

PCBM4304 **Biomedical Signal Processing** (3-0-0)

Module I (15 Hours)

Bio-Medical signals: The nature of bio-medical signals, Examples of biomedical signals: Action potential, Electroneurogram (ENG), Electromyogram (EMG), Electrocardiogram (ECG), Electroencephalogram (EEG), Event related potentials (ERPs), Electrogastragram (EGG), Phonocardiogram (PCG), Carotid pulse (CP), Vibromyogram (VMG), Vibroarthrogram (VAG), Speech signals,

Objectives of biomedical signal analysis, Difficulties in biomedical signal analysis, Computer –aided Diagnosis.

Sources of Artifacts: Physiological Interference, Stationary Verses Non-Stationary Processes, High Frequency Noise in ECG, Motion Artifacts in ECG, Power Line Interference in ECG, Maternal Interference in fetal ECG, Muscle Contraction Interference in VAG Signals.

(Text Book – I – Chapter 1 & 3)

Module II (12 Hours)

Concurrent Couples & Correlated Processes:

Problem Statement, Illustration of the problem with case studies: The ECG & PCG, The PCG & Carotid Pulse, The ECG & Atrial Electrogram, Cardio-Respiratory Interaction, The EMG & Vibromyogram, The Knee Joint and muscle vibration signals, Applications: Segmentation of the PCG.

Removal of Artifacts: Adaptive Noise Canceller, Cancellation of 60 Hz (power line) interference in ECG, Canceling Donor-Heart Interference in Heart Transplant ECG, Cancellation of ECG signal from the electrical activity of chest muscle.

(Text Book – I – Chapter 2 & Text Book – II – Chapter 6)

Module III (13 Hours)

Removal of Artifacts: Canceling of Maternal ECG in fetal ECG, Cancellation of High Frequency noise in Electro-surgery.

Event Detection:

Problem Statement, The PQRST & T waves in ECG, First & Second Heart Sounds, EEG Rhythms, waves and transients. Derivative Methods for QRS Detection, The Pan-Tompkins Algorithm for QRS detection, Detection of the Dicrotic Notch, Detection of P wave. Applications: ECG rhythm Analysis, Identification of heart sounds, Detection of Aortic components of second heart sounds

(Text Book – II – Chapter 6 & Text Book – I : Chapter 4)

Text Books:

- 1) Biomedical Signal Analysis – A case Study Approach- Rangaraj M. Rangayyan – John Willey & Sons Inc-2002.
- 2) Biomedical Signal processing – Principles & Techniques – D.C Reddy – Tata McGraw Hill Companies – 2005