

## UEI402 BIO-MEDICAL INSTRUMENTATION

L	T	P	Cr
3	1	2	4.5

**Human Body Subsystems:** Brief description of neuronal, Muscular, Cardiovascular and respiratory systems; Their electrical, Mechanical and Chemical activities.

**Transducers and Electrodes:** Principles and classification of transducers for bio–medical applications, Electrode theory, Different types of electrodes, Selection criteria for transducers and electrodes.

**Cardiovascular System Measurements:** Measurement of blood pressure, Blood flow, Cardiac output, Cardiac rate, Heart sounds; Electrocardiograph, Phonocardiograph, Plethysmograph, Echocardiograph.

**Respiratory System Measurements:** Measurement of gas volume, Flow rate, Carbon–dioxide and oxygen concentration in exhaled air.

**Instrumentation for Clinical Laboratory:** Measurement of pH value of blood, ESR measurement, Polarographic measurements.

**Measurement of Electrical Activity in Neuromuscular System and Brain:** Neuron potential, Muscle potential, Electromyograph, Brain potentials, Electroencephalograph.

**Medical Imaging:** Diagnostic X–rays, CAT, MRI, Thermography, Ultrasonography, Medical use of isotopes, Endoscopy.

**Patient Care, Monitoring and Safety Measures:** Elements of intensive care monitoring; Basic hospital systems and components; Physiological effect of electric currents, Shock hazards from electrical equipment, Safety measures; Standards, Codes and practices.

**Computer Applications and Biotelemetry:** Real time computer applications, Data acquisition and processing; Remote data recording and management.

**Prosthetics and Orthotics:** Introduction to artificial kidney, Artificial heart, Heart lung machine, Limb prosthetics and Orthotics elements of audio and visual aids.

**Assisting and Therapeutic Devices:** Introduction to cardiac pacemakers, Defibrillators, Ventilators, Muscle stimulators, Diathermy.

**Lasers:** Application of lasers to biomedical sciences.

### **Laboratory Work:**

Study of various physiological parameters using multi–channel recorder, Study of pulse oximeter, Study of various parameters of spirometer associated with lungs capacity, Study of ECG signal for 12 lead system, EEG frequency analysis, Ultrasonic characterization study of biological samples, Auto analyzer study, Study around TMT and EMS analysis.

**COURSE LEARNING OUTCOME (CLO):**The student will be able to

1. Explain the physiology of the heart, lung, blood circulation and circulation respiration.
2. Describe the biomedical applications of different transducers used and various sensing and measurement devices of electrical origin.
3. Elucidate electrical safety in medical equipments.
4. Describe different medical imaging techniques.

**Text Books:**

1. Carr, J.J. and Brown, J.M., *Introduction to Biomedical Equipment Technology*, Prentice Hall (2000).
2. Cromwell, L. and Weibell, F.J. and Pfeiffer, E.A., *Biomedical Instrumentation and Measurement*, Dorling Kingsley (2006).

**Reference Books:**

1. Geddes, L.A., and Baker, L.E., *Principles of Applied Biomedical Instrumentation*, Wiley InterScience (1989).
2. Khandpur, R.S., *Handbook of Biomedical Instrumentation*, McGraw Hill (2003).
3. Webster, J.G., *Medical Instrumentation Application and Design*, John Wiley (2007).

**Evaluation Scheme:**

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	25
2	EST	35
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	40