GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Production

Subject Code: ME02000931

Course / Subject Name: Micro-Manufacturing

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Nil
Rationale:	This course provides the knowledge and practice regarding basics of Metal Forming. Students are learning from the metal forming theory and their relationship with material Principles. Students were strengthening their knowledge from the Rolling, Forging, Bending of Sheet, Extrusion like Processes and their analysis.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT level
1	Select the process of micro manufacturing.	U/A
2	Analyse the end product processed through micro manufacturing.	A
3	Inspect the product manufactured by various processes.	U/A
4	Apply nano manufacturing to product processing	A

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	30	20	150

Course Content:

Content	Total No.Hours	% of Weitage
Introduction to micro-manufacturing: definition, need/importance, applications. Size effect.	03	8

Classification of micro-manufacturing processes. Micro-machining processes: molecular dynamics at atomistic scale, diamond micro-machining and grinding, ultrasonic micro- machining, micro-EDM, laser beam micro-machining, micro-ECM, electron beam micro- machining, focused ion-beam techniques, abrasive micro-finishing techniques. Micro-forming techniques: laser micro-bending, micro-deep drawing and micro-extrusion. Micro- welding and joining techniques.	25	50
Micro-fabrication using deposition techniques such as epitaxial, sputtering, chemical vapor deposition (CVD) techniques and Lithography (LIGA) based techniques.	05	13
Sensors and actuators for micro-manufacturing	07	15
Metrology for micro- manufacturing Dimensional Metrology for Micro/Mesoscale Manufacturing	03	8
Introduction to nano-scale manufacturing	02	6
Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**25**	**25**	**20**	**10**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

Textbooks:

[1] V.K. Jain, Micromanufacturing Processes, Taylor and Francis, 2012.
[2] J. McGeough, Micromachining of Engineering Materials, Marcel Dekker,2002.

References:

[1] K. F. Ehmann, Micromanufacturing: International Assessment of Research and Development, Springer, 2007.
[2] P. Raichoudhury, Handbook of Microlithography, Micromachining and Microfabrication, 1997.
[3] V. K. Jain, Introduction to Micromachining, 2nd Ed., Narosa, 2010.
[4] R. W. Johnstone, Introduction to Surface micromachining, Kluwer Academic, 2004..
[5] M. Madou, Fundamentals of microfabrication, CRC Press, 1997.
[6] H. J. Levinson, Principles of lithography, 2nd ed., SPIE Press, 2005.

(b) Open-source software and website:
As per the course content and course outcome.

List of Laboratory/Learning Resources Required: Software Suggested Activities for Students: Any activity based on above syllabus content

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