Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Science and Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Physics

Name of the Course: Ph. D. Course Work Syllabus Paper No III

(Syllabus to be implemented from w.e.f. June 2021)

Ph.D. Course Work Syllabus in Physics

Paper III: Characterization Techniques

PART A	**Microscopic Characterization Techniques**	
Unit- I	**X – Ray Diffraction Spectroscopy:** Review of basic crystal systems, powder diffraction method, instrumentation of X – ray diffractometer, sources of X –rays, detectors of X – rays, acquisition of raw data, data processing and refinement. θ – θ and θ - 2θ Spectrometers, Method of determination of lattice parameters for cubic, tetragonal, hexagonal crystal systems, use of JCPDs data cards. Basic concept of calculation of intensity of XRD data Low angle XRD and texture analysis, Qualitative and Quantitative analysis tools and software.	**24 hrs.** **2.5 Credit** **40 Marks**
Unit –II	**IR Spectroscopy and Applications:** Absorption in IR, IR Sensitive and insensitive modes of vibration, FTIR instrumentation **UV – VIS Spectroscopy:** Basic concept of absorption of light, UV-VIS Spectrophotometer Instrumentation, Determination of optical band gap using absorption spectroscopy.	**06 hrs.** **0.5 Credit** **10 Marks**
Unit-III	**SEM, FESEM and TEM:** Basic Instrumentation, Principle of Image formation, backscattered and Secondary electrons and images, basic concept of EDS and WDS, Principle of FESEM and advantages over SEM, TEM and HRTEM, SAED and Concept of electron diffraction, Sample preparation of for SEM, TEM. **Atomic Force Microscope (AFM)** :Contact – mode, tapping mode and lateral –force AFM, electrostatic force microscope, magnetic force microscope, AFM based nano – lithography, surface force and adhesion measurements, as well as molecular recognition.	**24 hrs.** **2.5 Credit** **40 Marks**
Unit- IV	**XPS and UPS:** basic principle, instrumentation configuration, data Interpretation and analysis, chemical shift, quantification, and depth – profiling. basic principle, instrumentation configuration, data interpretation and analysis, valence – band analysis and work function measurement.	**06 hrs.** **0.5 Credit** **10 Marks**
Total Credit = 06, Total Marks = 100 UA + 50 CA. Total hrs = 60		
Reference Books 1. X – ray Diffraction – B. D. Cullity 2. Research Article by Waldran. 3. Elements of Organic Spectroscopy by Y. R. Sharma 4. Characterization of Materials Vol. 1 By Elton N. Kaufman. 5. Spectroscopy of Organic Compounds - By P. S. Kalsi - Publisher - New Age 6. Analytical Instrumentation - By R. S. Khandpur		