Bio Medical Instrumentation

Course Code	23EC4602A	**Year**	III	**Semester**	II
Course Category	PE-III	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks :**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
CO1	Understand the Origin of Bioelectric potential and their measurements using appropriate electrodes and Transducers	L2
CO2	Analyze the Electro-physiology of various systems and recording of the bioelectric signals	L4
CO3	Explain modern imaging techniques employed in medical diagnosis,	L4
CO4	Identify the diverse therapeutic equipment utilized in the biomedical field.	L3

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2										1	1	
CO2	2										1	1	
CO3	3	2						2			1	2	
CO4	3	3						3			1	2	
Avg.	2	3						3			1	2	

Syllabus		
Unit No.	**Contents**	**Mapped CO**
1	**Introduction:** Factors to be considered in the design of medical instrumentation systems, Basic objectives of medical instrumentation system, Physiological systems of human body, Sources of Bioelectric potentials: Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials. Electrodes: Electrode theory, Bio Potential Electrodes, Biochemical Transducers, Introduction to bio-medical signals.	CO1,CO2
2	**The Cardiovascular System:** The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds, Cardio Vascular Measurements, Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmo graphy, Measurement of Heart Sounds, Event detection, PQRS & T-Waves inECG, the first & second Heart beats, ECG rhythm analysis, the di-crotic notch in the carotid pulse detection of events and waves, analysis of exercise ECG, analysis of	CO2, CO3

	event related potentials, correlation analysis of EEG channels, correlation of muscular contraction.	
3	**Patient Care & Monitory and Measurements in Respiratory System:** The elements of Intensive Care Monitory, Diagnosis, Calibration and reparability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators, the physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment, analysis of respiration.	CO2, CO3,
4	**Bio telemetry and Instrumentation for the Clinical Laboratory**, Introduction to bio telemetry, Physiological parameters adaptable to bio telemetry, the components of bio telemetry system, implantable units, applications of telemetry in patient care – The blood, tests on blood cells, chemical test, automation of chemical tests.	CO3
5	**X-ray and radioisotope instrumentation and electrical safety of medical equipment:** Generation of Ionizing radiation, instrumentation for diagnostic X-rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy - Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention, Modern Imaging Systems: Tomography, Magnetic Resonance Imaging System, Ultrasonic Imaging System, Medical Thermography.	CO4

Learning Resources
Text Books
1. Leslie Cromwell, Fred J. Weibell and Erich A. Pfeifer. "Biomedical Instrumentation and Measurement, 2nd Ed., Pearson Education. 2006 2. M. Arumugam "Biomedical Instrumentation", Anuradha Agencies Publications, 2nd Ed., 1997.
Reference Books
1. R.S. Khandpur "Handbook of Biomedical Instrumentation", Tata McGraw Hill, 2nd Ed., 2006 2. John G. Webster "Medical Instrumentation Application and Design" , Wiley India, 3rd Ed., 2007
e- Resources & other digital material
1. https://onlinecourses.nptel.ac.in/noc25_bt49/preview 2. https://onlinecourses.swayam2.ac.in/nou23_bt05/preview 3. https://archive.nptel.ac.in/courses/108/105/108105101/