BIOMEDICAL INSTRUMENTATION

(Open Elective)

COURSE CODE: 15EC1148 **L T P C**

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COURSE OUTCOMES:

At the end of the course the student shall be able to

CO1: To understand the basic Medical Instrumentation System and different types of electrodes used in bio-potential recording.

CO2: To study different bio-signal acquisition systems (such as ECG, EEG,EMG).

CO3: To study the instrumentation concerned with measuring blood flow and blood pressure and physiological assisting devices.

CO4: To study operation theatre, monitoring equipment and latest developments in medical imaging systems.

CO5: Patient safety while using biomedical equipments.

UNIT-I (10 LECTURES)

COMPONENTS OF MEDICAL INSTRUMENTATION SYSTEMS: Basic Medical Instrumentation System, Static and dynamic characteristics of medical instruments, Bio-signals and characteristics. Problems encountered with measurements from human beings. Sources of Bioelectric Potentials, Resting and Action Potentials.

UNIT-II (12 LECTURES)

BIO-POTENTIAL ELECTRODES AND PHYSIOLOGICAL TRANSDUCERS: Electrode potential, Electrode equivalent circuit, Types of Electrodes-Surface Electrodes, Needle Electrodes, Micro Electrodes. Transducers for Biomedical Applications.

BIO-SIGNAL ACQUISITION: Electrical Conduction system of the heart, Electrocardiogram, ECG leads, Einthoven triangle, ECG amplifier, EEG 10-20 lead system and EMG.

UNIT-III (10 LECTURES)

BIO-SIGNAL MEASUREMENTS: Blood flow meters- Electromagnetic blood flow meter, Ultrasonic Doppler blood flow meter. Blood pressure measurement- Ultrasonic blood pressure monitoring.

PHYSIOLOGICAL ASSIST DEVICES & THERAPEUTIC EQUIPMENT: Pacemakers- External & internal, Defibrillators- External & internal, Hemodialysis machine.

UNIT-IV (10 LECTURES)

OPERATION THEATRE EQUIPMENT: Spirometry, Anesthesia machine, Ventilators.

MONITORING EQUIPMENT: Arrhythmia Monitor, Foetal Monitor, and Incubator.

MEDICAL IMAGING EQUIPMENT: X-ray machine, Computed Tomography (CT), Ultrasound Imaging system

UNIT V (8 LECTURES)

PATIENT SAFETY: Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System, Test instruments for checking safety parameters of biomedical equipments.

TEXT BOOKS:

1. Leslie Cromwell and F.J. Weibell, E.A. Pfeiffer, "Biomedical Instrumentation and Measurements", PHI, 2nd ed, 1980.
2. Dr. M. Arumugam, "Biomedical Instrumentation", Anuradha publications, 2nd ed, 1994.
3. Onkar N. Pandey, Rakesh Kumar, "Bio-Medical Electronics and Instrumentation", Katson Books, 2011.

REFERENCES:

1. R.S. Khandpur, "Hand-book of Biomedical Instrumentation", TMH, 2nd Ed., 2003.
2. John G. Webster, "Medical Instrumentation, Application and Design", John Wiley, 3rd ed., 2009.

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