

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Program	Bachelor of Technology				Branch/Spec.	Biotechnology			
Semester	VII				Version	1.0.0.0			
Effective from Academic Year		2025-26			Effective for the batch Admitted in		July 2022		
Course code	2BT7103		Course Name		Nanobiotechnology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	1	-	4	Theory	40	60	100
Hours	3	-	2	-	5	Practical	30	20	50
Pre-requisites									
Basic knowledge of Chemistry, Physics, Cell biology, Biochemistry.									
Course Outcomes									
On successful completion of the course, the students will be able to:									
CO1	Understand the evolution of Nanotechnology and Identify different properties and types of nano materials								
CO2	Study the various fabrications methods used for synthesis of nano materials.								
CO3	Understand the Utilization of nanotechnology on biosystems and biomolecules								
CO4	Understand and Develop appropriate technique for diagnostics and therapeutics applications of various nano biomaterials.								
CO5	Identify and evaluate the toxicity effects of nano biomaterials used for various industrial and biotechnological applications.								
CO6	Apply nanotechnology concepts for Design of nano biomaterials for various biological applications.								
Theory Syllabus									
Unit	Content								Hrs.
1	INTRODUCTION TO NANOTECHNOLOGY: History of nanotechnology, generations of nanotechnology, different formats of nanomaterials, Surface and Bulk Properties of Bio materials – Nanobiomaterials – NanoCeramics – Nanopolymers – Nano Silica – Hydroxy apatite – Carbon Based nanomaterials, Surface modification – Textured and Porous Materials								9
2	FABRICATION OF NANOMATERIALS: Synthesis of nanomaterials by physical – physical vapour deposition(PVD), Arc discharge, sputtering techniques, pulse laser deposition (PLD), chemical – reduction, sol-gel, solvothermal synthesis, photochemical synthesis, electrochemical synthesis and biological methods, self-assembly and lithography,								9
3	NANO BIOMATERIALS: Biomimetic nanotechnology, protein-based nanostructures, Nano motors, bacterial (E. coli) and mammalian (Myosin family), DNA nanotechnology, nanostructures in cells study, microarray platforms, Nano printing of DNA, RNA, and proteins biochips applications in nano scale detection, lab-on-a-chip devices (LOC), tissue engineering								9
4	NANOMATERIALS IN DIAGNOSTICS, DRUG DELIVERY AND THERAPEUTICS: Self-assembly of nanoparticles - Modified Nanoparticles - Peptide/DNA /Lipid Nanoparticles For Drug Delivery. Metal/Metal Oxide Nanoparticles for biological activity (antibacterial/anti-fungal/anti-viral/ anticancer), imaging and hyperthermia using nanomaterials								9
5	TOXICITY EVALUATION OF NANOMATERIALS: Basics of nanotoxicity, Mechanisms of nanomaterial toxicity: oxidative stress, ecotoxicity, genotoxicity, hemolytic toxicity, mutagenicity and immunotoxicity. Evaluation of genotoxicity, cytotoxicity of nanoparticles using invitro and invivo systems. Nanoparticles disposal methods and risk management.								9
Practical Content									
Practicals are based on the above syllabus.									

Text Books	
1	Nanobiotechnology: concepts, applications and perspectives by Niemeyer CM and Mirkin CA. Pub.: Wiley-VCH.
2	Nanobiotechnology by Balaji S. Pub.: MJP Publishers.
Reference Books	
1	Bionanotechnology: Lessons from Nature by David S. Goodsell. Pub.: Wiley-Liss.
2	Bio-Nanotechnology: A Revolution in Food, Biomedical and Health Sciences by Debasis Bagchi, Manashi Bagchi, Hiroyoshi Moriyama, Fereidoon Shahidi. Pub.:Wiley-Blackwell.
ICT/MOOCs Reference	
1	https://nptel.ac.in/courses/118102003
2	https://archive.nptel.ac.in/courses/113/106/113106093/

Mapping of CO with PO and PSO:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	1	2	3	1	0	0	0	2	3	3	1
CO2	3	2	3	2	1	2	2	1	0	0	0	2	3	2	1
CO3	3	3	3	3	2	2	3	1	0	0	0	1	3	2	2
CO4	3	3	2	2	2	2	3	1	1	0	0	2	3	3	2
CO5	3	3	3	2	3	2	3	1	1	0	0	2	3	3	3
CO6	3	3	3	2	3	2	3	1	1	0	1	2	3	3	3