

## **Core theory course (Interdisciplinary)**

### **CPH-503: NANO TECHNOLOGY**

#### **UNIT-I**

**INTRODUCTION:** Pre- Nanotechnology, Origins of Concepts of Nano, Advances in Experimental Methods, Nanotechnology-Basics and Basis, Size of Nano, The Meaning of Nanotechnology, Four Generations of Nanotechnology Development, Technology of General Applicability, Multi-purpose Technology, Applications of Nanotechnology.

**NANOCHEMISTRY:** Introduction, Basic Concepts, Classification of Nanomaterials, Techniques of Production or Methodology, Size Concerns.

**Fullerenes:** Introduction, History of Discovery, Variations, Properties of Fullerenes.

**Nanoparticles:** Introduction, History, Properties of Nanoparticles, Classification, Characterization,, Production of Nanoparticles,Morphology of Nanoparticles, Safety Issues.

#### **UNIT-II**

**Carbon Nanotube:** Introduction, Discovery, Description, 'TYPES of Carbon Nanotubes and Related Structures,Single-walled Nanotubes, Multi-walled Nanotubes, Introduction, Structure, Research, Self-assembled Monolayers, Applications.

**NANOPHYSICS:** Quantum Dot, Description, Quantum Confinement in Semiconductors, Optical Properties, Fabrication, Mass Production, Applications, Computing Field ,Biology, Cellular Imaging, Quantum Dots for Thmour Thrgeting, Toxicity, Photovoltaic Devices, Light-emitting Devices, Quantum Wire, Carbon Nanotubes as Quantum Wires, Quantum Well, Fabrication, Applications, Quantum Point Contact, Fabrication, Properties, Applications.Nanocrystals,Nanocrystal solar cell.

#### **UNIT-III**

**NANOMEDICINE AND NANOBIOLGY:** Introduction, Basic concepts and applications, Drug Delivery, Cancer Diagnosis and Therapy, Surgery, Invivo Therapy, Neuro-electronic Interfaces, Cell Repair Machines, Nanobiotechnological Devices: Nanoparticles , Dendrimers , Nanorobots, Nubot , Nanoshell , Other Applications of Nanobiotechnology

**Biosensors :** Definition , Principles of Detection , Optical (Photometric) Biosensor , Electrochemical Biosensor , Others , Applications , Nanobiosensors , Nanonose ,Types of Nanosensors , Applications of Nanobiosensors Nanobiosensors and Cancer , Point-of-Care Testing , Nano- DNA Technology , Tile-based Arrays , Applications.

Building Blocks of DNA , DNA Sensors , DNA Field-effect Transistor , Optical Biosensors , Nanosized Optical Biosensors, Nanopathology-, Interactions.

#### **UNIT-IV**

##### **INSTRUMENTS AND METHODOLOGY**

Introduction, Next Generation of Nanotechnological Techniques, Modern Developments, Techniques of Nanolithography, Scanning Probe Microscope, Types of Scanning Probe Microscopy, Advantages, Disadvantages

Atomic Force Microscope, Description, Parameters Measured by AFM, Image modes, Force Spectroscopy, Identification of individual surface atoms, Advantages, Disadvantages, Scanning Tunnelling Microscope( Introduction).

##### **ENVIRONMENTAL AND SOCIAL ISSUES**

Dangers of Molecular Manufacturing, Sudden and Unexpected Risks, Basis of Economic Disruption, Potential Economic Impact, Over-Pricing and Poverty, Terrorism, Solutions and Regulations. Environmental Damages, Regulation, Environmental and Social Issues, Pollution Prevention, Areas of Pollution Prevention, Water and Waste Water Treatment,Water Conservation, Water Purification, Water Management, \, Health Risks and Environmental Issues, Society Related Problems, Positive Aspects of Nano, Negative Aspects of Nano., Action Plan for Prevention of Disasters by Nano, Implications of Nano in the Society.

##### **References:**

- (1) Nanotechnology by S.Shanmugam, MJP Publishers
- (2) Nanobiotechnology by Subbiah Balaji, MJP Publishers
- (3)Nanoscience and Technology by V S Muralidharan, A subramania, Ane Books Pvt Ltd