Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2025

Materials Science and Engineering

VI Semester

ML5009 & MEMS and Microfabrication

(Regulation 2019)

Time:3 hrs | Max. Marks: 100

CO1	Identify suitable materials for MEMS applications.
CO2	Discuss the micro and nanofabrication techniques.
CO3	Explain the method of etching, surface and bulk micro manufacturing methods.
CO4	Describe the MEMS components and Devices.
CO5	Select and Implement MEMS devices for the required application.

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)

(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1	List two properties that make silicon suitable for MEMS devices.	2	1	L2
2	Why are carbon nanotubes significant in NEMS applications?	2	1	L1
3	What is the purpose of a mask in Photolithography?	2	2	L1
4	Name two techniques used for Nanoimprint lithography.	2	2	L2
5	Define LIGA process in micro manufacturing.	2	3	L2
6	List two challenges faced in micro manufacturing process.	2	3	L1
7	Mention one application each of MEMS in automotive and Medical fields..	2	4	L1
8	List the applications of Radio Frequency MEMS.	2	4	L2
9	Brief Nano Measuring Systems.	2	5	L2
10	Write down the steps involved in the design of MEMS by using intellisuite.	2	5	L2

PART- B (5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q. No.	Questions	Marks	CO	BL
11 (a)	Describe the role and applications of polymers in MEMS and NEMS Technologies..	13	1	L2
	OR			
11 (b)	Explain the importance of biocompatible materials in MEMS based biomedical applications with example.	13	1	L2
12 (a)	Discuss various etching process (wet and Dry) used in Micro and Nano fabrication, with examples.	13	2 2	L3 L3
	OR			
12 (b)	Discuss in detail about Electron Beam Lithography with its applications.	13	2	L3

13 (a)	Describe the working principle, advantages, applications and limitations of LIGA process with neat sketch.	**13**	3	L4
	OR			
13 (b)	Discuss the following with neat sketch (i) Deep Reactive ion etching (DRIE) (ii) Chemical Vapor Deposition	**7** **6**	3	L4
14 (a)	With neat sketch explain the working principle, construction, advantages and applications of Micro – opto electromechanical Systems	**13**	4	L4
	OR			
14 (b)	With neat sketches explain the following with its applications. (i)Magnetic Sensors and Actuators (ii)Radio Frequency MEMS.	 **8** **5**	 4 4	 L4 L4
15 (a)	Discuss in detail the flow chart for integrated assembly, packaging and testing for mass production of MEMS.	**13**	5	L4
	OR			
15 (b)	Draw and explain the Confocal LASER scanning microscopy with suitable diagrams.	**13**	5	L4

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16.	Discuss a detailed case study about the applications of MEMS devices in Automobile Industry with suitable diagrams.	15	5	L6