Programme: M. Sc. (Physics)
Course Code: PHY-526 **Title of the Course:** Methods of Experimental Physics
Number of Credits: 4(1L+3P)
Effective from AY: 2022-23

Prerequisites for the course:	Nil	
Course Objectives:	This course seeks to develop understanding of principles of measurement of various fundamental quantities in a Physics laboratory.	
Content:	**1. Measurement of temperature** Thermocouple, diode and semiconductor sensors, RTD, pyrometer, Langmuir probes, **2. Measurement of resistance** Two probe measurement and four probe measurement using constant current source and constant voltage source, Lock-in amp, discharge of capacitance **3. Measurement of capacitance** RC circuit, DC bridges, AC Bridges **4. Measurement of radiation** GM counter, ionization chambers, scintillation detector, solid state detectors, CCD detectors **5. Measurement of magnetic flux** Force methods, induction methods (including SQUID), Hall probe, indirect methods (MOKE) **6. Measurement of frequency** Resonance methods 7. **Estimation of errors in measurement.** Precision and accuracy, estimation of errors, propagation of errors, general formula, least square fitting, non-linear least square	1 hours + 15 hours 1 hours + 15 hours 1 hours + 15 hours 1 hours + 15 hours 1 hours + 15 hours 1 hours + 15 hours 9 hours
Pedagogy:	Lectures and Laboratory Experiments.	
References/Readings	1. P. R. Bevington and D. K. Robinson, Data Reduction and Error Analysis for the Physical Sciences, McGraw Hill (Indian Edition) 2015. 2. R. Srinivasan, K. R. Priolkar and T. G. Ramesh, A Manual on Experiments in Physics, Indian Academy of Sciences, 2018.	
Course Outcomes:	Student will be able to 1. Understand the advantages and disadvantages of using a technique or probe for making scientific measurements. 2. Demonstrate the ability to use selected pieces of	

	measuring devices. 3. Estimate and translate errors and report quantities up to last significant digit 4. Construct scientific apparatus for measurement of physical quantities.	

Programme: M. Sc. (Physics) (Solid State Physics)
Course Code: PHS-601 **Title of the Course:** Solid State Physics I
Number of Credits: 4
Effective from AY: 2023-24

Prerequisites for the course:	Should have basic knowledge of Quantum Mechanics and Statistical Mechanics	
Course Objectives:	1. To introduce fundamental concepts of solids like crystalline order, symmetry in solids, simple crystal structures and their properties. 2. To acquaint with the concept of reciprocal lattice and its importance in structure determination using x-rays. 3. To introduce different types of crystal bindings and elastic properties of solids. 4. To familiarize the concept of lattice vibration and their role in thermal and optical properties of solids.	
Content:	**Crystal Structure** Crystals - Lattice, Bravais lattice, primitive unit cell, symmetry of molecules and crystals, symmetry operations and symmetry elements, Lattices in one, two and three dimensions, Space groups, definitions of directions, coordinates and planes. Simple crystal structures: NaCl, CsCl, diamond, hexagonal close-packed structure, cubic ZnS structure and their properties, Non ideal crystal structures – random stacking and polytypism Reciprocal Lattice - Diffraction of waves by crystals, Bragg law, Scattered wave amplitude - Fourier analysis, reciprocal lattice vectors, diffraction conditions, Laue equations, Brillouin zones, Geometric structure factor, Atomic Structure factor Point Defects General Thermodynamic Features, Color centres, Line Defects: Dislocations **Crystal Binding and Elastic Constants** Crystals of inert gases - Van der Waals - London interaction, repulsive interaction, equilibrium lattice constants, cohesive energy, Ionic Crystals - Electrostatic or Madelung Energy, evaluation of Madelung constant, covalent crystals, bonding in metals and Hydrogen bonds, Atomic Radii, Analysis of elastic strains, elastic compliance and stiffness constants, elastic waves in cubic crystals **Thermal Properties** Vibrations of a one -dimensional monatomic lattice, first Brillouin zone, group velocity, long wavelength limit,	20 hours 13 hours 15 hours