Title of the Course: Introduction to Nanoscience and Technology

Code: SC431

Credit structure: 3-0-0-3

Instructor: Anil Roy

Course Description
This course would be focused on current widespread interest in Nanoscale science, technology, materials, manufacturing techniques, nanodevices and nanoproducts. Nanoscale science and technology are, in general, the study of structures that have the size of at least one dimension less than of 100 nm. In this scale new properties and behaviour come up which are not normally observed in our macro-world. This happens because particles which are smaller than the characteristic lengths associated with particular phenomena often display new chemistry and physics, leading to new behaviour which depends on size. This course would investigate how physical, chemical, mechanical, biological properties change drastically when particles become smaller than a critical size. We would try to understand how bottom-up approach generates nanocrystals, how on nanoscale some particles initiate a process of self-assembly. Carbon nanostructure would be covered in detail for its huge potential of application. Few salient methods/tools for manufacturing at nanoscale would be discussed. Single atom transistor would be covered and discussed during the course.

Course Pre-requisite
No prerequisite

Course Content
Introduction to Nanoworld: The Fundamental Science of Electrons, Atoms, Molecules and Biosystems, Does Size Matter?, Synthesis of Nanoparticles by Chemical and Physical Methods, Control and Stability (Size, Shape, Morphology, Composition), Surface phenomena – Forces between particles and surfaces.

How to see a nanostructure?: Scanning Probe Microscopy, Transmission Electron Microscopy, Scanning Electron Microscopy, Molecular Beam Epitaxy

How to fabricate a nanostructure?: CMOS Technology, Nanolithography, Self Assembly and catalysis

Glimpses of Nano-world through possible applications, Carbon Nanostructures