
IV Year B.Tech. Biotechnology I - Semester	L	T	P	To	C
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BT 411 NANO BIOTECHNOLOGY (ELECTIVE-III)**Course Description & Objectives:**

This course combines physical laws, chemical procedures and biological principles on the nano-scale and enrich the students with important applications in a range of fields like medical diagnosis, drug delivery, detection of bio-macromolecules in complicated biochemical systems etc.

Course Outcomes:

1. This course will give a general description about Nanomaterials based on their dimensionality.
2. It gives the information about importance of reduction in materials dimensionality, and its relationship with materials properties.
3. This course will give a general description about Nanomaterials based on their dimensionality.
4. Imparts an understanding of approaches for Nanomaterial fabrication & Nanotechnology tools.
5. Imparts an understanding of approaches for Nanomaterial fabrication & Nanotechnology tools.
6. Gives an insight into the use of Nanotechnology in biomedical, microelectronics and optical applications.

Unit I : Introduction:

Scope and Overview, Length scales , Importance of Nanoscale and Technology, History of Nanotechnology, Future of Nanotechnology: Nano Technology Revolution, Silicon based Technology, Benefits and challenges in Molecular manufacturing: The Molecular assembler concepts.

Unit II : Nano Particles :

Introduction, Types of Nanoparticles. Techniques to Synthesize Nanoparticles, Characterization of Nanoparticles, Applications, Toxic

effects of Nanomaterials, Significance of Nanoparticles Nanofabrications- MEMS/NEMS, Atomic Force Microscopy, Self assembled monolayers/ Dip-pen Nanolithography, Soft Lithography, PDMS Molding, Nano wires and Nanotubes.

Unit III : Applications - I :

Nanobiosensor and Nanofluids. Nanocrystals in biological detection, Electrochemical DNA sensors and Integrated Nanoliter systems. Nano-Biodevices and Systems. Fabrication of Novel Biomaterials through molecular self assembly- Small scale systems for *in vivo* drug delivery- Future nanomachine.

Unit IV : Applications- II :

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Applications in cancer biology. Nanomedicine. Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules. Nanosurgical devices.

Unit V : Ethical Issues in Nanotechnology :

Introduction, Socioeconomic Challenges, Ethical Issues in Nanotechnology: With special Reference to Nanomedicine, Nanomedicine Applied in Nonmedical Contexts. Nanotechnology and Future Socio-economic Challenges.

TEXT BOOKS:

1. Christof M. Niemeyer, Chad A. Mirkin - Nanobiotechnology: Concepts, Applications and Perspectives. 1st Ed. Wiley-VCH, 2006.
2. Jian-Qin Liu, Katsunori Shimohara - Biomolecular Computation by Nanobiotechnology, 1st Ed., Artech House, 2007.

REFERENCE BOOKS:

1. Ralph S. Greco - Nanoscale Technology in Biological Systems. 1st Ed. CRC Press. 2005.
2. Hari Singh Nalwa - Handbook of Nanostructural Biomaterials and Their Applications in Nanobiotechnology. 1st Ed. American Scientific Publishers, 2005.

