

**Fourth year of Five Years integrated M.Sc (Physics)  
M.Sc. - IV, Semester –VIII**

**L T P C**  
**3 2 0 5**

**MP 402 : Condensed Matter Physics-II**

- **Overview** (05 Hours)  
Crystal physics, Lattice vibration and thermal properties, Electronic properties, Dielectrics, Magnetism.
- **Phase Transitions** (08 Hours)  
Review of critical phenomena through percolation. Phase transition in soft matter. Equilibrium phase diagrams, Kinetics of phase separation, Growth processes, Liquid-Solid transition, freezing and melting
- **Liquid Crystals** (08 Hours)  
Types of liquid crystals, Characterization and identification of liquid crystal phases, Orientational order, elastic properties, Phase transition in liquid crystals, Applications. Granular Materials through sandpile model and self-organized criticality.
- **Colloids** (08 Hours)  
Types of Colloids, Characterization of Colloids, Charge and steric Stabilization, Kinetic properties, Forms of colloids: Sols, Gels, Clays, Foams, Emulsions, Electrorheological and Magneto-rheological fluids.
- **Magnetism** (07 Hours)  
Review of magnetism, Circular and helical order. Consequences of broken symmetry, phase transition, Landau's theory, rigidity, excitation, magnons, domains and domain walls, magnetic hysteresis, pinning effects. Magneto resistance, giant magneto resistance, NMR, technological aspects of magnetic materials.
- **Introduction to Nanoscience** (07 Hours)  
The nanoscale dimension and paradigm, Definitions, history and current Practice, Overview of current industry applications, Nanoscale science and engineering principles.

**(Total Contact Time (Theory) : 42 Hours)**

**BOOKS RECOMMENDED :**

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|---------------------------|--|------------------------|------|
| 1. <b>C. Kittel,</b>      | <i>Quantum Theory of Solids,</i>                 | John Wiley,            | 1987 |
| 2. <b>R. A. L. Jones,</b> | <i>Soft Condensed Matter</i>                     | Oxford                 | 2002 |
| 3. <b>S. Blundell,</b>    | <i>Magnetism in Condensed Matter,</i>            | Oxford                 | 2001 |
| 4. <b>M. Tinkham,</b>     | <i>Introduction to Superconductivity</i>         | McGraw-Hill, New York, | 1996 |
| 5. <b>P. W. Anderson</b>  | <i>Basic Notions of Condensed Matter Physics</i> | Addison Wesley         | 1997 |