# BT-VIII B : Nano-biotechnology

**Marks :75 Hours : 45**

**Objective:**

To know the use of Biotechnology at nanoscale and learn the various methods for the development of nanoparticles and IPR

# Outcome:

Students will understand the use of Nano-biotechnology in various areas like agriculture, medicine, cosmetics and environment. They will learn the rights of Intellectual properties

# Unit I: Nano-Biotechnology

Introduction, The nanoscale dimension and paradigm. Types of nanomaterials and their classifications. D, 2D and 3D etc. Nanocrystal, Nanoparticle, Quantum dot, Quantum Wire and Quantum Well etc. Polymer, Carbon, Inorganic, Organic and Biomaterials – Structures and characteristics. Physical and Chemical Fundamentals of Nanomaterial

# Unit II: Nano-Biotechnology Applications

Proteins - Lipids - RNA and DNA Protein Targeting - Small molecule/Nanomaterial – Protein Interactions Nanomaterial-Cell interactions-Manifestations of Surface Modification (Polyvalency) MRI, Imaging Surface Modified Nanoparticles MEMS/NEMS based on Nanomaterials.

# Unit III :Biological Nanoparticles

Lipid Nanoparticles for Drug Delivery. Peptide/DNA Coupled Nanoparticles. Inorganic Nanoparticles for Drug Delivery Metal/Metal Oxide Nanoparticles (antibacterial/anti fungal/anti viral) Anisotropic and Magnetic Particles (Hyperthermia)

# Unit-IV

Applications of Nanotechnology/ Nano-biotechnology in various areas like agriculture, medicine, cosmetics and environment. Intellectual Property Rights:- Concept of IPR, Patents, Trademarks, Copyrights, Secrets. Patenting of biological materials.

# Text & References

1. Madhuri Sheron, Sunil Pande- Bio-Nano technology concept and applications Ane Books New Delhi
2. Mark Ratner, Daniel Ratner-Nanotechnology-Pearson
3. Ramsden-Nanotechnology- an Introduction-Elsevier
4. Ed. Vincent Rotello – Nanoparticles- Springer
5. C. M. Niemeyer- Nano-biotechnology, C.A. Mirkin, Wiley VCH, 2004
6. T. Pradeep, ―Nano: The Essentialsǁ, McGraw – Hill education, (2007).
7. P. Boisseau, P. Houdy and M. Lahmani - Nanoscience: Nano-biotechnology and Nano- biology, Springer, 2007.
8. S. M. Lindsay - Introduction to nanoscience, OXFORD publication
9. Anke Krueger- Carbon materials and nanotechnology –Wiley- VCH publication
10. S. K. Kulkarni- Nanotechnology- (3rd Edition)
11. M.H. Fulekar- Nanotechnology: Importance and Applications, IK International 2010.

# Practical

1. Demonstration of techniques for isolation and synthesis of nanoparticles
2. Isolation and detection of nano particles from plant extract (silver nano particles)
3. To study antibacterial/antifungal activity of nanomaterial
4. Extraction and estimation of protein
5. Isolation of DNA from Bacteria/Plant/Animal material.
6. Spectrophotometric analysis (UV/IR) of nano particles
7. Study of IPR, Patent applications process in concern with nano materials derived from living system