



**Course Title: Biomedical Instrumentation**

**Credit Units:**

L	T	P/S	SW/F W	TOTAL CREDIT UNITS
3	1	0	0	4

**Course Level:UG**

**Course Code: IE409**

**Course Objectives:**This course basically deals with instrumentation concepts in the field of medicine. This course provides in depth study of various biomedical instruments.

**Pre-requisites:**Measurement & Measuring Instruments, Biology for Engineers, Applied Physics-I & II

**Course Contents/Syllabus:**

	Weightage (%)
<b>Module I: Introduction</b>	
Origin of bio-electric signals, recording systems, source of low level recording circuits, preamplifiers, main amplifier and driver stage, writing systems, types of recorders and transducers used.	15
<b>Module II: Bio-Medical Recorders and Display Systems</b>	
ECG, EEG, EMG, photo-cardiograph and electrodes used for ECG, EEG and EMG, oscilloscopes used for biomedical measurements, multi-channel display.	20
<b>Module III: Blood Gas Analyzers</b>	
B.P measurement, patient monitoring system, blood PH measurement, blood PO <sub>2</sub> , PCO <sub>2</sub> , complete blood gas analyzer.	20
<b>Module IV: Special Machines</b>	
MRI, and ultrasonic imaging systems, x-ray machine, x-ray computed tomography, basic NMR components, physics of ultrasonic rays, A-scanner, B-scanner, echocardiograph, display devices for ultra-sonic imaging.	20
<b>Module V: Cardiac Pacemakers and Defibrillators</b>	
External pacemaker, implantable pace maker, programmable pace maker, leads and electrodes used, DC defibrillators, electrodes used, and implantable defibrillators.	15
<b>Module VI: Laser Applications in Biomedical Fields</b>	
Lasers: ruby laser, argon laser, helium- neon laser, CO <sub>2</sub> laser, Nd-YAG laser	10

**Student Learning Outcomes:** After learning this subject, the student will be able to

1. Understand basic concept of Bio-Medical Instrumentation.
2. Understand the principle and practical working of various Medical Instruments.
3. Analyze concepts with mathematical as well as technical approach for manufacturing and operation of Bio-medical Instrumentation.
4. Identify the practical application areas by the theoretical knowledge of Bio-medical Instrumentation.
5. Develop the concept of different basic bio medical instrument which will be helpful in Medical Science.
6. Experimentally study about the signals and parameters of biomedical instrumentation system utilizing in Medical Science.

**Pedagogy for Course Delivery:**

Class Room Lectures, assignments, Quizzes/Viva, Practical on the Hardware

**Assessment/ Examination Scheme:**

Theory L/T (%)	Lab/Practical/Studio (%)	Total
100	-	100

**Theory Assessment (L&T):**

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

**Text Reading:**

- Introduction to Bio-medical Instrumentation : R.S khandpur.
- Bio-medical instrumentation: Crambell.