

4196 - MEDICAL INSTRUMENTS - III									
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)				
Lectures	Practical	Credits			Theory		Practical Ex.		Total
3	3	6	25	25	3 Hrs	100	50 oral		200
Pre-requisite		Source	Semester						
Nil		MEX		Theory	Test	Total	TW	PR	Gr Total
				75	25	100	50	50	200

Rationale: This course deals with "Patient - Care Equipment" likely to be used with the patient in the hospital. Examples include electrocardiographs, electroencephalographs, catheters, respirators, patient monitors and central nursing stations.

The course emphasises those topics that are unique to the biomedical field, such as biopotentials, equipment safety, equipment block diagrams and patient equipment interface connections.

The course also deals with biotelemetry. Telemetric transmission of functional and physiological information offers many advantages in medical diagnostics and patient surveillance.

COURSE CONTENTS		Hrs	Mks
1. ELECTROCARDIOGRAPH		8	16
The ECG and the ECG block diagram. ECG lead connections, Augmented ECG leads and Chest lead connections. Common mode voltage reduction.			

2. ELECTROENCEPHALOGRAPH	4	8
The EEG and the block diagram. EEG electrodes. Electroencephalograms and their use in diagnosis.		
3. DEFIBRILLATOR	4	8
Defibrillator electrodes. The ac Defibrillator. The dc Defibrillators.		
4. PACEMAKERS	4	8
Properties of the pacemakers. Lead wires and electrodes Synchronous pacemakers. Rate responsive pacing.		
5. BLOOD PRESSURE MONITORING	8	16
Direct Measurement of Blood Pressure. Fluid resistance. Indirect measurements of blood pressure.		
6. RESPIRATORY AND PULMONARY FUNCTION MONITORING	8	16
Therapeutic and diagnostic equipment. The ventilator. Spirometer. Pneumotachograph. Plethysmograph		
7. MEASUREMENT OF FLOW AND VOLUME OF BLOOD	8	16
Flowmeters: electromagnetic, ultrasonic, thermal-convection, radiographic. Indicator Dilution Method. Plethysmography.		
8. RADIOTELEMETRY	4	12
Single Channel Radiotelemetry system. Multi Channel frequency-division and time-division multiplexed radiotelemetry system.		
Total	48	100

PRACTICAL:

1. Study of the electrocardiograph.
2. Study of the pacemaker.
3. Study of the dc Defibrillator.
4. Study of the electronic noninvasive blood pressure monitor.
5. To test a first order low-pass filter.
6. To measure the cut-off frequency of a second order low pass filter.
7. To experiment with a second order high-pass filter.
8. To amplitude-modulate a carrier using a bipolar modulator.
9. To demodulate an AM signal.

MINI-PROJECT:

The students are expected to construct and test and produce satisfactory results for any digital electronics based equipment and submit a report on the work done and the results obtained.

RECOMMENDED BOOKS:

1. Handbook of Biomedical Instrumentation by R.S. Khandpur.
2. Medical Instrumentation Application and Design by J.G. Webster.
3. Medical Instruments Technical Manuals from various manufacturers.

