

Course Code	Course Title	L	T	P	C
1152BM114	BioMEMS	3	0	0	3

a) Course Category

Program Elective

b) Preamble

Imparts in students detailed knowledge about Principle and working of Micro electro mechanicalsystem (MEMS). Gives brief knowledge about Fabrication process of MEMS. Gives brief knowledge about applications of Bio-MEMS technology for therapeutics and diagnostics.

c) Prerequisite

Basic Physics and
Material science

d) Related Courses

Nil

e) Course Outcomes

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the basics of MEMS Technology	K2
CO2	Design and fabricate simple MEM device	K4
CO3	Compare and explain about the characteristics of MEMs Physical and chemical sensor	K2
CO4	Classify the biosensors according to its working principle and discuss its application as an implantable device	K2
CO5	Discuss the various applications of BioMEMS in therapeutics and diagnostics	K2

f) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	L											
CO2	L	M	H	H	H								H	
CO3	H	M	L											
CO4	H	M	L											
CO5	L	L	L											

g) Course content

UNIT I INTRODUCTION TO MEMS 9

Historical perspective, Development of MEMS Technology, MEMS Technology: Present, Future and Challenges, MEMS Applications, Comparison of MEMS and Microelectronics.

UNIT II FABRICATION PROCESSES AND TECHNOLOGIES 9

Different Materials, Substrates, Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), Etching Processes, Patterning, Wafer Bonding, Annealing, Chemical Mechanical Polishing (CMP), Material Doping. Bulk Micromachining, LIGA (Lithographie, Galvanoformung, Abformung), Sacrificial Surface Micromachining.

UNIT III MEMS SENSORS AND ACTUATORS 9

MEMS Actuators, MEMS Sensing, Electron Tunneling, Sensor Noise, MEMS Physical Sensors, MEMS Chemical Sensors

UNIT IV MEMS BIOSENSORS

9

Classification of Physical Sensors, Integrated, Intelligent or Smart sensors, Bio Sensing Principles and Sensing Methods, Biosensors Arrays and Implantable devices.

UNIT V BIOMEMS APPLICATIONS

9

Delivery of Diagnostic and Therapeutic Agents to Vascular Targets, Real-Time Biological Imaging and Detection, Diagnostic and Therapeutic Applications of Metal Nano shells, Micro devices for Oral Drug Delivery.

Total 45 Hrs.

h) Learning

Resources

Text Books

1. Senturia, Stephen, D., "Microsystem Design", Kluwer Academic Publishers, 2001
2. Microelectromechanical system design, James j. allen. Taylor & Francis 2nd edition.
3. BioMEMS and Biomedical Nanotechnology, volume III Tejal Desai, sangetha Bhatia.
4. Biomedical Nanotechnology. Neelina H Malsch , Taylor & Francis

Reference Books

1. Manz, A., & Becker, H.(Eds.), "Microsystem Technology in Chemistry and Life Sciences", Springer-Verlag, New York, 1999. ISBN: 3-540-65555-7.
2. Bao, M., H., "Micromechanical Transducers: Pressure sensors, accelerometers, and gyroscopes", Elsevier Publications, New York, 2000.
3. Lambrechts, M., "Biosensors: Microelectrochemical Devices", CRC Press, 1992.
4. Buerk, Donald, G., "Biosensors: Theory and Applications", CRC Press, 1995.
5. Madon, Marc, "Fundamentals of Micro fabrication", CRC Press, 1997.
6. Kovacs, Gregory, "Micro machined Transducers Sourcebook", WCB McGraw-Hill, Boston, 1998.
7. Saliterman Steven, S., "Fundamentals of BioMEMS and Medical Microdevices", WileyInterscience, SPIE Press Monograph Vol. PM153.