

Course code	Course Name	L-T-P-Credits	Year of Introduction
BM303	BIOSENSORS & TRANSDUCERS	3-0-0-3	2016
Prerequisite : Nil			
Course Objectives			
<ul style="list-style-type: none"> • To understand the basic principles of biological sensors in the body • To understand the principles behind chemical analysis of body fluids • To understand the principles of measurement using biosensors. • To impart fundamental measurement techniques using transducers and transduction mechanisms. 			
Syllabus			
<p>Transducers and sensors: Study of biological sensors in human body and their basic mechanism of action. Study of various Chemoreceptors, hot and cold receptors, baroreceptors, sensors for smell, sound, vision, osmolality and taste. Bio sensors -Ion exchange membrane electrodes-oxygen electrodes - Chemical Transducers: Transducers for the measurement of ions and dissolved gases. Reference electrodes - Hydrogen electrodes - silver-silver chloride electrodes -Calomel electrodes. Measurement of pH - Glass pH electrodes. Temperature transducers, Displacement transducers, Pressure transducer.</p>			
Expected Outcome			
<ul style="list-style-type: none"> • After the completion of the course, students will be able to acquire knowledge about bio sensors, chemo receptors and biomedical transducers. 			
Text Books:			
<ol style="list-style-type: none"> 1. Keith Brindley, Sensors & Transducers, Heinemann Newnes, Great Britain, 1988. 2. R S C Cobbold, Transducers for Biomedical Instruments, John Wiley & Sons, 1974. 			
Reference Books:			
<ol style="list-style-type: none"> 1. A V S De Reuck, Touch Heat & Pain, J & A Churchill Ltd. London, 1967. 2. <u>Avraham Rasooly</u> & <u>Keith E. Herold</u>, Biosensors and Bio detection, , Vol 503. 3. Brown & Gann, Engineering Principles in Physiology Vol. I Academic Press, 1973 4. D L Wise , Applied Bio Sensors, Butterworth Publishers, London 1989 5. E. Galindo , BIOTECHNOLOGY – Vol. II - Biosensors 6. Geddes & Becker, Principles of Applied Biomedical Instrumentation, John Wiley, 1989. 7. Harry Thomas , Handbook of Bio medical Instrumentation, Reston, Virginia 2000 8. Iberall & Guyton , Regulation & Control in Physiological System, Instruments Society USA 9. R S Khandpur, Handbook of Bio medical Instrumentation, Tata McGraw Hill, 2004. 10. Xueji Zhan , Electrochemical Sensors, Biosensors and their Biomedical Applications 1st Edition , 			
Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	Sensors : Study of biological sensors in human body and their basic mechanism of action	3	15%
	Organization of nervous system-neuronal mechanism and	4	

	circuit processing. Transducers –types and classification-active and passive.		
II	Introduction to bio sensor-classification based on bio recognition element - Enzymatic, DNA, antigen-antibody	4	15%
	Classification based on signal transduction - electro chemical, optical, colorimetric, piezoelectric	3	
FIRST INTERNAL EXAM			
III	Study of various Chemoreceptors, hot and cold receptors, baro receptors	3	15%
	Sensors for smell, sound, vision, osmolality and taste	2	
	Chemical Transducers: Transducers for the measurement of ions and dissolved gases	2	
IV	Reference electrodes - oxygen electrodes - CO ₂ electrodes enzyme electrode -construction -Hydrogen electrodes	3	15%
	Silver-silver chloride electrodes-Calomel electrodes. Measurement of pH - Glass pH electrodes	2	
	Catheter tip electrodes for the measurement of pO ₂ and pCO ₂	2	
SECOND INTERNAL EXAM			
V	Temperature transducers –thermo resistive transducers, thermoelectric, p-n junction, chemical thermometry	4	20%
	Flow and velocity transducers-principle and working	3	
VI	Displacement & Pressure transducers: Potentiometric -resistive strain gauges, inductive -capacitive - piezo electric transducers measurement of blood pressure - sphygmomanometer -indirect method - based on Korotkoff sound, oscillometric method	5	20%
	Direct method- catheter tip and catheter type transducers	2	
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks: 100

Exam Duration: 3 Hours

There shall be three parts for the question paper.

Part A includes Modules 1 & 2 and shall have three questions of fifteen marks out of which two are to be answered. There can be subdivisions, limited to a maximum of 4, in each question.

Part B includes Modules 3 & 4 and shall have three questions of fifteen marks out of which two are to be answered. There can be subdivisions, limited to a maximum of 4, in each question.

Part C includes Modules 5 & 6 and shall have three questions of twenty marks out of which two are to be answered. There can be subdivisions, limited to a maximum of 4, in each question.

Note: Each part shall have questions uniformly covering both the modules in it.