

4/4 B.Tech - SEVENTH SEMESTER

EC7T4D

Bio Medical Instrumentation

Credits: 3

Lecture : 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Course Objectives:

- With widespread use and requirements of medical instruments, this course gives knowledge of Electro-physiology, Bio-electrical and non-electrical parameters measurement related to various systems of human body.
- It attempts to render a broad and modern account of biomedical instruments.

Learning Outcomes:

Student will be able to

- Understand the Origin of Bioelectric potential and their measurements using appropriate electrodes and Transducers.
- Understand the Electro-physiology of various systems and recording of the bioelectric signals
- Understand the working principles of various Imaging techniques
- Understand the design aspects of various Assist and Therapeutic Devices

UNIT- I

Bioelectric Potentials, Electrodes and Transducers: Sources of Bioelectric potentials - Resting and action potential - Propagation of Action potential, Bioelectric Signals, Electrode theory- Equivalent circuit- Types of electrodes. Biochemical Transducers- pH, pCO₂ and pO₂ electrodes.

UNIT- II

Electrophysiological Measurements: Electrophysiology of Heart, Nervous system and Muscle activity. ECG - EEG, Evoked potential - EMG- ERG- Electrodes, lead systems and typical waveforms.

UNIT- III

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- IV

Medical Imaging Techniques: X-Ray Machine - Computer Tomography - Angiography - Ultrasonography - Magnetic Resonance Imaging System Nuclear imaging techniques - Thermography - Lasers in Medicine - Endoscopy.

UNIT- V

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. Handbook of Biomedical Instrumentation, R.S. Khandpur Tata McGraw Hill, 2nd Edition, 2006.

References:

1. Biomedical Instrumentation, M. Arumugam Anuradha Agencies Publications, 3rd Edition, 2006.
2. Medical Instrumentation Application and Design, John G. Webster, Wiley India, 3rd Edition, 2007.