

Name of the Programme: M.Sc. Biotechnology

Course Code: GBT-527

Title of the Course: NANOTECHNOLOGY

Number of Credits: 2

Effective from AY: 2022-23

Pre-requisites for the Course:	None	
Course Objectives:	1) To provide a general and broad introduction to the multi-disciplinary field of nanotechnology. 2) To study the application of nanotechnology	
Content:	<p style="text-align: center;"><u>MODULE I</u></p> <ul style="list-style-type: none">• Introduction, concepts, historical perspective;• Different formats of nanomaterials and applications with examples for specific cases; Cellular Nanostructures; Nanopores; Biomolecular motors; Bio-inspired Nanostructures, Synthesis, and characterization of different nanomaterials.• Thin films; Colloidal nanostructures; Self-assembly, Nanovesicles; Nanospheres; Nanocapsules and their characterization.• Nanoparticles for drug delivery, concepts, optimization of nanoparticle properties for suitability of administration through various routes of delivery, advantages.• Strategies for cellular internalization and long circulation, strategies for enhanced permeation through various anatomical barriers.	No. of hours 15
	<p style="text-align: center;"><u>MODULE II</u></p> <ul style="list-style-type: none">• Nanoparticles for diagnostics and imaging (theranostics); concepts of smart stimuli-responsive nanoparticles, implications in cancer therapy,	15

	<p>nanodevices for biosensor development.</p> <ul style="list-style-type: none"> • Nanomaterials for catalysis, development, and characterization of nanobiocatalysts • Application of nano scaffolds in synthesis, applications of nanobiocatalysis in the production of drugs and drug intermediates. • Introduction to Safety of nanomaterials, Basics of nanotoxicity, Models and assays for Nanotoxicity assessment • Fate of nanomaterials in different strata of the environment; Ecotoxicity models and assays; Life cycle assessment, containment. 	
Pedagogy:	Lectures/ video tutorials/assignment.	
References/ Readings:	<ol style="list-style-type: none"> 1. K. Chittaranjan, D. S. Kumar, M. V. Khodakovskaya, Plant Nanotechnology Principles and Practices. Springer, 2016. 2. J. GeroDecher, B. Schlenoff., Multilayer Thin Films: Sequential Assembly of Nanocomposite Materials, Wiley-VCH Verlag, 2003. 3. D. S. Goodsell, Bionanotechnology: Lessons from Nature, Wiley-Liss, 2004. 2. T. H. Grey, Bioconjugate Techniques, Elsevier, 2013. 3. M. Kuno, Introductory Nanoscience, Physical and Chemical Concepts. Garland Science, 2012. 4. N.H. Malsch, Biomedical Nanotechnology, CRC Press, 2005. 5. J.J. Ramsden, Nanotechnology: An Introduction. Elsevier Amsterdam,. 2012. 6. S. Sanmugam, Nanotechnology. MJP publisher, 2011. 	
Course Outcomes:	<ol style="list-style-type: none"> 1. Students will be able to describe the basic science behind the properties of materials at a nanometre scale. 2. Students will be able to use and apply knowledge gained to synthesize nanoparticles 3. Students will be able to analyse the properties of nanoparticles and decide on its application 4. Students will be able to understand the life cycle nanoparticles and their impact on environment. 	