

## PEI5I103 DIGITAL SIGNAL PROCESSING

### Module-I(10hours)

#### Discrete Time System

Basic Discrete Time Signals and their classifications, Discrete time systems and their classifications, Stability of discrete time system, Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive and Non-recursive discrete time system, impulse response of LTI system, Correlation of discrete time Signal

#### The Z-Transform and Its Application to the Analysis of LTI Systems:

The Z-Transform: The Direct Z-Transform, The Inverse Z-Transform; Properties of the Z-Transform; Inversion of the Z-Transforms: The Inversion of the Z-Transform by Power Series Expansion, The Inversion of the Z-Transform by Partial-Fraction Expansion; Analysis of Linear Time-Invariant Systems in the z-Domain: Response of Systems with rational System Functions, Transient and Steady-State Responses, Causality and Stability, Pole-Zero Cancellations.

### Module-II (15hours)

#### The Discrete Fourier Transform: Its Properties and Applications

Frequency Domain Sampling: Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals, The Discrete Fourier Transform, The DFT as a Linear Transformation, Relationship of the DFT to other Transforms; Properties of the DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Additional DFT Properties; Linear Filtering Methods Based on the DFT: Use of the DFT in Linear Filtering, Filtering of Long Data Sequences; Frequency Analysis of Signals using the DFT; The Discrete Cosine Transform: Forward DCT, Inverse DCT, DCT as an Orthogonal Transform.

#### Efficient Computation of the DFT: Fast Fourier Transform Algorithms

Efficient Computation of the DFT: FFT Algorithms: Direct Computation of the DFT, Radix-2 FFT Algorithms: Decimation-In-Time (DIT), Decimation-In-Frequency (DIF); Applications of FFT Algorithms: Efficient Computation of the DFT of two Real Sequences, Efficient Computation of the DFT of a 2N-Point Real Sequence, Use of the FFT Algorithm in Linear Filtering and Correlation.

### Module-III

(10hours)

#### Structure and implementation of FIR and IIR filter:

Structure for the Realization of Discrete-Time Systems, Structure for FIR Systems: Direct-Form Structure, Cascade-Form Structures, Frequency-Sampling Structures; Structure for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures.

#### Design of Digital Filters:

General Considerations: Causality and Its Implications, Characteristics of Practical Frequency-Selective Filters; Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method;

Design of IIR Filters from Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.

**Basic adaptive filter:** System modeling and Identifications using adaptive filter

#### Text Books

1. *Digital Signal Processing – Principles, Algorithms and Applications* by J. G. Proakis and D. G. Manolakis, 4th Edition, Pearson.
2. *Digital Signal Processing – S. Salivahan, A. Vallavraj and C. Gnanapriya*, Tata McGrawHill.
3. *Digital Signal Processing: a Computer-Based Approach – Sanjit K. Mitra*, Tata McGraw Hill.

## B.Tech (E&IE/AE&I) detail Syllabus for Admission Batch 2015-16

### Reference Book :

1. *Digital Signal Processing: Tarun Kumar Rawat, Oxford university Press*
2. *Digital Signal Processing: T.J.Cavicchi, Wiley Student Edition*
3. *Digital Signal Processing – Manson H. Hayes (Schaum's Outlines) Adapted by Subrata Bhattacharya, Tata McGraw Hill.*
4. *Digital Signal Processing: Dr. Shalia D. Apte, 2nd edition Wiley Publication*
5. *Adaptive signal processing, B. Widrow and S. D. Stearns, Pearson Education*