Academic Session: 2022-2023

PHY 3205: Solid State Physics I

3 Hours/week	3 Credits	Examination Duration: 3 Hours

1. **Crystal Systems:** Classification of Materials; Lattice; Crystal and its Symmetries; Classification of Crystals, Unit Cell; Basis vector; Bravais Lattice; Miller Indices; Crystal Structures; Calculation of Lattice Points; Packing Factor; Inter-planar Spacing; Reciprocal Lattice; Bragg's Diffraction; Brillouin Zones; Atomic Form Factor; Structure Factor.

2. **Imperfections in Crystals:** Classification of Defects; Point Defects; Dislocations Screw and Edge Dislocations; Diffusion in Metals; Plane Defects; Crystal Grains and Grain Boundaries; Energy of Grain Boundaries; Color Centers.

3. **Crystal Bindings:** Crystals of Inert Gas; Ionic Crystals; Binding Energy and Bulk Modulus; Covalent; Metallic and Hydrogen Bonded Crystals.

4. **Dynamics of Crystal Lattice:** Elastic Vibration of a Continuous Medium; Concept of Phonon; One-dimensional Monatomic and Diatomic Lattices; Theories of Lattice Specific Heat - Einstein Model and Debye Model.

5. **Free Electron Theory of Metals:** Classical and Quantum Pictures of Free Electron Theory; Energy Levels, Effect of Temperatures on F-D Distribution, Fermi Sphere, Density of states in One, Two, and Three-dimensions.

Books Recommended:

Kittel, C	Introduction to Solid State Physics
Ashcroft and Mermin	Solid State Physics
Omar, MA	Elementary Solid-State Physics
McKelvey, JP	Solid State and Semiconductor Physics
Azaroff, LV and Brophy, JJ	Electronic Processes in Materials
Dekker, AJ	Solid State Physics
Singhal, RL	Solid State Physics
Wahab, MA	Solid State Physics