

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. SEMESTER : VIII

ELECTRICAL & ELECTRONICS ENGINEERING

Subject Name: **BIOMEDICAL INSTRUMENTATION**

Sr. No.	Course Contents	Total Hrs
1.	The Human Body: An Overview Introduction, The cell, Body fluids, Musculoskeletal system, Respiratory system, Nervous system, The circulatory system, The body as a control system, The circulatory system, the heart, bioelectricity, electro-conduction system of the heart, heart problems	6
2.	Bio-Signals and Sensors Signal acquisition, Transduction, Active versus Passive sensors, Sensor error sources, Sensor terminology, Tactics and signal processing for improved sensing, Electrodes for biophysical sensing, Medical surface electrodes, Microelectrodes, strain gauges, inductive transducers, Quartz pressure sensors, Capacitive transducers, Temperature transducers.	6
3.	Bioelectric Amplifier Bioelectric amplifiers, Multiple input circuits, Differential amplifier, Signal processing circuits, isolation amplifiers, chopper stabilized amplifiers, Input guarding	5
4.	ECG, EEG and EMG machine The heart as a potential source, The ECG waveform, The standard lead system, Other ECG signals, The ECG preamplifier, ECG readout devices, ECG machine. Electroencephalograph, EEG electrodes, EEG amplitude and frequency bands, Multichannel EEG recording systems and typical external control, X-ray, Introduction of CT scan. EMG electrodes, amplifier and machine.	6
5.	Physiological Pressure and Other Cardiovascular Measurement and Devices Blood pressure measurement, Plethysmography, Blood flow measurement, Phonocardiography, Vectorcardiography, Catheterization laboratories, Pacemaker, Defibrillators, Hear-Lung machine	5
6.	Intensive and Coronary Care Units Special care units, ICU/CCU equipment, Bedside monitors, Bedside monitor circuits, Central monitoring consoles, ECG/Physiological telemetry	4
7.	Medical Laboratory Instrumentation Blood (purpose and components), Blood test (cells and chemistry), Medical laboratory department, Overview of clinical instrumentation, Colorimeter, Flame photometer, Spectrophotometer, Blood cell counter, pH/Blood gas analyzer, Chromatograph, Auto analyzer, Basic renal physiology, Renal failure, Peritoneal dialysis, Hemodialysis, The hemodialysis machine, High – flux and high efficiency dialysis, Electrical safety precautions, Typical faults – troubleshooting and maintenance	6
8.	Medical Ultrasonography Introduction, Physics of sound and ultrasound waves, Ultrasound transducers, Absorption and attenuation of ultrasound energy, Scan modes and scanning systems, Biological effects of ultrasound, Doppler effect, Transcutaneous Doppler flow detectors, Flow meters, Ultrasonic blood pressure measurement, Echoencephalography	5

Text Books:

1. R. S. Khandpur, "Handbook of Biomedical Instrumentation, Tata – McGraw Hill Publication
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology, Pearson Publication

Reference Books:

1. D. Jennings, A Flint, BCH Turton, LDM Nokes, "Introduction to Medical Electronics Applications", Edward Arnold Group Publication
2. Leslie Cronwell, Fred J. Weibell, Erich A Pfeiffer, "Biomedical Instrumentation and measurements", Prentice-Hall.