

Introduction to Nanotechnology

B.E. Sem. VIII [MECH/AUTO]

(Elective – II)

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Basic Solid State Physics-Crystal structures, size dependence of properties, semiconductors, energy bands, excitons.
2. Measurement of properties-particle size, TEM, SEM, STM, AFM, Spectroscopy and magnetic resonance Properties of individual nanoparticles – Metal nanocrystals, magic numbers and theoretical modeling, geometric structure, semiconducting nanoparticles, carbon nanoparticles.
3. Synthesis and characterization Bulk nanocrystals- synthesis methods thin film deposition, multilayers, magnetic nanoparticles, spin valve, giant and colossal magnetoresistance, ferrofluids Quantum wells, wires and dots –
4. Carbon nanostructures, carbon molecules, carbon clusters, carbon nanotubes: Fabrication, structure, Electrical properties, vibration properties, Mechanical properties. Application of carbon Nanotubes; Field emission and shielding, Computers, Fuel cells, Chemical sensors, Catalysis, Mechanical Reinforcement.
5. Organic compounds and polymers-forming and characterization, size effects, supramolecules, micelles Biological materials –biological building blocks, DNA double nanowire, genetic code, biological nanostructures (proteins, miscelles and vescilles), multilayer films,
6. MEMS, NEMS – design, fabrication and applications. (Nanostereolithography, Plasma CVD), coating of nanoparticles.

Reference Books :

1. Introduction to Nanotechnology (*Charles P Poole Jr. and Frank J Owens*) Wiley
2. Nanostructured Materials & Nanotechnology Concise Edition (*Hari Singh Nalwa*) (Editor) Academic.
3. Handbook of Nanoscience, Engineering, and Technology (*William A Goddard, Donald W Brenner, Sergey Edward Lyshevski, Goddard III*) CRC Press.
4. Introduction to Semiconductor Optics (*Peyghambrain., S.W. Koch and A. Mysyrowicz*) Prentice Hall.
5. Optical Properties of Semiconductor Nanocrystals (*S.V. Gaponenko*) Cambridge Univeristy Press.
6. Advanced magnetic nanostructures (*David Sellmyer and R Skomski Ed.*) Springer.
7. Advanced Polymeric Materials (*Gabriel O Shonaike, Suresh G Advani*) CRC Press.
8. Nano: The essentials Understanding Nanoscience and Nanotechnology (*T. Pradeep*) Tata McGraw Hill.
9. Nanotechnology (*Lynn Foster*) Pearson Education

