GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Bio – Medical Engineering

Subject Name: **Bio-Medical Signal Processing**
Subject Code: **160305**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
4	0	2	6	70	30	50

Sr. No	Course Content	Total Hrs.
1.	**Introduction to signals and systems.**	**4**
2.	**Transform Analysis of Linear Time-Invariant System:** Frequency response of LTI system, System functions for systems with linear constant-coefficient Difference equations, Freq. response of rational system functions relationship between magnitude & phase, All pass systems, Minimum/Maximum phase systems, Linear system with generalized.	**8**
3.	**Structures for Discrete Time Systems:** Block Diagram representation of Linear Constant-Coefficient Difference equations, Basic Structures of IIR Systems, Transposed forms Basic Structures for FIR Systems, Overview of finite-precision Numerical effects, Effects of Co-efficient quantization, Effect of round off noise in digital filters, Zero input limit cycles in Fixed-point realizations of IIR filters, Lattice structures.	**8**
4.	**Filter Design Techniques:** Design of Discrete-Time IIR filters from Continuous-Time filters, Design of FIR filters by windowing Optimum approximations of FIR filters, FIR equiripple approximations.	**8**
5.	**Discrete-Fourier Transform:** Representation of Periodic sequences: The discrete Fourier series, Properties of discrete Fourier Series, Fourier Transform of Periodic Signals, Sampling the Fourier Transform, The Discrete-Fourier Transform, Properties of DFT, Linear Convolution using DFT.	**8**

6.	**Computation of Discrete-Fourier Transform:** Efficient Computation of DFT, Goertzel Algorithm, Decimation-in-Time FFT Algorithms, Decimation-in-Frequency FFT Algorithm.	**8**
7.	Introduction to DSP processor architecture and its Applications.	**4**
8.	**Biomedical Signal Analysis:** Cardiovascular System ,Arrhythmia Detection **,**QRS Detection **,** ECG Signal Analysis **,** Heart Rate Variability Analysis **,**EMG Analysis **,**EEG Signal Processing	**8**

The Practical and Term work will be based on the topics covered in the syllabus.

Text Books:

1. "Discrete Time Signal Processing:, Oppeheim, Schafer, Buck Pearson education publication, 2nd Edition, 2003.
2. "Digital Signal Processing: Principles, Algorithm & Application", Proakis, Manolakis, PHI, 2003, 3rd Edition.
3. "Digital Signal Processing: A Computer Based approach", Sanjit Mitra, McGrawHill
4. MATLAB user's guide.
5. M. Akay, (Edited), "Nonlinear Biomedical Signal Processing: Dynamic analysis and Modeling," (Vl. II), IEEE Press.