

P2PNBC06 - NANOPOLYMERS IN MEDICINE**Module I (10 hours)**

Bionanotechnology today: Basic capabilities, Functional principles of Bionanotechnology: Information driven nano-assembly, Energetics, Chemical transformation, Regulation, Biomaterials, Biomolecular motors, Traffic across membranes, Biomolecular sensing, Self replication, Machine-Phase bionanotechnology.

Module II (10 hours)

Nanomedicine, Molecular design using biological selection, Harnessing molecular motors, Artificial life, Hybrid materials, Biosensors. Structural principles of Bionanotechnology: The raw materials; biomolecular structure and stability, Protein folding, Self assembly, Self-organization, Molecular recognition, Flexibility

Module III (12 hours)

Biomaterial based metallic nanowires, networks and circuitry: DNA as functional template for nanocircuitry; Protein based nanocircuitry; Neurons for network formation. DNA based nanomechanical devices. Biosensor and Biochips. Drug Delivery, Therapeutic action of nanoparticles and nanodevices- Targeted, non-targeted delivery; controlled drug release; exploiting novel delivery routes using nanoparticles; gene therapy using nanoparticles;

Module IV (12 hours)

Nanostructures for use as antibiotics, diseased tissue destruction using nanoparticles; diagnostics using nanomaterial, nanoparticles for bioanalytical applications - nanodevices for sensing and therapy. Use of nanoparticles for MRI, X Ray, Ultrasonography, Gamma ray imaging. Nanoparticles as molecular labels; biological labeling using quantum dots as molecular labels; Tissue Engineering.

Text Books

1. Nanotechnology Understanding Small Systems, Rogers Pennathur Adams, CRC Press, Taylor & Francis Group.
2. Gonsalves; Kenneth E., Halberstadt; Craig R., Laurencin; Cato T. And Nair; Lakshmi S.(Eds.), Biomedical Nanostructures, Wiley-Interscience, Hoboken (2008).
3. Chu; Paul K. and Liu; Xuanyong (Eds.), Biomaterials Fabrication and Processing Handbook, CRC Press, Boca Raton (2008)
4. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari Singh Nalwa

Reference Books

1. Bionanotechnology: Lessons from Nature by David S. Goodsell
2. Nanocomposite Science & Technology Ajayan, Schadler& Braun
3. BioMEMS (Microsystems) - Gerald A. Urban
4. Nanosystems: Molecular Machinery, Manufacturing, &Computation - K. Eric Drexler
5. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
6. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
7. Dendrimers I, II, III, Ed. F. Vogtle
8. Tissue Engineering-Bernhard O. Palsson , Sangeeta N. Bhatia
9. Principles of Tissue Engineering - Robert Lanza, Robert Langer, & Joseph P