

PEI201: BIOMEDICAL INSTRUMENTATION AND TECHNIQUES

L	T	P	Cr
3	0	2	4.0

Course Objectives: To understand the concepts of Biological Measurement, to enable selection, design and configuration of Biomedical Instruments

Characteristics of Transducers and Electrodes for Biological Measurement: Introduction to human body, block diagram, classification, characteristics, Various physiological events, Bioelectric potentials.

Cardiac System: Cardiac musculature, Electro cardiography, ECG recording, , Phonocardiography, Holter recording ECG lead system, Heart rate meter, Vector cardiography, Blood pressure measurement, Pacemakers, Defibrillators.

Respiratory System: Mechanics of breathing, Parameters of respiration, Respiratory system measurements, Respiratory therapy instruments and Pulse-oximeter.

Instrumentation for Measuring Nervous Function: EEG signal, Frequency band classification, Lead systems, EEG recording, Clinical applications of EEG signal.

Neurological signal processing: Brain and its potential, EEG signal and its characteristics, EEG analysis, Linear prediction theory, Auto regressive methods, Recursive parameter estimation, Spectral error measure, Adaptive segmentation, Transient detection and elimination.

Biomedical imaging: Infrared imaging, principles of ultrasonic measurements, ultrasonic diagnosis, ultrasonic imaging systems, Doppler, X ray machine, Fluoroscopy, Computed tomography, Principles of sectional imaging, scanner configuration, data acquisition system, image formation principles, 2D image reconstruction techniques. Magnetic Resonance Imaging - Principles of MRI, pulse sequence, image acquisition and reconstruction techniques, MRI instrumentation, Functional MRI, Application of MRI, comparison of imaging modes, Introduction to Fusion imaging.

Telemedicine: Definition and scope, Types, Applications and Advantages, Challenges, Legal and Ethical issues. Compression and Analysis of Bio-signals for Telemedicine.

Laboratory work: Experiments around Polyrite, ECG, EEG, Spirometer, Pulse-oximeter, Sphygmomanometer and Bio-signal digital analysis.

Minor Project:

Study of major biomedical instruments available at different labs.

Course learning outcome (CLO): After the completion of the course the students will be able to

1. Study characteristics of transducers and electrodes for biological measurement.
2. Understand cardiac system and respiratory system.
3. Apply instrumentation system for measuring nerve function parameter.
4. Use ECG and neurological signal processing for analysis.
5. Apply telemedicine concepts for handling distant patients.

Recommended Books:

1. Carr. John M Brown., *Biomedical Instrumentation, Prentice Hall of India (2000) 4th ed.*
2. Cromwell, l., weibell, fred j., pfeiffer, eric a. *Biomedical instrumentation and measurements, Prentice Hall of India (2000) 2th ed.*
3. Khandpur R.S., *Handbook of Biomedical Instrumentation, Tata McGraw-Hill Education, 2003*

Evaluation Scheme:

S.No	Evaluation Elements	Weightage (%)
1.	MST	25
	EST	40
	Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	35