Course Name: **NANOBIOSCIENCE**
(Karunakar Kar)
credit = 2; Number of Lectures = 29

Course contents	**No of Lectures**
Introduction to Nanoscience	
Introduction to Nanoscale, History of nanotechnology, and nanoscience in nature, Discussion on CNTs, MWCNT, Quantum dots	**2**
Molecular based study of condensed matter; low-dimensional materials	**2**
Properties of nanomaterials: size, surface charge, conductivity, optical properties and biocompatibility. Spectroscopy of nanomaterials (FTIR, UV-Vis, Raman, Fluorescence)	**3**
Synthesis and characterization of nanomaterials	
Fabrication of nanostructures, Top down and bottom up approaches, their relative merits, metallic nanoparticles, semi-conductor, and biopolymeric nanostructures, and Magnetic nanoparticles.	***2***
Methods of characterization: TEM, SEM. EDAX, DLS, XRD	**3**
Stability of nanoparticle dispersions, Surface functionalization of nanoparticles by various methods.	**2**
Rationally engineered Nanostructures and nanomaterials based on proteins, peptides, carbohydrates, and nucleic acids	**3**
Biological application of Nanotechnology	
Strategies to design biologically active nanostructure-based biomaterials. Interaction of nanoparticles with biomolecules, determination of binding constants, effects on secondary structure	***3***
Cell uptake, cytotoxicity of nanomaterials, size, shape and dose dependence effects.	**3**
Biomaterials, immobilized enzymes and. Size dependent enzymatic kinetics, drug loading and release kinetics, Drug delivery systems	**3**
Nanomaterials as Biosensors, Cellular imaging tools, tissue scaffolds, 3D tissue culture	**3**
Recommended Textbooks, reference books: (1) Poole, C.P., Owens, F.J. *Introduction to Nanotechnology* Wiley,2012 (2) Cao, G. Wang, *Y. Nanostructures and Nanomaterials: Synthesis, Properties, and Applications* WorldScientific, (3) Bohidar, H.B and Rawat, K: Design of Nanostructures: Self-Assembly of Nanomaterials,Wiley-VCH,2017 (4) Pradeep, T. Nano: The Essentials: Understanding Nanoscience and Nanotechnology: Mc-Graw-HillEducation (5) Cox, M.M, Nelson, D.L., *Lehninger Principles of Biochemistry,* W.H. Freeman & Co, 2009. (6) Voet, D., Voet, J.G., Pratt, C.W., *Fundamentals of Biochemistry: Life at the Molecular Level,* Wiley,2012 (7) Selected Review Papers/Book Chapters	