

Course Title: Nano-biology

Semester: VII

Course Code: CH-461

Credit Hours: 3-0

Pre-requisite: Nil

1. Course Objectives. This course aims to provide students an advanced level understanding of nanochemistry in terms of various properties of nanomaterials to be used in biology and medicine. The students will also learn the applications of nanomaterials in diagnostics, theranostics and biomedical science.

2. Course Outcomes. On successful completion of the course the student will have sound knowledge of the classification, properties and applications of nano-biomaterials. In particular, targeted drug delivery and medicinal aspects of nanochemistry are areas where the students would be able to converse with the prevalent challenges in nano-medicine.

3. Course Outline

a. Nanochemistry:

- (1) An overview of fundamental concepts of Nanochemistry
- (2) Nano-biology
- (3) Featured nanomaterials with applications in nano-biology
- (4) Interaction between biomolecules and nanoparticle surfaces.
- (5) Surface Nano-engineering
- (6) Origin of structural DNA nanotechnology. DNA-protein interactions.
- (7) Experimental techniques to characterize DNA nanostructures including AFM; SEM; TEM; single molecule and bulk fluorescence; gel electrophoresis
- (8) Targeted drug-delivery.
- (9) Magnetic nanoparticles and their applications in diagnostics/theranostics.
- (10) Inorganic metal oxide nanoparticles and medical therapeutics.
- (11) Challenges in Nano-medicines/Ethical aspects.
- (12) Future Perspectives: Nanobiology.

4. Text / Reference Books

- a. Ludovico Cademartiri, Geoffrey Ozin, Concepts of Nanochemistry ,Wiley, 2009.
- b. T. Pradeep, et al., A Textbook of Nanoscience and Nanotechnology ,Tata McGraw Hill Ltd (2012).
- c. Handouts