

**EC-311C****BIOMEDICAL INSTRUMENTATION  
( ELECTIVE - I )****L T P C  
4 - - 3****COURSE OBJECTIVES:**

1. To Bio-signals and their characteristics, biological parameters and relationship between them.
2. To understand the principles involved in acquiring different bio-signals.
3. To represent these principles in form of mathematical equations.
4. understand or become aware of different Therapeutic equipment.
5. understand Modern medical imaging systems.

**COURSE OUTCOMES:****After successful completion of the course, the students are able to**

1. understand about Bio-signals and their characteristics, biological parameters and relationship between them.
2. understand about the principles involved in acquiring different bio-signals.
3. understand about Anatomy of the nervous system-neuronal communication
4. understand or become aware of different Therapeutic equipment.
5. understand about Modern medical imaging systems-Radiography.

**UNIT I****(10)**

Bio-signals and their characteristics, organization of cell, Nernst equation of membrane, Resting and Action potentials. Bio-amplifiers, characteristics of medical instruments, problems encountered with measurements from living systems. Bio-potential electrodes - Body surface recording electrodes, Internal electrodes, micro electrodes. Bio-chemical transducers - reference electrode, the pH electrodes, Blood gas electrodes.

**UNIT II****(10)**

Heart and cardiovascular system Heart electrical activity, blood pressure and heart sounds. Cardiovascular measurements electro cardiography " electrocardiogram, ECG Amplifier, Electrodes and leads, ECG recorder principles. Types of ECG recorders. Principles of blood pressure and blood flow measurement.

**UNIT III****(10)**

Anatomy of the nervous system-neuronal communication, electro encephalogram (EEG), EEG Measurements EEG electrode-placement system, interpretation of EEG, EEG system Block diagram, pre-amplifiers and amplifiers. Anatomy of vision, electrophysiology of the Eye (ERG) Spatial properties of ERG, the electrooculogram (EOG), Ophthalmoscopes, Tonometer for eye pressure measurement.

**UNIT IV****(10)**

Therapeutic equipment, Pacemaker, Defibrillator, Shortwave diathermy. Hemodialysis machine. Respiratory Instrumentation - Mechanism of respiration, Spirometry, Pneumotachograph, Ventilators.

**UNIT V****(10)**

Modern medical imaging systems-Radiography, computed Radiography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear Medicine, Single Photon Emission Computed Tomography (SPECT), Positron Emission Tomography (PET), Ultrasonography.

**LEARNING RESOURCES:**

**TEXT BOOK(s):**

1. Leslie Cromwell - Biomedical Instrumentation and Measurements, 2nd Edition, PHI, 2006.
2. John G Webster - Medical Instrumentation - Application and Design, John Wiley and Sons, 3rd Edition.

**REFERENCE BOOK(s):**

Joseph Carr and Brown - Introduction to Biomedical equipment technology.

**WEB RESOURCES:**

<http://nptel.iitm.ac.in/courses/102104043>