# MANGALORE UNIVERSITY

## DEPARTMENT OF BIOCHEMISTRY

### MSc in Biochemistry

## SOFTCORE BCS 505: NANOTECHNOLOGY

**Total number of lecture hours:42** **Total number of credits: 03**

**Course objectives:**

- To understand the basic concept of nanotechnology.
- To synthesize nanoparticles and know their applications.
- To study the applications of nanotechnology in food industries.
- To learn its use in agriculture, farming.
- Use of nano-fertilizers too.

**Course outcome:**

- Student gets to know the biological nanoparticles.
- Synthesis of nanoparticles using bacteria, fungi, plants and soon.
- Student learns about biosensors, nanotechnology and its applications.
- Nanotechnology in Food packaging, agriculture, farming,
- Potential of nano-fertilizers.

**Unit I** **14 hrs.**

**Biological nanoparticles and their applications:** Introduction to biological nanoparticles and their applications: Exosomes, lipoproteins, ferritin, magnetite viruses. Biological nanomotors and machines, mechanisms of biological machines, protein assemblies: muscle myosin, kinesin, nerve, ATPase, bacteriorhodopsin, haemoglobin dynein, cilia. Bacterial flagella: structure and function; nanomotor. Ion channels: nanopores of high specificity. Bioinspired nanomaterials: DNA and peptide based. Interaction between biomolecules and nanoparticle surfaces.

**Unit II** **14 hrs.**

**Biological synthesis**:

Biological synthesis of nanoparticles using bacteria, fungi, plants, purified enzymes and biological templates, Slayer. Silver nanoparticles, gold nanoparticles, cerium oxide nanoparticles, titanium oxide and zinc oxide nanoparticles. Application of inorganic nanoparticles.

**Unit III** **14 hrs.**

**Biosensorand nanobiosensor:** Biosensor and nanobiosensor basic concepts, characterization, perception, Enzyme–metal NP hybrids for bio-sensing and for the generation of nanostructures, Biomolecule–semiconductor NPs for biosensing, Different types of nanobiosensors; Nanobiosensors for medical diagnostics. Nanoprobes for analytical applications. **Nanotechnology and its application in food industry:** Nanotechnology and food packaging, natural biopolymers, advantages of nanomaterials in food packaging applications, nanosensors, outstanding issues, risks and regulations, public perception. Nanotechnology in Agriculture, Precision farming, Smart delivery system, Insecticides using nanotechnology, Potential of nanofertilizers.

**REFERENCES:**


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2. Jeremy Ramsden, Essentials ofnanotechnology
3. RammohanDevulapally and Ramasamy Paulmurugan Polymer nanoparticles for drugand small silencing RNA delivery to treat cancers of different phenotypes WIREs NanomedNanobiotechnol2014, 6:40–60. doi: 10.1002/wnan.
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5. Nanotechnology: Technology Revolution of 21st Century by Rakesh Rathi, published byS.Chand.
6. Introduction to Nanoscience, by StuartLindsay.
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8. Nanomaterials by A.K. Bandyopadhyay; New Age InternationalPublishers.
9. Nanotechnology by Mark Ratner and Daniel Ratner, PearsonEducation.
10. Nano Essentials,T.Pradeep/TMH
11. Bharat Bhusan, “Springer Handbook of Nanotechnology”, springer, Newyork,2007.
12. Hari Singh Nalwa, “Encyclopedia of Nanotechnology”, USA2011.
13. James A. Schwarz, Cristian I. Contescu, Karol Putyera, “Dekkerencyclopedia”.