



GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3722419
Semester – II
Subject Name: Nanocomposites

Type of course: Program Elective IV

Prerequisite:

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Introduction: Importance and emergence of nanotechnology, challenges, current and future research. Size dependence of properties, crystal structure, energy bands, insulators, semiconductors and conductors, gaps of semiconductors, Fermi surfaces, localized particles.	10
2	Preparation of Nanocomposites: Polymer Nanocomposites, Nanocomposites Preparation and Synthesis, Polymer Matrices : Thermoplastics, Thermosets, Elastomers, Natural and Biodegradable Polymers	10
3	Rheology of Nanocomposites: Rheology of Multiphase Systems, Rheology of Polymer / clay Nano composites, Recent studies on Rheology, Measure Techniques, Steady shear Rheology, Dynamic Rheology, Non Linear Viscoelastic properties, Extensional Rheology, Rheological modeling of Nanocomposites.	10
4	Processing of Nanocomposites: Extrusion, Injection Moulding, Blow Moulding, Foaming, Rotational Moulding	10
5	Structure and Properties Characterization: Scattering Techniques, Microscopic Techniques, Spectroscopic Techniques, Spectroscopic Techniques, Chromatography, Solid-state characterization: Mechanical Testing, Thermal Characterization	10
6	Application of Polymer Nanocomposites : Thermoplastics, Thermosets, Biodegradable Polymers	4



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Reference Books:

1. Luigi Nicolis & Gianfranco Carotenuto “Metal -Polymers Nanocompsites” A John Wiley & Sons, Inc Publication 2005
2. Y.C. Ke & P. Stroeve “ Polymer-Layered Silicate and Silica Nanocomposites- Elsevier, 2005
3. L.A. Utracki “ Clay-Containing Polymeric Nanocomposites” Rapra Technology Limited, 2004
4. Robert K, Ian H, Mark G, Nanoscale Science and Technology, John Wiley & sons Ltd.,2005
5. Edward I Wolf. - Weinheim, Nanophysics and Nanotechnology: An Introduction to
6. Modern Concepts in Nanoscience, c2004, Wiley
7. S. N. Sahu, R. K. Choudhury, and P. Jena, Nano-scale Materials: From Science to Technology, Nova Science Publishers, 2006.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify the Importance of Nanotechnology and its emergence	15
CO-2	Understand the preparation and synthesis of nanocomposites	15
CO-3	Understand the Rheology of nanocomposites.	10
CO-4	Describe various processing methods of nanocomposites	25
CO-5	Understand various characterization methods for characterization of nanocomposites.	15
CO-6	Apply the knowledge of various processing and characterization techniques for making nanocomposites for end use applications	20

List of Experiments:

As per the above subject topics

Major Equipment:

List of Open Source Software/learning website:

1. https://en.wikipedia.org/wiki/Polymer_nanocomposite
2. <https://www.hindawi.com/journals/jnm/polymeric.nanocomposites/>



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