

1.	WTO-Trade-related Aspects of Intellectual Property Rights Edited by P.T. Stoll, J. Busche, K. Arend (2009).
2.	Intellectual Property Rights in Agricultural Biotechnology by F.H. Erbisch and K.M. Maredia (2000).

BIOMEDICAL INSTRUMENTATION, BIOSENSOR AND TRANSDUCER

Details of course: -

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Biomedical Instrumentation, Biosensor and Transducer (BT433)	03	01	00	Nil

Course Objective: To understand the basic workflow and principle of biosensors and transducer

Course Outcome (CO):	
1	Understand the basic principles, working mechanisms, and technical specifications of various physiotherapy, electrotherapy, and radiation therapy equipment, including safety aspects and clinical applications.
2	Comprehend the functioning, safety aspects, and clinical applications of surgical instruments such as surgical diathermy machines, cardiac pacemakers, defibrillators, and hemodialysis equipment
3	Explore the components, types, transducers, and applications of biosensors, including their use in clinical analysis, environmental monitoring, and modern scientific research.
4	Understand the functioning and models of various biological sensors/receptors in the human body, including their neural mechanisms and signal processing in time and frequency domains.
5	Analyze the principles, interface characteristics, and types of electrodes used in biochemical transducers, including applications in recording bio-signals like ECG, EEG, and EMG.
6	Investigate the principles, types, and applications of optical and pulse sensors, including photo detectors, optical fiber sensors, and photoelectric pulse transducers, in various biomedical applications.

S.No	Content	Contact Hours
1	Physiotherapy, Electrotherapy and Radiation Therapy Equipment's: Basic principle, working and technical specifications of Shortwave Diathermy, Ultrasonic therapy unit, Infrared and UV lamps, Nerve and Muscle Stimulator, Radiation and Physical therapy Units. Surgical Instruments: Surgical	8

	Diathermy machine, electrodes used with surgical diathermy, safety aspects in electronic surgical units, surgical diathermy analyzers, Cardiac pacemaker and defibrillator, hemodialysis.	
2	Introduction, what are Biosensors? Various components of biosensors, Types of Biosensors, Advantages and limitations Biocatalysis based biosensors, bio-affinity based biosensors & microorganisms-based biosensors, biologically active material and analytes, Types of membranes used in biosensor constructions. Transducers in Biosensors, Various types of transducers; principles and applications, Calorimetric, optical, potentiometric/amperometric conductometric/resistor metric, Transducers in Biosensors II Piezoelectric, semiconductor, impedimetric, mechanical and molecular electronics-based transducers. Chemiluminescence - based biosensors. Application and uses of Biosensors, Biosensors for personal diabetes management, Microfabricated Sensors and the Commercial Development of the I- Stat- Point-of-Care system. Non-invasive Biosensors in Clinical Analysis, Surface Plasmon Resonance, Biosensors based on Evanescent Waves, Applications of Biosensor-based instruments to the bioprocess industry, Application of Biosensors to environmental samples, Nanomaterials based biosensors, Introduction to Biochips and their application in modern sciences, Bimolecular electronics.	8
3	Study of biological sensors: Sensors / receptors in the human body, basic organization of nervous system-neural mechanism and circuit processing. Chemoreceptor: hot and cold receptors, barro receptors, sensors for smell, sound, vision, osmolality and taste. Sensor models in the time and frequency domains.	9
4	Biochemical Transducers: Electrode theory: electrode-tissue interface, metal-electrolyte interface, electrode-skin interface, electrode impedance, electrical conductivity of electrode jellies and creams. Biopotential electrodes: microelectrodes, body surface electrodes, needle electrodes. Reference electrodes: hydrogen electrodes, silver-silver chloride electrodes, Calomel electrodes. Recording electrodes for ECG, EEG, and EMG. Transducers for the measurement of ions and dissolved gases, pH electrode, specific ion electrodes.	9
5	Ion exchange membrane electrodes, enzyme electrode, glucose sensors, immunosensors. Basic principles of MOSFET biosensors	8
6	Optical sensor- photo detectors, optical fiber sensors, and indicator mediated transducers, general principles of optical sensing, optical fiber temperature sensors. Pulse sensor: photoelectric pulse transducer, strain gauge pulse transducer.	
Total		42

Books: -

S.No.	Name of Books/ Author/Publisher