

**Production & Processing of Polymer Nano-Composites**  
**Graduate credit (1.5/3) course in Polymer Engineering (Nanotechnology) curriculum**  
**Amirkabir University of Technology**

**Chapter 1: The basic of polymer nanocomposite** (Introducing nanocomposites, A brief on preparation, structure, modification and properties of different kinds of nanoparticles including nano calcium carbonate, nano zinc oxide, silica, aluminum oxide, graphite, nanotube, graphene, fullerene, diamond –nano silicate layers and...).

**Chapter 2: Morphology and microstructure of polymer nanocomposites** (The structure of different kinds of polymeric nanocomposites, thermodynamic and rheological parameters affecting microstructure, introducing characterization methods (XRD, SEM, AFM, TEM, DSC, FTIR, XPS, EDAX, Rheological...)).

**Chapter 3: Methods of Preparation of Polymer Nanocomposites** (Different preparation methods and their applications including in situ polymerization, solution, latex, sol-gel and melt methods).

**Chapter 4: Melt Mixing of Nanocomposites** (Basic concepts and mechanisms of mixing, mixing evaluation (statistical, theoretical and experimental), parameters affecting mixing (flow kind, orientation, process condition, residence time distribution and...), mixing machines and their applications (internal mixer, two roll mill, single screw and twin screw extruders)).

**Chapter 5: Processing of Elastomeric Compounds and Nanocomposites** (Micro and nano scale fillers and reinforces, mixing methods and their mechanisms, mixing control and evaluation methods, elastomer forming methods, vulcanization of elastomeric nanocomposites, in-process tests (viscometer, rheometer, ODR, MDR, RPA), nanocomposite of elastomeric blends and compatibilization, thermoplastic elastomers and their nanocomposites (TPE and TPV).

1. S. N. Bhattacharya, M. R. Kamal, R. K. Gupta “Polymeric Nanocomposites, Theory and Practice” Carl Hanser Verlag, Munich 2008.
2. S. Pavlidou, C.D. Papaspyri “A review on polymer–layered silicate nanocomposites” Progress in Polymer Science 33 (2008) 1119–1198.
3. S. Thomas “Progress in Rubber Nanocomposites” Elsevier, 2016.
4. Z. Tadmor, C. G. Gogos “Principles of Polymer Processing” John Wiley & Sons, 2013.
5. J. L. White “Rubber Processing: Technology, Materials, Principles” Hanser Publishers, 1995.