EC309: Bio-Medical Electronics & Instrumentation

Details of course:-

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Bio-Medical Electronics & Instrumentation	3	1	0	NIL

Course Objective: To familiarize students with the fundamental principles and concepts of biomedical electronics and the functioning of biological systems from an engineering perspective.

Course Outcomes:

- CO1: Analyze the human physiological systems and their interaction with biomedical instruments. analyze biomedical signals such as ECG, EEG, and EMG for diagnostic and monitoring purposes.
- CO2: Utilize appropriate electrode and transducers for measuring various physiological parameters.
- CO3: Evaluate the principles, functioning, and applications of various medical imaging modalities like X-Ray, CT, MRI, and ultrasound.
- CO4: Apply signal processing methods to filter, analyze, and interpret biomedical signals for enhanced diagnostics.

S. No.	Content	Contact Hours
Unit 1	Principles of biomedical instrumentation and techniques, SOURCES OF BIOMEDICAL SIGNALS, General block diagram of a medical instrumentation system, Physiological systems, Action Potential, Biopotential of electrodes, polarization, Functional organization of peripheral nervous system,	10
Unit 2	ECG, EEG, EMG, ERG **Biomedical Instrumentation Systems** Block diagram and working principles of: o Electrocardiogram (ECG) o Electroencephalogram (EEG) o Electromyography (EMG) o Electroretinography (ERG)	8

	○ Blood pressure monitors ○ Spirometers • Patient monitoring systems • Implantable medical devices (pacemakers, defibrillators, etc.)	
Unit 3	**Medical Imaging Systems:** Introduction to medical imaging modalities, X-Ray imaging and computed tomography (CT), Ultrasound imaging,Magnetic Resonance Imaging (MRI), Nuclear medicine (PET, SPECT), Basics of image processing in medical systems	8
Unit 4	**Biomedical Signal Processing:** Fundamentals of signal processing, Noise removal and artifact rejection,Feature extraction and analysis, Frequency-domain and time-domain analysis, Applications in diagnostics and monitoring	8
Unit 5	**Recent Trends in Biomedical Electronics** Introduction to Artificial Intelligence in healthcare, Wearable healthcare devices and applications, Robotics in surgery and rehabilitation, Nanotechnology in medical devices, Advanced biosensors and lab-on-chip devices	8
	Total	42

Books:-

S. No	Name of Books/Authors/Publisher
1	Handbook Of Biomedical Instrumentation / R.S.Khandpur/3rd Edition/ Tata McGraw Hill Publishers 2014.
2	Biomedical Instrumentation and Measurements /Leslie Cromwell/ 2nd Edition/PHI 1990.
4	Medical Instrumentation: Application and Design / John G. Webster/5th Edition/Wiley 2020.