

GUJARAT TECHNOLOGICAL UNIVERSITY

BIO MEDICAL ENGINEERING (31) INTRODUCTION TO BIOMEDICAL ENGINEERING SUBJECT CODE: 2723113 SEMESTER: II

Type of course: Open Elective Subject

Prerequisite: NA

Rationale: NA

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	<p>UNIT I PHYSIOLOGY AND TRANSDUCERS</p> <p>Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of the nervous system – Structure of nervous system, neurons - synapse – transmitters and neural communication – Cardiovascular system – respiratory system – Basic components of a biomedical system - Transducers – selection criteria – Piezo-electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.</p>	8	15
2	<p>UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS</p> <p>Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier.</p> <p>ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments</p>	10	22
3	<p>UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS</p> <p>Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – spirometer –</p>	10	20

	Photo Plethysmography, Body Plethysmography – Blood Gas analysers : pH of blood –measurement of blood pCO ₂ , pO ₂ , finger-tip oxymeter - ESR, GSR measurements .		
4	UNIT IV MEDICAL IMAGING Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Introduction to Biometric systems	10	20
5	UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart-Lung machine – Audio meters – Dialysers – Lithotripsy	10	23

Reference Books:

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.
3. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
4. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
5. C.Rajaroo and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman Ltd, 2000.

Course Outcome:

List of Experiments:

Open Ended Problems:

Major Equipments:

List of Open Source Software/learning website:

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website