

## BS (4 Years) for Affiliated Colleges



Code	Subject Title	Cr. Hrs	Semester
<b>PHY-439</b>	<b>SOLID STATE PHYSICS-III</b>	<b>3</b>	<b>VIII</b>
Year	Discipline		
<b>4</b>	<b>Physics</b>		

### Course Outlines:

Phonons: Classical, Einstein and Debye models for specific heat, Hamiltonian of the electron-phonon interaction, renormalization of the effective electron mass, screening of the electron-phonon interaction, ionic crystals, the polaron.

Optical Properties: Macroscopic description and microscopic model, microscopic theory of frequency-dependent dielectric constants, optical properties of semi-conductors, quantization of electromagnetic field, interaction of conduction electrons.

Transport Phenomenon: Semiclassical model of for conduction of metals, Boltzmann equation, relaxation time, conductivity equation.

Solids in External Magnetic Fields: Free electron approximation in magnetic field, Landau diamagnetism in free electrons, spin Hamiltonian, the Hubbard model, Pauli paramagnetism of conduction electrons, De Haas van Alphen effect, the quantum Hall effect.

### **Books Recommended:**

1. *Solid State Physics* by Ashcroft & Mermin, (1976).
2. *Introduction to Solid State Physics*, 7<sup>th</sup> Edition, by C. Kittel, (1996).
3. *Elementary Solid State Physics* by M. A. Omar, (1975).
4. *Quantum Theory of the Solid State* by J. Callaway, (1991).
5. *Principles of the Theory of Solids* by J. M. Ziman, (1969).