



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
EXC8044	Biomedical Electronics	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

Pre-requisite Course Codes		EXC305:Electronic Instruments and Measurements FEC102,202: Applied Physics I and II
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Describe anatomy of human body and interpret bioelectric signals
	CO2	Analyze physiological systems, measurement of related bio-signals and its instrumentation
	CO3	Analyze cardiovascular system related measurement techniques
	CO4	Analyze building blocks of life support instruments and imaging techniques
	CO5	Justify the importance of patient safety and hospital management system
	CO6	Adapt the norms related to biomedical electronics

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Bio-Potential and Measurement		08
	1.1	Structure of Cell, Origin of Bio-potential, electrical activity of cell their characteristic and specifications.	1,3	
	1.2	Measurement of RMP and AP. Electrode-Electrolyte interface and types of bio-potential electrodes.	1,3	
2		Physiological Systems and Related Measurement		14
	2.1	Respiratory system- Physiology of respiration and measurements of respiratory related parameters	2,3	
	2.2	Cardiovascular system- Structure of Heart, Electrical and Mechanical activity of Heart, ECG measurements and Cardiac arrhythmias	2,3	
	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	2,3	
	2.4	Muscular system- Generation of EMG signal, specification and measurement.	2,3	
	2.5	Design of ECG amplifier (Pre-amplifier)	2	
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.	2,3	



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		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	2,3	
5		Imaging Techniques		10
	5.1	X-Ray- Generation, X-ray tube and its control, X-ray machine and its application	2,3	
	5.2	CT Scan- CT Number, Block Diagram, scanning system and application. Ultrasound Imaging- Modes of scanning and their application	2,3	
	5.3	MRI- Concepts and image generation, block diagram and its application	2,3	
6		Significance of Electrical Safety		04
	6.1	Physiological effects of electrical current, Shock Hazards from electrical equipments and methods of accident prevention.	1,2,3	
			Total	52

References:

- [1] Leslie Cromwell, "Biomedical Instrumentation and Measurements", Second Edition, Pearson Education, 1980.
- [2] John G. Webster, "Medical Instrumentation", John Wiley and Sons, Fourth 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, Fourth Edition, 2001.
- [6] John E Hall, Guyton's Medical Physiology, Twelfth Edition, 2011