4194 - MEDICAL INSTRUMENTS - II

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
Nil	MEX

Semester	Theory	Test	Total	TW	PR	Gr Total
	75	25	100	25	50	175

Rationale: Physiotherapy is an important component of medical treatment. Students undergoing this course would learn about equipment used in physiotherapy.
The students have been exposed to electrodes in medical instruments-I, therefore this course explores physiological transducers, differential amplifiers and biopotential amplifiers.

COURSE CONTENTS	Hrs	Mks
1. PHYSIOTHERAPY EQUIPMENT Use of Heat and Cold in Medical Therapy: Physical basis of heat and temperature. Thermo-therapy : Infrared, Ultraviolet, Ultrasonic, Short-wave and Microwave. Cryo-therapy: Use of cryogenic in medicine, Cryosurgery, Safety with cryogenics. Respiratory therapy: Nebulizers, Hyperbaric Oxygen therapy.	9	25
2. RADIOTHERAPY EQUIPMENT Principles of Radiation Therapy. Sources of Radioactivity for Nuclear Medicine. Basic Instrumentation: Geiger Mueller counter, photomultiplier tube, scintillation detector system. Nuclear Medicine Imaging Devices: Rectilinear scanner, gamma camera, positron camera. Principles of Radiotherapy treatment planning.	13	30
3. MEDICAL INSTRUMENT TRANSDUCERS 1. Thermal Transducers; 2. Wheatstone Bridge; 3. Strain Gauges; 4. Differential; 5. Capacitive Transducer; 6. Inductive Transducers; 7. Photoelectric Transducers; 8. Piezoelectric Transducers	13	20
4. BIOPOTENTIAL AMPLIFIERS A Transistor differential Amplifier: Inverting and Non-inverting Amplifiers. Operational Amplifier Analysis: Operational Amplifier Voltage and Current Sources,	9	15

Operational Amplifiers in Tandem, High-Input-Impedance Amplifiers with Controlled Gain, Differential Amplifier with Controlled Gain, Buffer Amplifier for a Differential Amplifier. Isolation amplifier. Bio-potential Measurement Interference and Common Mode Rejection in a Differential Amplifier.		
5. CRITERIA FOR THE FAITHFUL REPRODUCTION OF AN EVENT	4	10
1. Fourier Series; 2. Amplitude and Phase Distortion; 3. The Step Function; 4. Damped Resonant Systems		
Total	48	100

PRACTICAL:

The students will perform the following practical:

1. Temperature measurement by thermistor, thermocouple and resistance temperature detector.
2. Displacement measurement using a linear variable differential transformer.
3. Stress and strain measurement by strain gauges.
4. Intensity measurement using a light dependent resistor.
5. Force measurement using a piezo-electric transducer.
6. Study of the ultrasonic therapy machine.
7. Study of the nerve and muscle stimulator.
8. Study of a differential amplifier.: single ended input, differential mode input, common mode input, common mode rejection ratio.
9. Study of infrared physiotherapy.
10. MINI-PROJECT : The student will construct on a PCB and obtain satisfactory results, any of the medical electronic equipment covered in the syllabus.

VISITS:

1. Hospital visit to radiation therapy.
2. Hospital visit to physiotherapy.

RECOMMENDED BOOKS:

1. Handbook of Biomedical Instrumentation by R.S. Khandpur
2. Handbook of Biomedical Instrumentation and Measurement by Harry E. Thomas (Prentice-Hall)
3. Medical Instruments Technical Manuals from various manufacturers.