano Tubes(CNT) - structure of CNT - Synthesis of CNT - Arc Discharge Method - Pulsed Laser Deposition CVD- Properties of CNT- Applications of CNT.

Max. <56> Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain the basic Physics in atomic spectroscopy
CO2 - Apply the concepts of spectroscopy to solve related problems in spectroscopy
CO3 - Understand the crystal structure of solids.
CO4 - Develop the knowledge of the physics of the material's analytical techniques.
CO5 - Explain the working mechanism of surface analysis tools.
CO6 - Differentiate between various techniques for the synthesis and applications of nanomaterials.

TEXT/REFERENCE BOOKS

1. Modern Physics by G. Aruldhas and P. Rajagopal, PHI Learning Pvt. Ltd.
2. Concepts of Modern Physics by Arthur Beiser, McGraw-Hill Higher Education
3. Elements of Solid-State Physics (2 Edition) by J. P. Srivastava, PHI Learning
4. Introduction to Solid State Physics (7 Edition) by C. Kittle, Wiley (India)
5. Robert, D.Braun, Introduction to Instrumental analysis, McGraw Hill.
6. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, john wiley & Sons (2001)

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