

Year & Sem:	Course Code: ME3607	Course Name: Nano Technology	No. of Credits: 4	L	T&PS	P
				2	2	0

UNIT I: BASICS AND SCALE OF NANOTECHNOLOGY Introduction – Scientific revolutions –Time and length scale in structures – Definition of a nanosystem –Dimensionality and size dependent phenomena – Surface to volume ratio -Fraction of surface atoms – Surface energy and surface stress- surface defects-Properties at nanoscale (optical, mechanical, electronic,and magnetic).

UNIT II :

DIFFERENT CLASSES OF NANOMATERIALS Classification based on dimensionality- Quantum Dots,Wells and Wires- Carbon- based nano materials (buckyballs, nanotubes, graphene)– Metalbased nano materials (nanogold, nanosilver and metal oxides) - Nanocomposites- Nanopolymers – Nanoglasses –Nano ceramics -Biological nanomaterials.

UNIT III: SYNTHESIS OF NANOMATERIALS Chemical Methods: Metal Nanocrystals by Reduction - Solvothermal Synthesis- Photochemical Synthesis - Sonochemical Routes- Chemical Vapor Deposition (CVD) – Metal Oxide - Chemical Vapor Deposition (MOCVD).Physical Methods:Ball Milling – Electrodeposition - Spray Pyrolysis - Flame Pyrolysis - DC/RF Magnetron Sputtering - Molecular Beam Epitaxy (MBE).

UNIT IV: FABRICATION AND CHARACTERIZATION OF NANOSTRUCTURES Nanofabrication: Photolithography and its limitation-Electron-beam lithography (EBL)- Nanoimprint – Softlithography patterning. Characterization:Field Emission Scanning Electron Microscopy (FESEM) – Environmental Scanning Electron Microscopy (ESEM) High Resolution Transmission Electron Microscope (HRTEM) –Scanning Tunneling Microscope (STM)-Surface enhanced Raman spectroscopy (SERS)- X-ray Photoelectron Spectroscopy (XPS) - Auger electron spectroscopy (AES) – Rutherford backscattering spectroscopy (RBS).

UNIT V: APPLICATIONS Solar energy conversion and catalysis - Molecular electronics and printed electronics -Nanoelectronics -Polymers with aspecial architecture - Liquid crystalline systems - Linear and nonlinear optical and electro-optical properties, Applicationsin displays and other devices -Nanomaterials for data storage - Photonics, Plasmonics- Chemical and biosensors -Nanomedicine and Nanobiotechnology – Nanotoxicology challenges.

References/Text Books:

1. Pradeep T., “A Textbook of Nanoscience and Nanotechnology”, Tata McGraw Hill Education Pvt. Ltd., 2012.
2. Hari Singh Nalwa, “Nanostructured Materials and Nanotechnology”, Academic Press, 2002.
3. Nabok A., “Organic and Inorganic Nanostructures”, Artech House, 2005.
4. Dupas C., Houdy P., Lahmani M., “Nanoscience: Nanotechnologies and Nanophysics”, Springer-Verlag Berlin Heidelberg, 2007.

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.