

NANOBIOTECHNOLOGY AND APPLICATIONS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/Week	Total Hours/Semester	Hrs/Week	Total Hours/Semester		
III		Elective-III	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To understand the overview nanobiotechnology
- To understand the role of nanotechnology in biology
- To learn the different methodology for nanoparticles synthesis
- To learn the various instruments for characterization of nanoparticles
- To understand the impact of nanoparticles on the environment.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the outline of nanobiotechnology.	K2
CO2	To learn about the role of nanotechnology in biology .	K1
CO3	To learn about the various methodologies for synthesis of nanomaterials.	K1
CO4	To acquire knowledge on the working principle of different instruments for nanomaterials characterization.	K3&K4
CO5	To understand the impacts of nanoparticles on human health and environment	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	M	S	S	M	S
CO3	S	M	S	M	S
CO4	M	S	M	S	M
CO5	S	M	M	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT -I**9 Hours****INTRODUCTION TO NANOTECHNOLOGY**

Introduction - Importance of nanoscience and nanotechnology in biomedical applications. Interaction between biomolecules and nanoparticles. Applications of nanotechnology in biotechnology, killing cancer cells, providing oxygen and artificial mitochondria. Nano biosensors.

UNIT -II**9 Hours****NANOMATERIALS FOR BIOLOGY**

Carbon based nanomaterials - carbon nanotubes for biomedical applications, SWCNT and MWCNT. Magnetic nanoparticles - Quantum dots - Quantum dot biomolecular tags. Conjugation of quantum dots with biomolecules. Si nanowires. Nano biomaterials: Biocompatibility; Antibacterial activity; DNA and Peptide based nanomaterials; Polymer nanostructures.

UNIT -III**9 Hours****SYNTHESIS OF NANOPARTICLES**

Top-Down approach, Bottom-Up approach, PVD, CVD, Micro emulsion method, Sol-gel processing. Biological synthesis of nanoparticles - Use of bacteria, fungi, Actinomycetes for nanoparticle synthesis, Role of plants in nanoparticle synthesis.

UNIT- IV**9 Hours****CHARACTERIZATION OF NANOBIMATERIALS**

Basic principles, operations and applications of UV-Visible spectroscopy, FI-IR spectroscopy, SEM, TEM, Fluorescence spectroscopy, Fluorescent resonance energy transfer (FRET), AFM of DNA, STM of DNA and Co focal microscopy.

UNIT- V**9 Hours****ENVIRONMENTAL NANOTECHNOLOGY**

Nanotoxicology, Environmental and Health impacts of nanomaterials, Waste remediation, Nanoporous polymers and their application in water purification, Energy conversion. Photocatalytic fluid purification, Current status of nanobiotechnology, Future perspectives of nanobiology and safety measures of nanomaterials.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	A.K. Bandyopadhyay	Nanomaterials	New Age International Publishers	2007
2.	Challa Kumar	Tissue, cell and organ engineering	Wiley-VCH, Verlag	2006
3.	C.N.R. Rao, A. Muller, A.K. Chutham	The Chemistry of Nanoparticles	Wiley-VCH, Verlag	2006
4.	Robert A. Freitas	Nanomedicine, Vol. IIA	Landes Bioscience, Georgetown.	2003
5.	Hari Singh Nalwa	Handbook of Nanostructure Biomaterials and Their Applications in Nanobiotechnology	American Scientific Publishers	2006
6.	Bharat Bhusha	Handbook of Nanotechnology	Springer	2007
7.	Dr. Christof M. Niemeyer Dr. Chad A. Mirkin	Nanobiotechnology : Concepts, Applications and Perspectives	Elsevier publication	2004
8.	<u>C. Shad Thaxton</u> <u>Chad A. Mirkin</u> <u>Dr. Christof M. Niemeyer</u>	DNA–Gold-Nanoparticle Conjugates	Elsevier publication	2004

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	C.M.Niemeyer, C.A. Mirkin	Nanobiotechnology	WILEY-VCH Verlag GmbH & Co. KG Weinheim.	2004
2.	Pulickel M. Ajayan, Linda S. Schadler, Paul V. Braun	Nanocomposite Science & Technology	WILEY-VCH Verlag GmbH & Co. KG A, Weinheim	2004
3.	C. P. Poole and F. J. Owens	Introduction to Nanotechnology	Wiley	2006
4.	M. Ratner and D. Ratner	Nanotechnology: A Gentle Introduction to the Next Big Idea	Prentice Hall.	2002

5.	L. E. Foster	Nanotechnology – Science, Innovation, and Opportunity	Pearson Education.	2006
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WEB SOURCES:

www.livescience.com

www.sciencemag.com

www.treehugger.com

www.nature.com

TEACHING METHODOLOGY

- Class room teaching
- Assignments ,Seminars and Models
- Group Discussions
- Home test
- PPT Presentations
- Board and chalk
- Demonstration from the Video slides, Animated videos and interactive software.

SYLLABUS DESIGNERS

- Dr D.Sasikala, Assistant Professor & HOD
- Dr.V.Kiruthiga, Assistant Professor
- Dr V.Rekha, Assistant Professor
- DrA.Vinodhini, Assistant Professor
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- Dr. S. Vijayakumari, Assistant Professor