Biomedical Engineering

Subject code: EC 100003
Credit: 2

Prerequisite: None

Course Objective: Biomedical Engineering (BME) is a multidisciplinary field that combines knowledge in a wide range of engineering, medicine and societal science. It aims to focus on innovating newer equipment and technologies to enhance human health and health care in a holistic manner.

Course Outcomes: At the end of this course, the students will be able to:
CO1: Apply knowledge of basic engineering and biology to solve the problems
CO2: Knowledge of human body about cell, potential and organs of body
CO3: Develop a thorough understanding on principles of bio-instrumentation
CO4: Explain the role of bio-potential electrodes, and design of sensors
CO5: Differentiate and analyse the biomedical signal sources
CO6: Knowledge about imaging techniques used in hospital

Detailed subject

Unit-1: The Human Body: An Overview [7 hours]
Introduction to biomedical engineering, applications of biomedical engineering, cell-structure and function, tissue & organs, bio-potentials, action potential, major human systems (musculoskeletal, circulatory, nervous, respiratory system)

Unit-2: Bio-instrumentation [7 hours]
Instruments in medical practice, man-instrumentation system, basics components, linear network analysis, bioelectric amplifier (OpAmp, isolation amplifier, instrumentation amplifier), bio-instrumentation design, intelligent medical instrumentation

Unit-3: Biomedical Electrodes and Sensors [8 hours]
Introduction, signal acquisition, bio-potential measurements, active & passive sensor, electrodes for biophysical sensing (Ag-AgCl, surface electrodes, microelectrodes), transducers, sensors.

Unit-4: Biomedical Signals, Imaging and Informatics [8 hours]
Bioelectric phenomena, sources of biomedical signals, origin of biopotentials, basics of bio-signal processing, noise, interference, electrical safety issues, principle of medical imaging techniques such as X-ray, US, MRI, CT scan, nuclear imaging, fundamentals of bio-informatics.

Text Books:
1) Introduction to Biomedical Engineering, John D. Enderle & Joseph D. Bronzino Academic press, 3rd Edition, 2012
Reference Books:
1)The Biomedical Engineering Handbook, Joseph D. Bronzino, Donald R. Peterson, CRC press, 4th Edition 2015.

2) Fundamentals of Biomedical Engineering, G.S. Sawhney, New Age International(P) Ltd, 2011.