

Semester

5th Semester	RPP5D004	Nano Science & Bio Technology	L-T-P 3-0-0	3 Credits
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Module -1 (6 Hours)

Fundamental and process of fabrication

The world of small dimensions, Nanoscale Properties (Electrical, Optical, Chemical, Mechanical), Nanoscale visualization techniques, Electron microscopy (TEM, SEM, Cryo-SEM), Scanning probe microscopy (AFM, STM), Diffraction techniques (XRD, synchrotron), Top-down and Bottom-Up approach, nanoparticles (synthesis, properties and applications).

Module-2 (12 Hours)

Nano-Device and Components:

Structure of carbon nanotube, Classification and physical properties of CNT, Graphene: structure, synthesis and properties, Nanophotonics (Photonic crystal in one, two and three dimensions), Quantum dot, quantum wire, Nanofluidics: nanopores and Nano capillaries, Debye length, Nanomechanics (elastic, thermal and kinetic material properties).

Module-3 (10 Hours)

Quantum Electronics:

Coulomb blockade in nano capacitors and quantum dot circuits. Single Electron Transistor (SET), Quantum information and computing, Spintronics devices and its classifications, Structural and optical properties of nanomaterials, Molecular Electronics, NEMS, Optical and Magnetic computer.

Module -4 (10 Hours)

Bio-Device and application

Bio-nanostructures (nanofibers, nanotubes, nanocellulose), Biological nanomachines Ribosomes, Photosynthesis systems, Near-field Bioimaging, Nanoparticles for optical diagnostics and Targeted Therapy, Protein nanotechnology, DNA nanotechnology, Nano robot and its application, Nanocapsule, Nanosomes, Medibots, Artificial pancreas, Artificial Muscle, Nanoclinic for Gene delivery and photodynamic therapy Nanoparticle in cancer, Bionanomotors.

Additional module (Terminal Examination-Internal) (05 hr)

Nanotechnology safety and the environment, Impact of nanotechnology on society and industry, Biosensors (fabrication, functionalization, applications), Current research on nanotechnology.

Books:

1. Rishal Singh, S.M. GiJpta, Introduction to nanotechnology Oxford university press, (2016).
2. Paras N. Prasad, Nanophotonics, John Wiley & Sons, (2016).
3. C. M. Nieiiieyer, C. A. Mirkin, —Nanobiotechnology: Concepts, Applications and

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- Perspectives, Wiley — VCH,(2004).
4. 4T.Pradeep,—Nano:TheEssentials,McGraw— I-Iilleducation,(2007).
 5. Challa, S.S.R. Kumar, .JosefHormes, CarolaLeuschaer, Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and Impact, Wiley — VCH, (2005).
 6. Nicholas A. Kotov, —Nano particlc Assemblies and Superstructures, CIRC,(2006).
 7. David S Goodscil, “Bionanotechnology. John Wiley & Sons, (2004).