

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. Erbis and K.M. Maredia (2000).

## BIOMEDICAL INSTRUMENTATION, BIOSENSOR AND TRANSDUCER

**Details of course: -**

Course Title	Course Structure			Pre-Requisite
	L	T	P	
<b>Biomedical Instrumentation, Biosensor and Transducer (BT433)</b>	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, baroreceptors, 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 gels 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.	
<b>Total</b>		<b>42</b>

**Books: -**

S.No.	Name of Books/ Author/Publisher
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