

DEPARTMENT OF ELECTRONICS
MSc Electronics

ELS 555 - BIO-MEDICAL ELECTRONICS

Unit-I

10 Hours

Introduction to biomedical instrumentation: Basic concept of medical instrumentation, Basic sensor and principles, amplifier and signal processing. Sources of bioelectric potentials: Resting and action potentials, propagation of action potentials, the bioelectric potential
Bio Potential Electrodes: Origin of bio potential and its Propagation, Electrode theory, Electrode-electrolyte interface, electrode– skin interface, half-cell potential, electrode impedance, polarization effects of electrode- non-polarizable electrodes, Types of electrodes, electrolysis & arching, Stimulating electrodes, capacitive electrodes,
Electrode-tissue interaction, internal electrodes, electrodes on a subject, tissue response to electrolytes, skin abrasion

Unit-II

10 Hours

Bio-potential Amplifier: Basic requirements, the electro cardiograph, problem frequently encountered, transient protection, common-mode and other interference reduction circuits, amplifier for other Bio-potential pre-amplifier, other Bio-potential signal processor.
Blood Pressure: Direct Measurements, Harmonic Analysis of Blood Pressure Waveform, Dynamic Properties of Pressure Measurement System response, Band width required for measuring blood pressure, typical pressure waveform distortion system for measuring venous pressure, heart sound, phonocardiography, and cardiac catheterization, effect of potential and kinetic energy on pressure measurements, indirect measurement of blood pressure, Tonometry.

Unit –III

10 Hours

Measurement of flow and volume: indication-Dilution method that use continuous infusion, indicator-dilution method that use Rapid Injection, Electromagnetic Flow meters ,ultrasonic flow meters, thermal convection velocity sensors, chamber plethysmography, electrical impedance plethysmography, Photo plethysmography.
Measurement of the respiratory system: modelling the respiratory system, measurement of pressure, measurement of gas flow, lung volume, and respiratory plethysmography, some test for respiratory mechanism, and measurement of gas concentration.
Diagnostic Imaging system: X-Rays, Computed (Axial) Tomography Scanners, Magnetic Resonance Imaging Scanners, Positron Emission Tomography, Diagnostic Ultrasound

Text Book:

1. “Medical Instrumentation Application and Design”, John G. Webster, John Wiley, New York, 2004.
2. “Biomedical Instrumentation and Measurements” Leslie Cromwell, Fred J. Weibell, PHI, 15th edition

Reference Book:

1. “Principles of Applied Biomedical Instrumentation”, Geddes and Baker, John Wiley, 3rd Edition, 1989.
2. “Introduction to Biomedical Equipment Technology”, Joseph J. Carr and John M. Brown, Prentice Hall, 1998.
3. “Bio-medical Instrumentation”, R.S. Khandpur, TataMcGraw-hill, 2nd Edition 2008

