UEI831: BIOSENSORS AND MEMS

L T P Cr
3 1 0 3.5

Course Objectives: To introduce the concept of biosensors and MEMS, design and fabrication, types and their applications.

Overview of biosensors and their electrochemistry: Molecular reorganization: Enzymes, Antibodies and DNA, Modification of bio recognition molecules for Selectivity and sensitivity, Fundamentals of surfaces and interfaces

Bioinstrumentation and bioelectronics devices: Principles of potentiometry and potentiometric biosensors, Principles of amperometry and amperometric biosensors, Optical Biosensors based on Fiber optics, FETs and Bio-MEMS, Introduction to Chemometrics, Biosensor arrays; Electronic nose and electronic tongue

MEMS Technology: Introduction Nanotechnology and MEMS, MEMS design, and fabrication technology – Lithography, Etching, MEMS material, Bulk micromachining, Surface micromachining, Microactuator, electrostatic actuation, Micro-fluidics.

MEMS types and their applications : Mechanical MEMS – Strain and pressure sensors, Accelerometers etc., Electromagnetic MEMS – Micromotors, Wireless and GPS MEMS etc
Magnetic MEMS – all effect sensors, SQUID magnetometers, Optical MEMS – Micromachined fiber optic component, Optical sensors, Thermal MEMS – thermo-mechanical and thermo-electrical actuators, Peltier heat pumps

Course Learning Outcomes (CLO):
After the successful completion of the course the students will be able to:
1. explain the concept of molecular reorganization, fundamentals of surfaces and interfaces
2. elucidate the principles of different types of biosensors
3. explain the concept of MEMS design, and fabrication technology
4. explain the different types of MEMS and its applications

Text Books:
1. *Gardner, J.W., Microsensors, Principles and Applications, John Wiley and Sons (1994).*
2. *Kovacs, G.T.A., Micromachined Transducer Sourcebook, McGraw −Hill (2001).*
3. *Turner, A.P.F., Karube,I., and Wilson G.S., Biosensors −Fundamentals and Applications, Oxford University Press (2008).*

Reference Book:
1. *Trimmer, W., Micromechanics and MEMS, IEEE Press (1990)*

Evaluation Scheme:

S.NO.	Evaluation Elements	Weightage
1	MST	30
2	EST	45
3	Sessional (May include Assignments//Quizzes/Lab Evaluations)	25