

(4 Lect./Week)  
(4 hrs. Lab/Week)  
(1 Student's presentation /Week)

(Total Credits -7)

### **Paper 802: Polymeric Nanomaterials**

1. Introduction to general aspects of nanostructured materials, e.g. nanocomposites, block copolymers, interaction parameter.
2. Phase behaviour morphology and phase diagrams, microphase separation transition.
3. Preparation, structure and properties of nanoreinforcing agents: eg. nanoclays, POSS, carbon nanostructures and nanoparticles.
4. Effect of factors such as loading, dispersion and percolation, influence of size, shape and diameter of nanotubes, fictionalization of nanoparticles and nanoplatelets.
5. Structural and morphological characterization
  - Morphology of crystalline polymers.
  - Nanostructure development in semicrystalline polymer during deformation by X-ray scattering & diffraction technique.
  - Nanostructure of two component amorphous block copolymers: Effect of chain architecture.
6. Polymer nanocomposites: Technical challenges and understanding of interfacial dynamics using LJ Potential and many body problems approach.
7. Applications of polymeric nanomaterials.

### **Practical - Polymer VIII:**

1. Particle size analysis of nanofillers.
2. Preparation of polymer nanocomposites by solution & melt compounding.
3. Determination of mechanical properties of nanocomposites.
4. Characterization of nanocomposites.
5. Determination of electrical properties of nanocomposites.

### **Suggested Readings:**

1. Polymer Nanocomposites by J.H. Koo, McGraw-Hill (2010).
2. Polymeric Nanocomposites-Theory and Practice by S. N. Bhattacharya, Hanser Gardner (2008).
3. Mechanical Properties of Polymer based on Nanostructure and Morphology by G. H. Michler and F. J. Balta, CRC Press (2005).
4. Introduction to Nanotechnology by- C. Papoose, F. J. Owens, Wiley, John & Sons (2003).
5. Nanocrystalline Materials by S.C. Tjong, Elsevier Science (2006).