

NSE-941**Nanocomposite Materials****Credit Hours: 3****Prerequisites: Nil****Course Objectives:**

- To provide an understanding on properties of metal, metal oxide, polymeric/organic nanomaterials as fillers
- To provide fundamental concepts related to different matrix materials for composites.
- To provide understanding on various synthetic techniques used in the preparation of nanocomposites
- To provide understanding on state of the art applications of nanocomposites

Course Contents:

- Physical, chemical, mechanical and electrical properties of nanofillers (ceramic and metallic nanofillers) specifically graphene, CNTs, nanoclays, nanoferrites, nanowires, nanofibers etc.
- Physical Characteristics and mechanical properties of polymeric matrices: thermoplastic matrices, thermosetting matrices, elastomeric matrices
- Synthesis techniques for the preparation of synthetic polymers: Addition polymerization, condensation polymerization, emulsion polymerization etc.
- Preparation techniques of nanocomposites: In-situ polymerization method, solution casting method, melt method using twin screw extruder etc.
- Characterization of nanocomposites: Thermal, mechanical, electrical and barrier properties of nanocomposites
- Structure and morphology of nanocomposites: intercalated and exfoliated morphologies
- Size effects and its interfacial effect on the properties of nanocomposites
- Natural polymers-their blends and nanocomposites

Course Outcomes:

The students will get an in depth understanding on nan-sized metal and ceramic particles together with synthetic and natural polymers. This knowledge will help students to prepare themselves for upcoming challenges in the area of nanocomposites.

Recommended Books:

- Polymer nanocomposites and their applications, Suprakas Sinha Ray and Mosto Bousmina, American Scientific Publishers, 2006, ISBN: 158883-099-3
- Polymer Nanocomposites: Processing, Characterization and Applications, Joseph H. Koo, McGraw-Hill, 2006, ISBN: 9780071458214

- Metal-polymer nanocomposites, Luigi Nicolais and Gianfranco Carotenuto, John Wiley & Sons, Inc. 2005.
- Advances in Natural Polymers: Composites and Nanocomposites, P. M Visakh, Aji P. Mathew, Sabu Thomas (auth.), Sabu Thomas, P. M. Visakh, Aji. P. Mathew (eds.), Springer Berlin Heidelberg, 2013.