

4/4 B.Tech - SEVENTH SEMESTER

EC7T4D

Bio Medical Instrumentation

Credits: 4

Lecture : 4 periods/week

Tutorial: 1 period /week

Internal assessment: 30 marks

Semester end examination: 70 marks

Course Objectives:

- To the basics of Electro-physiology and its measurements, non-electrical parameters related to various systems of human body and their measurements.
- Electrodes and Transducers used in bio signal acquisition.
- Various Medical Imaging techniques used for diagnosis along with other diagnostic and therapeutic devices

UNIT- I

Bioelectric Potentials, Electrodes and Transducers: Sources of Bioelectric potentials - Resting and action potential - Propagation of Action potential Electrode theory- Equivalent circuit- Types of electrodes.

UNIT- II

Physiological Transducers: Inductive, Capacitive, Piezoelectric transducers and Thermistors, Biochemical Transducers- pH, pCO₂ and pO₂ electrodes.

UNIT- III

Electrophysiological Measurements: Electrophysiology of Heart, Nervous system and Muscle activity. Bio-signals: ECG - EEG, Evoked potential - EMG- ERG- Electrodes and lead system, typical waveforms and signal characteristics. Signal Conditioning circuits: Design of low noise medical amplifier, Isolation amplifier, Protection circuits and Electrical safety.

UNIT- IV

Non-Electrical Parameter Measurements: Measurement of blood pressure, blood flow, Plethysmography, Cardiac Output, Heart Sounds- Lung volumes and their measurements- Auto analyzer - Blood cell counters, Oxygen saturation of Blood.

UNIT- V

Medical Imaging Techniques - I: X-Ray Machine - Computer Tomography - Angiography - Ultrasonography - Magnetic Resonance Imaging System.

UNIT- VI

Medical Imaging Techniques – II : Nuclear imaging techniques - Thermography - Lasers in Medicine - Endoscopy.

UNIT- VII

Bio-Telemetry: Bio telemetry - Elements and design of Bio telemetry system- Radio Telemetry Systems- Problems in implant telemetry-Uses Bio-Telemetry.

UNIT- VIII

Assist And Therapeutic Devices: Cardiac pacemakers - Defibrillators - Artificial heart valves - Artificial Heart Lung machine - Artificial Kidney - Nerve and Muscle Stimulators - Respiratory therapy equipment - Patient Monitoring System.

Learning Resources

Text Books:

1. Biomedical Instrumentation and Measurement, Leslie Cromwell, Fred J. Weibell and Erich A. Pfeifer., 2nd Edition, Pearson Education. 2006
2. Biomedical Instrumentation, M. Arumugam 2nd Edition, Anuradha Agencies Publications. 1997

References:

1. Handbook of Biomedical Instrumentation, R.S. Khandpur 2nd Edition, Tata McGraw Hill. 2006
2. Medical Instrumentation Application and Design, John G. Webster, 3rd Edition, Wiley India, 2007