2012-13

PVP SIDDHARTHA INSTITUTE OF TECHNOLOGY

(COURSE STRUCUTRE FOR AUTONOMOUS SCHEME)

I Year M. Tech. (Machine Design) M.E.	**T**	**P**	**C**
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MEMD2T5D - NANO TECHNOLOGY

(Elective-III)

Unit-I

Introduction to nanotechnology, Essence of Nanotechnology, Nano in daily life, Brief account of nano applications, Properties of nano materials, Metal nano clusters, Semiconductor nano particles. Main engineering activities of design, manufacture and testing in a nanotechnology context.

Unit-II

Top-down and bottom-up nanofabrication The Intel-IBM approach to nanotechnology: lithography, etching, ion implantation, thin film deposition, Electron beam lithography, Soft lithography: nano imprinting and micro contact printing, Solution/plasma-phase nanofabrication, sol-gel methods, template techniques.

Unit-III

Self assembly and self-organization Functional coatings with self assembled monolayers of molecules and nanoparticles Langmuir-Blodgett films, layer-by-layer growth.

Unit-IV

Imaging/characterization of nanostructures General considerations for imaging, Scanning probe techniques: SEM, STM, AFM, NSOM.

Unit-V

Metal and semiconductor nano particles Synthesis, stability, control of size, Optical and electronic properties, Ultra-sensitive imaging and detection with nanoparticles, bioengineering applications, Catalysis.

Unit-VI

Semiconductor and metal nanowires Vapor/liquid/solid growth and other synthesis techniques,,Nanowire transistors and sensors.

Unit-VII

Carbon nanotubes Structure and synthesis, Electronic, Vibrational, and mechanical properties, How can C nanotubes enable faster computers? Brighter TV screens and stronger mechanical reinforcement.

Unit-VIII

Mechanics at nanoscale Enhancement of mechanical properties with decreasing size, Nano electromechanical systems, nanomachines, Nanofluidics, filtration, sorting, Molecular motors.

Text Books:

1. Nanoscale Science and Technology by Kelsall, Hamley, and Geoghegan, Wiley (2005)
2. Introduction to Nanoscale Science and Technology by Di Ventra, Evoy, and Heflin, Kluwer Academic Publishers (2004).

References:

1. Introduction to Nanotechnology by Poole and Owens, Wiley (2003).
2. Nanochemistry: A Chemical Approach to Nanomaterials, Ozin and Arsenault, RSC Publishing