In.M.Sc. Applied Physics, 5 years

10^{TH} SEMESTER

FPYC-1002: NANO SCIENCE AND TECHNOLOGY

Mark-100

Properties of individual Nanoparticles:

Magic numbers, Theoretical modeling of nanoparticles, Geometric structure, Electronic structures, relativity, fluctuations, magic clusters, Bulk to nanostriction

Semiconducting Nanoparticles:

Optical properties, photofragmentation, Coulombic explosion.

Carbon nanostructures

Carbon molecules:Nature of the carbon Bond, New carbon structures

Small Carbon Clusters, Discovery of C_{60}, Structure of C_{60} and its crystal, Alkali doped C_{60},Larger and Smaller Fullerenes, Other Bucky balls,

Carbon Nanotubes

Fabrication, Structure, Electricalproperties, Vibrationalproperties, Mechanical properties

Applications of carbon nanotubes: Field emission and shielding, computers, Fuel cells, Chemical Sensors, Catalysis, Mechanical Renforcement.

Bulk Nanostructured materials:

Solid Disordered Nanostructures: Methods of synthesis, Failure mechanism of Conventional Grain-Sized Materials, Mechanical properties, Nanostructured Multilayers, Electrical properties, Other properties, Metal Nanocluster Composite Glasses, Porous Silicon

Nanostructured Crystals: Natural Nanocrystals, Computational Prediction of Cluster Lattices, Arrays of nanoparticles in Zeolites, Crystals of Metal Nanoparticles, Nanoparticle Lattices in Colloidal suspensions, Photonic Crystals

Nanostructured Ferromagnetism: Basics of ferromagnetism, Effect of bulk Nanostructuring of magnetic properties, Dynamics ofnanomagnets, Nanopore Containment of magnetic properties, Nanocarbonferromagnets, Giant and colossal Magneto resistance, Ferro fluids

Optical and vibrational spectroscopy:

Infrared frequency range: Spectroscopy of semiconductors; Excitons,Infrared surface spectroscopy, Raman spectroscopy, Brillouin spectroscopy,

Luminescence: Photoluminescence, Surface states, thermo luminescence nanostructures in Zeolite Cages**.**

Quantum wells , Wires and Dots : Preparation of quantum nanostructures , size and Dimensionallyeffects: Size effects, Conduction electron and dimensionality, Fermi gas and density of states, potentialwells, partial confinement Properties dependent on Density of states, Excitons, Single electron tunneling, Applications: infrared detectors, Quantum Dot Lasers, Superconductivity.

References:

Introduction to Nanotechnology: Charles P. Poole, Jr. ,Frank J. Owens