SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous)

Narsapur, West Godavari District, A.P. 534280

DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
20RB7E11	Micro Electro Mechanical Systems	VII	Mechanical Engineering	5	2025-26	09-06-2025

COURSE OUTCOMES

1	Classify various micro electro mechanical system components.[K2]
2	Demonstrate mechanical sensors and actuators.[K2]
3	Describe thermal sensors and actuators.[K2]
4	Describe magnetic sensors and actuators. [K2]
5	Illustrate micro-opto-electro mechanical systems. [K2]

UNIT	Outcomes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
INTRODUCTION						
I	Classify various micro electro mechanical system components. [K2]	1.1	Introduction about Micro Electro Mechanical Systems	T1, T2	1	Chalk & Talk, PPT & Think share Pair
		1.2	MEMS history and development	T1, T2	1	
		1.3	Micro Machining	T1, T2	1	
		1.4	Lithography Principles & Methods	T1, T2	1	
		1.5	Structural and Sacrificial Materials	T1, T2	1	
		1.6	Thin Film Deposition	T1, T2	1	
		1.7	Impurity Doping & Etching	T1, T2	1	
		1.8	Surface Micro machining	T1, T2	1	
		1.9	Wafer Bonding	T1, T2	1	
		1.10	IGA	T1, T2	1	
Total					**10**	

MECHANICAL SENSORS AND ACTUATORS						
II	Demonstrate mechanical sensors and actuators. [K2]	2.1	Principles of sensing and actuation: beam and cantilever	T1, R1	1	Chalk & Talk, & Video
		2.2	Capacitive sensor	T1, R1	1	
		2.3	Piezo electric sensor	T1, R1	1	
		2.4	Strain sensor, pressure & flow sensor	T1, R1	1	
		2.5	Pressure measurement by micro phone	T1, R1	1	
		2.6	MEMS gyroscope	T1, R1	1	
		2.7	Shear mode piezo actuator	T1, R1	1	
		2.8	Gripping piezo actuator	T1, R1	1	
		2.9	Inchworm technology	T1, R1	1	
Total					**09**	
THERMAL SENSORS AND ACTUATORS						
III	Describe thermal sensors and actuators. [K2]	3.1	Heat transfer processes	T1,T3	1	Chalk & Talk, & Video
		3.2	Thermistors & Thermos devices	T1,T3	1	
		3.3	Thermocouple	T1,T3	1	
		3.4	Micro machining	T1,T3	1	
		3.5	Peltier effect heat pumps	T1,T3	1	
		3.6	Thermal flow sensors	T1,T3	1	
		3.7	Micro hot plate gas sensors	T1,T3	1	
		3.8	Shape memory alloys	T1,T3	1	
		3.9	U shaped horizontal and vertical electro thermal sensor	T1,T3	1	
		3.10	Micro spring thermal actuator	T1,T3	1	
		3.11	Data storage cantilever	T1,T3	1	
Total					**11**	
MAGNETIC SENSORS AND ACTUATORS						
		4.1	Magnetic sensing and detection	T1,R1	1	
		4.2	Magneto resesitive sensors	T1,R1	1	
		4.3	Halls effect	T1,R1	1	

IV	Describe magnetic sensors and actuators. [K2]	4.4	Magneto diodes & transistor	T1,R1	1	Chalk & Talk, & Quiz
		4.5	MEMS magnetic sensor	T1,R1	1	
		4.6	Pressure sensor	T1,R1	1	
		4.7	Magnetic MEMS actuator	T1,R1	1	
		4.8	Directional micro actuator	T1,R1	1	
		4.9	Feedback circuit integrated magnetic sensor	T1,R1	1	
Course Beyond Syllabus			Chemical and Biological sensors	T1	1	
Total					**10**	
MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS						
V	Illustrate micro-opto-electro mechanical systems [K2]	5.1	Principle of MOMS technology	T1,T2	1	Chalk & Talk, & Video
		5.2	Properties of light & Light modulators	T1,T2	1	
		5.3	Beam splitter	T1,T2	1	
		5.4	Micro lens & Micro mirrors	T1,T2	1	
		5.5	Digital micro mirror device	T1,T2	1	
		5.6	Light detectors	T1,T2	1	
		5.7	Grating light valve and optical switch,	T1,T2	1	
		5.8	Wave guide and tuning	T1,T2	1	
		5.9	Shear stress measurement	T1,T2	1	
Course Beyond Syllabus			Microfluidic Devices	T1	1	
Total					**10**	
CUMULATIVE PROPOSED PERIODS					**50**	

Text Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
T1	Mahalik N P, MEMS, Tata McGraw-Hill Education (India) Pvt Limited, 2013.
T2	Rai - Choudhury P, MEMS and MOEMS Technology and Applications, PHI Learning Private Limited, 2009.
T3	Nadim Maluf, An Introduction to Micro Electro Mechanical System Design,2nd Edition, Artech House, 2004.

Reference Books:	
S.No.	**AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION**
R1	Tai-Ran Hsu, MEMS and Micro Systems: Design and Manufacture,1st Edition, McGraw Hill Education, 2017
R2	Chang Liu, Foundation of MEMS, 2nd Edition, Pearson Education, 2011
R3	Gerald Urban, Bio-MEMS (Micro systems), Springer.2006
R4	Mohamed Gad-el-Hak, MEMS Handbook, CRC Press, 2002.

Web Details	
	https://nptel.ac.in/courses/117105082
	https://lecturenotes.in/subject/134/micro-electro-mechanical-systems

		Name	Signature with Date
i.	Faculty	Dr. R Sanjeev Kumar	6/6/25
ii.	Course Coordinator	Dr. R Sanjeev Kumar	
iii.	Module Coordinator	Dr. D Bhanu Prakash	
iv.	Programme Coordinator	Dr. M Francis Luther King	

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Principal