

<b>LS 539A Nanobioscience 2 Credits</b> Name of the Faculty : Dr. Karunakar Kar*		
S.No.	Topic	Faculty Name/ Contact Hours
<b>Introduction to Nanoscience</b>		
1.	Introduction to Nanoscale, History of nanotechnology, and nanoscience in nature, Discussion on CNTs, MWCNT, Quantum dots	KK/2
2.	Molecular based study of condensed matter; low-dimensional materials	KK/2
3.	Properties of nanomaterials: size, surface charge, conductivity, optical properties and biocompatibility. Spectroscopy of nanomaterials (FTIR, UV-Vis, Raman, Fluorescence)	KK/3
<b>Synthesis and characterization of nanomaterials</b>		
4.	Fabrication of nanostructures, Top down and bottom up approaches, their relative merits, metallic nanoparticles, semi-conductor, and biopolymeric nanostructures, and Magnetic nanoparticles.	KK/2
5.	Methods of characterization: TEM, SEM. EDAX, DLS, XRD	KK/3
6.	Stability of nanoparticle dispersions, Surface functionalization of nanoparticles by various methods.	KK/2
7.	Rationally engineered Nanostructures and nanomaterials based on proteins, peptides, carbohydrates, and nucleic acids	KK/3
<b>Biological application of Nanotechnology</b>		
8.	Strategies to design biologically active nanostructure-based biomaterials. Interaction of nanoparticles with biomolecules, determination of binding constants, effects on secondary structure	KK/3
9.	Cell uptake, cytotoxicity of nanomaterials, size, shape and dose dependence effects.	KK/3
10.	Biomaterials, immobilized enzymes and. Size dependent enzymatic kinetics, drug loading and release kinetics, Drug delivery systems	KK/3
11.	Nanomaterials as Biosensors, Cellular imaging tools, tissue scaffolds, 3D tissue culture	KK/3

**Further Reading:**

- Poole, C.P., Owens, F.J. Introduction to Nanotechnology Wiley,2012
- Cao, G. Wang, Y. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications World Scientific,
- Bohidar, H.B and Rawat, K: Design of Nanostructures: Self-Assembly of Nanomaterials,Wiley- VCH,2017
- Pradeep, T. Nano: The Essentials: Understanding Nanoscience and Nanotechnology: McGraw-Hill Education
- Cox, M.M, Nelson, D.L., Lehninger Principles of Biochemistry, W.H. Freeman & Co, 2009.
- Voet, D., Voet, J.G., Pratt, C.W., Fundamentals of Biochemistry: Life at the Molecular Level, Wiley, 2012
- Selected Review Papers/Book Chapters