GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3730810
Semester – III
Subject Name: Micro and Nano Manufacturing System

Type of course: Program Elective V

Prerequisite: Nil

Rationale:
Subject is designed to understand the principles of various micro and Nano manufacturing methods. This subject aims for the student to acquire knowledge of the fundamentals of micro and nano-products and of the manufacturing of such products and knowledge of micro and Nano-materials processing methods and techniques.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Contents	Total Hrs
1	**Scope of Nano Technology:** Nano technology Concepts and Applications, Micro- and Nanofabrication, Nano technology in India, Scope for Micro-fabrication, Rise Nano technology Fields, Commercialization Issues of Micro-Nano Technology	08
2	**Micro-fabrication:** Mechanical Micromachining, Physical Fabrication Methods, Lithography, Processing Setup, Nano Lithography & Manipulation, Precision Micro- and Nano grinding , Use of Spectrometers & Microscopes	12
3	Laser-Based Micro and Nanofabrication, Pulsed Water Drop Micromachining, Nano Materials, Synthesis of Nano materials, Bio Materials, Nano Composites, Development of Nano Particles	10
4	**Innovative Applications on Present Devices:** Nano chips, Nanotubes and Nanowires, Integration of chips and microprocessors, Technology Support, Meeting Social Needs	08
5	**Nano Design & CAD:** Computer Aided Nano Design, VLSI product detailing Finite Element Analysis of Microstructures, 3-D Molecular Modelling	07
	Total Hours	**45**

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Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**30**	**30**	**10**	**10**

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. Micro fabrication & Nano manufacturing by Mark J. Jackson
2. ASM handbook on machining
3. Springer's Hand book of Nano-technology - Bharat Bhusan (Ed.)
4. Nanotechnology and Nano electronics – WR Fahrner, Springer International Z. Cui, Nanofabrication, Springer, 2008
5. Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, and John J. Moore, Introduction to Nano science and Nanotechnology, CRC Press, Boca Raton, 2009.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Able to apply the knowledge in mechanics, scaling, design, fabrication and characterization of Micro and Nano systems.	50
CO-2	Able to understand innovative application of Nano technology	50

Term Work: Nil

List of Experiments: Nil

Major Equipment: Nil

List of Open Source Software/learning website:

1. The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester.
2. NPTEL