

Course code	Course Name	Teaching Scheme (Hrs)			Credit Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tut.	Total
EXC8044	Biomedical Electronics	4						4

Course code	Course Name	Examination Scheme							
		Theory (out of 100)				Term Work	Practical and oral	Oral	Total
		Internal Assessment (out of 20)			End Sem. Exam				
		Test 1	Test 2	Avg.					
EXC8044	Biomedical Electronics	20	20	20	80	--	--	--	150

Course Pre-requisites:

- EXC305:Electronic Instruments and Measurements
- FEC102,202: Applied Physics I and II

Course Objective:

1. To make students understand the Identification, classification, and working principle of various Biomedical Instruments used for Bio-potential measurement
2. Application of these instruments in diagnosis, therapeutic treatment and imaging fields

Course Outcome:

The Students will be able to

1. Identify various Bio-potential and their specifications in terms of amplitude and frequency.
2. Understand principle and working of various Biomedical Instruments for diagnosis applications.
3. Decide the applications of therapeutic instruments for treatment purpose.
4. Understand applications of imaging instruments and the modalities involved in each technique.

Module No.	Unit No.	Topics	Hrs.
1		Bio-Potential and Measurement	08
	1.1	Structure of Cell, Origin of Bio-potential, electrical activity of cell their characteristic and specifications.	
	1.2	Measurement of RMP and AP. Electrode-Electrolyte interface and types of bio-potential electrodes.	
2		Physiological Systems and Related Measurement	14
	2.1	Respiratory system- Physiology of respiration and measurements of respiratory related parameters	
	2.2	Cardiovascular system- Structure of Heart, Electrical and Mechanical activity of Heart, ECG measurements and Cardiac arrhythmias	
	2.3	Nervous system- Nerve cell, neuronal communication, nerve-muscle physiology, CNS, PNS. Generation of EEG and its measurement. Normal and abnormal EEG, evoked potential and epilepsy	
	2.4	Muscular system- Generation of EMG signal, specification and measurement.	
	Design of ECG amplifier		
3		Cardiovascular Measurement	08
	3.1	Blood Pressure- Direct and Indirect types. Blood Flow- Electromagnetic and Ultrasonic types. Blood Volume- Types of Plethysmography. (Impedance, Capacitive and Photoelectric) Cardiac Output- Flicks method, Dye-dilution and Thermo-dilution type. Heart sound measurement	
4		Life support Instruments	08
	4.1	Pacemaker- Types of Pacemaker, mode of pacing and its application. Defibrillator- AC and DC Defibrillators and their application. Heart Lung machine and its application during surgery. Haemodialysis system and the precautions to be taken during dialysis. Baby Incubator and its application	
5		Imaging Techniques	10
	5.1	X-Ray- Generation, X-ray tube and its control, X-ray machine and its application	
	5.2	CT Scan- CT Number, Block Diagram, scanning system and application. Ultrasound Imaging- Modes of scanning and their application	
	5.3	MRI- Concepts and image generation, block diagram and its application	
6		Significance of Electrical Safety	04
	6.1	Physiological effects of electrical current, Shock Hazards from electrical equipments and methods of accident prevention.	
		Total	52

Recommended Books:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurements", 2nd Edition, Pearson Education, 1980.
2. John G. Webster, "Medical Instrumentation", John Wiley and Sons, 4th edition, 2010.
3. R. S. Khandpur, "Biomedical Instrumentation", TMH, 2004
4. Richard Aston, "Principles of Biomedical Instrumentation and Instruments", PH, 1991.
5. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", PHI/Pearson Education, 4th edition, 2001.
6. John E Hall, Gyton's Medical Physiology, 12th edition, 2011

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the test will be considered as final IA marks

End Semester Examination:

1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 5 marks will be asked.
4. Remaining questions will be selected from all the modules