

Course Code	Course Title	L	T	P	C
1152BT110	NANOBIOTECHNOLOGY AND ITS APPLICATION.	3	0	0	3

Course Category: Program Elective

a. Preamble: To study the advancement of Nanobiotechnology and its application in medical field.

b. Prerequisite Courses: None

c. Related Courses: None

d. Course Outcomes: Upon the successful completion of the course, students will be able to gain basic knowledge about nanoscience involved in Nanobiotechnology

CO Nos.	Course Outcome	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Students will able to understand Nanotechnology-Nanobiotechnology and gain knowledge about synthesis approaches for nanomaterials.	K2
CO2	To know about characterization techniques used in nanotechnology	K2
CO3	To learn the applications of proteins, lipids and nucleic acids nanotechnology.	K2
CO4	To know about the applications of nanotechnology	K2
CO5	To know about nano technology involved in drug delivery system and Tissue Engineering	K2

e. Course Content:

UNIT –I:

A Brief History and development of Nanotechnology, Definition of nanotechnology, Nano*bi*otechnology v/s Bionanotechnology, Bottom-Up versus Top-Down approaches; Methods of synthesis of nanoparticles or fabrication, Surface property relationship.

UNIT –II:

Types of Nanomaterials, Characterization techniques by SEM, TEM, Atomic force microscopy Dynamic light scattering (DLS), XRD. Surface Plasmon resonance (SPR), Raman shift, FTIR.

UNIT - III:

Bionanotechnology: Lipid Bilayers, liposomes, neosomes Polysaccharides, Peptides, Nucleic acids, DNA scaffolds, Enzymes, Biomolecular motors: linear, rotary motors, Immunotoxins, Membrane transporters and pumps; *S*-layer proteins: structure, chemistry and assembly; engineered Nanopores.

UNIT –IV:

Clinical applications of nanodevices. Artificial neurons. Real-time nanosensors- Synthetic retinyl chips based on bacteriorhodopsins. High throughput DNA sequencing with nanocarbon tubules, Nanoparticles for Bioanalytical Applications; Applications in cancer biology.

UNIT-V:

Fundamentals of Drug Nanoparticles: Delivery of Nanoparticles: Brain Delivery, Ocular Drug Delivery, Gene Delivery Systems and Carriers in Cancer Therapy; Natural polymers in tissue engineering applications, Degradable polymers for tissue engineering, Controlled release strategies in tissue engineering and Nanotoxicology.

TEXT BOOKS

1. David S Goodsell, “Bionanotechnology”, John Wiley & Sons, 2004.
2. Christof M. Niemeyer, Chad A. Mirkin - Nanobiotechnology: Concepts, Applications and Perspectives. 1st Ed. Wiley-VCH, 2006.
3. Introduction to Nanotechnology, Charles P. Poole Jr. and Frank J. Owens, A Wiley-Interscience publication, India, 2003.

REFERENCES

1. Microbial bionanotechnology: Biological Self-Assembly Systems and Biopolymer-Based Nanostructures ed: Bernd Rehm, Taylor and Francis, 2006
2. Applications of nanoparticles in biology & medicine O.V. Salata, Journal of nanobiotechnology (2004)
3. Nanoparticulates Drug Carriers, Edited by VLADIMIR P TORCHILIN, 2006, Imperial College Press, 57 Shelton Street, Covent Garden, London WC2H 9HE, ISBN 1- 86094-630-5
4. Tissue Engineering, Clemens van Blitterswijk, Peter Thomsen, Anders Lindahl, Jeffrey Hubbell, David Williams, Ranieri Cancedda, Joost de Bruijn, Jérôme Sohler, Academic Press, Elsevier, 84 Theobald’s Road, London WC1X 8RR, UK, 30 Corporate Drive, Suite 400, Burlington, MA 01803, USA, 525 B Street, Suite 1900, San Diego, CA 92101-4495, USA, 2008 ISBN: 978-0-12-370869-4.