



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160409

Semester – VI

Nanobiotechnology

Type of course: Material Science, Chemistry, Biotechnology and Nanotechnology

Prerequisite: Fundamental of Chemistry, Synthesis of Nano materials, Physics of Nano materials

Rationale: The purpose of this course is to provide a review of timely concepts in the rapidly emerging field of Nano medicine. It reviews how Nano medicine is redefining clinical research in areas such as diagnostic imaging agents and drug delivery.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs.	% Weight
1	INTRODUCTION 1.2 Historical Background 1.3 First-Generation Biomaterials (1950s–1960s) 1.3.1 General Characteristics 1.3.2 Naturally Occurring Biomaterials 1.3.3 Metals and Alloys 1.3.3.1 Pure Metals 1.3.3.2 Alloys 1.3.3.3 Shape-Memory Alloys (SMAs) 1.3.4 Ceramics 1.3.5 Polymers 1.3.6 Composites 1.4 Second-Generation Biomaterials (1970s–2000) 1.4.1 General Characteristics 1.4.2 Biodegradable Polymers 1.4.3 Hydrogels 1.4.4 Bioactive and Biodegradable Ceramics 1.5 Third-Generation Biomaterials (2000–Present) 1.5.1 Biomaterials in Tissue Engineering 1.5.2 Micro/Nanotechnology and Biomaterials 1.5.2.1 Microfabrication and Microtechnology 1.5.2.2 Nanofabrication and Nanotechnology	10	20%
2	NANO MEDICINE 2.1 Introduction 2.2 Basics of Nanobiotechnology in Relation to Nanomedicine	10	20%



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160409

	2.3 Relation of Nanobiotechnology to Nanomedicine 2.4 Landmarks in the Evolution of Nanomedicine 2.5 Classification of Nanobiotechnologies 2.6 Micro- and Nanoelectromechanical Systems 2.7 BioMEMS 2.8 Microarrays and Nanoarrays 2.9 Protein Nanoarrays 2.10 Microfluidics and Nano fluidics 2.11 Nanotechnology on a Chip		
3	MAGNETIC NANOPARTICLES AS DRUGCARRIERS 3.1 Introduction 3.2 Definitions 3.3 Properties of magnetic materials in the vicinity of Nano medicine 3.4 Nanoparticles 3.5 Magnetic Nanoparticles 3.6 Iron oxide based magnetic nanoparticles 3.7 Cobalt based magnetic nanoparticles 3.8 Iron based magnetic particles 3.9 Encapsulated magnetic nanoparticles 3.10 Biocompatibility issue soft magnetic nanoparticles	10	20%
4	APPLICATION OF MAGNETIC NANOPARTICLES AS DRUG CARRIERS 4.1 Magnetic hyperthermia 4.2 Magnetic chemotherapy 4.3 Other magnetic treatment approaches 4.4 Magnetic gene transfer	10	20%
5	NANOPARTICLE-BASED DRUG DELIVERY 5.1 Gold Nanoparticles as Drug Carriers 5.2 Calcium Phosphate Nanoparticles 5.3 Ceramic Nanoparticles 5.4 Nanocrystalline Silver 5.5 NanoCrystal Technology 5.6 Nanoparticles Bound Together in Spherical Shapes 5.7 Encapsulating Water-Insoluble Drugs in Nanoparticles 5.8 Trojan Nanoparticles	8	20%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
Remembrance R Level	Understanding U Level	Application A Level	Analyze N Level	Evaluate E Level
30	35	35	-	-



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3160409

Legends: R: Remembrance; U: Understanding; A: Application and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

TEXT BOOKS AND REFERENCES

EDITOR

1. The Handbook of Nanomedicine Kewal K. Jain MD ISBN: 978-1-60327-318-3 e-ISBN: 978-1-60327-319-0 Library of Congress Control Number: 2007940762 ,2008 Humana Press, a part of Springer Science+Business Media, LLC.
2. Nano Particulates As Drugcarriers , Vladimir torchilin ,NortheasternUniversity,USA ,ImperialCollegePress (WorldScientificPublishingCo.Pte.Ltd.)
3. Nanoparticle Technology for Drug Delivery edited by Ram B. Gupta Auburn University,Auburn, Alabama Uday B. Kompella University of Nebraska Medical Center Omaha, Nebraska New York London, Published in 2006 byTaylor & Francis Group
4. Nanoscale Technology in Biological Systems, Edited by Ralph S. Greco, Fritz B. Prinz ,R. Lane Smith,CRC PRESS,Boca Raton London New York Washington, D.C. Copyright © 2005 by Taylor & Francis

Course Outcome:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Comprehend the principles behind nanomedicine	25%
CO-2	Describe broad understanding of concepts and applications of nanomedicine	25%
CO-3	Describe the concepts of Nano medicine to a focused clinical area of their choice	25%
CO-4	Impart the knowledge to apply these nano drug delivery systems for the diagnosis and therapy	25%

List of Open Source Software/learning website:

<https://en.wikipedia.org/wiki/Nanomedicine>

<http://www.nanotechproject.org/inventories/medicine/>

<http://www.nanomedjournal.com/>