UEI842 BIO–MEDICAL DSP

L	T	P	Cr
3	1	0	3.5

Introduction: Characteristics of medical data, Software designof digital filters, Basic electrocardiography, ECG lead system, ECG signal characteristics, Sampling basics, Simple conversion system, Conversion requirements for biomedical signals.

Digital filters: Digital filters, The Z transform, Elements of digital filter, Types of digital filters, Transfer function of a difference equation, The Z plane pole zero plot, The rubber membrane concept, Characteristics of FIR filters, Smoothing filters, Notch filters, Window method of filter designing, Frequency sampling, Min max design, Generic equations of IIR filters, Simple one pole example, Integrators, Design methods of two pole filters, Basic design concept, Low pass integrator filter of low pass integer filter, High pass integer filters, Band pass integer filter and band reject filters, Effect of filter cascades.

Adaptive filters: Principle noise canceller model,, 50Hz adaptive canceling, Other applications of adaptive filtering, Basics of signal averaging, Signal averaging as digital filter, A typical average, Software for signal averaging , Limitations of signal averaging.

Data reduction techniques: Turning point algorithm, AZTECH algorithm, Fan algorithm, Huffman coding, SPIHT using wavelets and other techniques.

ECG Analysis: Power spectrum of ECG, Band pass filtering techniques, Differentiation techniques, Template matching techniques, A QRS detection algorithm, ECG interpretation, ST segment analyzer, Potable arrhythmia monitor.

Neurological signal processing: Brain and its potential, EEG signal and its characteristics, EEG analysis, Linear prediction theory, Auto regressive methods, Recursive parameter estimation, spectral error measure, Adaptive segmentation, Transient detection and elimination.

COURSE LEARNING OUTCOME (CLO): The student will be able to

1. Explain the concepts of DSP in biomedical.
2. Distinguish among different digital filters.
3. Explain the concept of adaptive filtering.
4. Implement different type of data reduction techniques.
5. Analyse ECG and neurological signal using DSP.

***Text Books**:*

1. *Prokis, J.G., Digital signal processing, Prentice–Hall of India Private Limited (1997).*
2. *Tomkin, W. J., Biomedical DSP, Prentice–Hall of India Private Limited (2003).*

***Reference Books**:*

1. *Carr, J., Biomedical instrumentation, PHI Learning Pvt. Limited (2008).*

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	25