

3/4 B.Tech. FIFTH SEMESTER FREE ELECTIVE

FE

BIO MEDICAL INSTRUMENTATION

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

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**Course Objectives**

- The purpose of this course is to introduce the students to the basics of Electro-physiology and its measurements, non-electrical parameters related to various systems of human body and their measurements

**Learning outcomes**

- Students develop knowledge of how instruments work in the various department and laboratories of a hospital and thereby recognize their limitations.
- Students develop knowledge on Electrodes and Transducers used in bio signal acquisition. Also student will get to know about various Medical Imaging devices. techniques used for diagnosis along with other diagnostic and therapeutic.

**UNIT I**

Components of Medical Instrumentation System. Bioamplifier. Static and dynamic characteristics of medical instruments. Biosignals and characteristics. Problems encountered with measurements from human beings.

**UNIT II**

Organisation of cell. Derivation of Nernst equation for membrane Resting Potential Generation and Propagation of Action Potential, Conduction through nerve to neuro-muscular junction.

**UNIT III**

Bio Electrodes – Biopotential Electrodes-External electrodes, Internal Electrodes. Biochemical Electrodes.

**UNIT IV**

Mechanical function, Electrical Conduction system of the heart. Cardiac cycle. Relation between electrical and mechanical activities of the heart.

**UNIT V**

Cardiac Instrumentation Blood pressure and Blood flow measurement. Specification of ECG machine. Einthoven triangle, Standard 12-lead configurations, Interpretation of ECG waveform with respect to electro mechanical activity of the heart.

**UNIT VI**

Therapeutic equipment. Pacemaker, Defibrillator, Shortwave diathermy. Hemodialysis machine.

**UNIT VII**

Neuro-Muscular Instrumentation Specification of EEG and EMG machines. Electrode placement for EEG and EMG recording. Interpretation of EEG and EMG.

**UNIT VIII**

Respiratory Instrumentation Mechanism of respiration, Spirometry, Pneumotachograph Ventilators.

**Learning resources**

**TEXT BOOKS :**

1. Biomedical Instrumentation and Measurements – Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, PHI, 2nd Ed, 1980.
2. Hand-book of Biomedical Instrumentation – R.S. Khandpur, TMH, 2nd Ed., 2003.

**REFERENCES :**

1. Principles of Applied Biomedical Instrumentation – L.A. Geddes and L.E. Baker, John Wiley, 1975.
2. Medical Instrumentation, Application and Design – John G. Webster, John Wiley, 3rd Ed., 1998.
3. Biomedical Telemetry – Mackay, Stuart R., John Wiley, 1968.