

Biomedical Microsystems

B.E. Sem. VIII [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Overview of MEMS & Micro System

MEMS & Micro systems - typical MEMS & Micro system products. Introduction to the world of microsystems. Description of the design and fabrication of microsystems. Integration of fabrication processes.

2. Materials for MEMS and Microsystems

Introduction- Substrates and Wafers, Active Substrate Materials – silicon as a substrate Material, Silicon Compounds, Polymers- photoresists and Packaging Materials.

3. Microsystems Fabrication Processes

Photolithography, Photoresist, Mask design, Additive Processes - deposition, Subtractive Processes - etching, Modifying – doping, annealing, curing
Thin Film Deposition: Spin-on Films, Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD).

4. Micromachining:

Bulk Micromachining, Surface Micromachining, High Aspect-Ratio Processes (LIGA), Polymer Micro/Nano Fabrication.

5. Micro-Molding Techniques

Rigid Mold: Micro contact Printing, Imprinting or hot embossing, Injection molding, Cast Molding (Replica Molding), Flexible Mold: Soft lithography.

6. Nanolithography and Nanopatterning

7. Micro Total Analysis Systems (μ TAS)

- Components,
- Micro Fluidics and Fluid control components (channels, pumps, valves),
- μ -TAS: sample handling – (Microactuators examples - microvalves, micropumps, micromotors, Micro mixers, Microactivation methods),
- μ -TAS: separation components,
- μ -TAS: detection

8. Micro/ Nano Biosensors

Classification of physical sensors, Integrated, Intelligent, or Smart sensors, Biosensing Principles and sensing methods, biosensors arrays and implantable devices.

9. Cell Chips

Cell handling and characterization systems, systems for biotechnology and PCR, polynucleotide arrays and genetic screening.

10. Microsurgical Tools and Microneedles

11. Drug Delivery and Implantable Devices

12. Microsystem Packaging

Micro Systems Packaging (Types) – Essential Packaging Technologies (Types)

Reference Books :

1. Fundamentals of Microfabrication (*Marc Madou*) CRC Press, 1997. Gregory Kovacs
2. Micromachined Transducers Sourcebook, WCB McGraw-Hill, Boston, 1998.
3. Fundamentals of BioMEMS and Medical Microdevices (*Steven S. Saliterman*) SPIE Press Monograph Vol. PM153 by Wiley Interscience.
4. Microsystem Technology in Chemistry and Life Sciences (*A. Manz and H. Becker, Eds.*) Springer-Verlag, New York, 1999. ISBN: 3-540-65555-7
5. Microsystem Design (*Stephen D. Senturia*) Kluwer Academic Publishers, 2001.
6. Micromechanical Transducers: Pressure sensors, accelerometers, and gyroscopes (*M.-H. Bao*) Elsevier, New York, 2000.

