GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code : 3152112
Semester – V
Subject Name: Nano Materials

Type of course: Engineering/science

Prerequisite: Basic fundamentals of introduction to materials engineering

Rationale: This course is designed to recognize the differences between nonmaterial and conventional materials and to become familiar with a wide range of nonmaterial, their synthesis, characterization, properties and applications

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Tutorial Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	1	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	History of nano-materials	**02**
2	Discussion of the Feynman talk “There is plenty of room at the bottom”	**02**
3	Synthesis routes for nano and ultra fine grained materials: bottom up and top down approaches	**06**
4	Specific synthesis routes such as vapor deposition, sol-gel, rapid solidification processing, high energy ball milling, cryo rolling, and equal channel angular extrusion	**04**
5	Mechanical property aspects of nanomaterials, inverse Hall-Petch relationship	**04**
6	Specific nanomaterials and their applications such as: Carbon nanostructures (Nanotubes, nanohorns, graphene, buckyballs etc) Semiconducting nanomaterials – Quantum confinement, Quantum wells, quantum wires and quantum dots. Magnetic nanomaterials – super paramagnetism , Ferroelectric, nano ceramics), Superplasticity Nanocomposites.	**10**

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35%	**35%**	**30%**	**0%**	**0%**	**0%**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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.

Reference Books:

1. Introduction to Nanomaterials, Charles Poole and Frank Owens, Wiley 2007
2. Understanding Nanomaterials, Malkiat S. Johal, CRC Press; 1 edition (April 28, 2011)
3. Nanoparticles - Nanocomposites – Nanomaterials: An Introduction for Beginners 1st Edition Dieter Vollath (Author), Wiley-VCH; 1 edition (October 14, 2013)

Course Outcomes

After completing this course, students will able to,

Sr. No.	CO statement	Marks % weightage
CO-1	Indicate the differences between nanomaterials and conventional materials	10
CO-2	Indicate how specific synthesis techniques can result in nanomaterials	55
CO-3	Give examples of specific nanomaterials and explain the scientific reasons for the properties displayed by them	35

List of Tutorials:

As per the content of units.

List of Open Source Software/learning website:

I. http://nptel.iitm.ac.in/
II. www.ocw.mit.edu