

3/4 B.Tech-FIFTH SEMESTER

EC5T6

Digital Signal Processing

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Prerequisites: Signals and Systems (EC3T3)

Course Objectives:

- To introduce the concepts and techniques associated with discrete time signals and systems.
- To develop the representation of discrete-time signals in the frequency domain using Discrete Fourier transform (DFT).
- To learn the basic forms of FIR and IIR filters, and how to design filters with desired frequency responses.
- To Study the concepts of Multirate DSP and its applications.

Learning Outcomes:

Student will be able to

- Analyze properties of Discrete time Signals and Systems.
- Design FFT algorithms.
- Realize various digital filters for DSP applications..
- Implement the applications of DSP in speech processing and spectrum analysis.

UNIT-I

Discrete Time Signals and Systems: Introduction to Digital signal processing, Discrete time Signals, Discrete time systems, Analysis of Linear Time-Invariant Systems, Convolution, Causality and Stability.

The Z- Transform: Definition, Properties of Z-Transform, Inverse z Transform, Computation of Frequency Response, Solution of linear constant coefficient difference equations using Z Transforms

UNIT-II

The Discrete Fourier Transform (DFT): Introduction to DFT, Properties of the DFT, Circular Convolution, overlap add method, overlap save method, Relationship of DFT to other Transforms. Radix-2 Decimation-In-Time (DIT) and Decimation-In-Frequency (DIF) FFT Algorithms, Inverse FFT

UNIT-III

Design of IIR Digital Filter: Design procedure for Analog Butterworth and Chebyshev filters, Design of IIR Digital Filters using Bilinear Transformation, Analog Design using Digital Filters, Design of Digital Filters using Digital to Digital Transformation, Impulse Invariant Design.

UNIT-IV

Design of FIR Digital Filters: Introduction to FIR Filters, Design of Linear phase FIR Digital Filters using Windows (Rectangular, Bartlett, Blackman, Hamming and Hanning windows) and Frequency Sampling Method.

Realization of Discrete time systems: Realization of IIR and FIR systems-Direct, Cascade, Parallel, Ladder realizations.

UNIT-V

Multirate Digital Signal Processing: Introduction, Decimation and Interpolation by integer factor, Sampling rate conversion by Rational number, Multistage approach to sampling rate Conversion, Applications of Multirate Signal processing.

Learning Resources

Text Books:

1. Digital Signal Processing: Principles, Algorithms and Applications, John G Proakis & D. G. Manolakis, PEARSON, 4th Edition, 2007.
2. Fundamentals of Digital Signal Processing - Lonnie C Ludeman, John Wiley & Sons, 2003

References:

1. Introduction to Digital Signal Processing “Johnny R Johnson, PHI Learning, 2011
2. Theory and Application of Digital Signal Processing - Lawrence R Rabiner & Bernard Gold, Prentice Hall.

WEB REFERENCES:

1. www.nptel.iitm.ac.in
2. <http://www.ece.cmu.edu/~ee791/>
3. <http://www.ee.umanitoba.ca/~moussavi/dsp815/LectureNotes/index.html>
4. <http://cobweb.ecn.purdue.edu/~ipollak/ee438/FALL04/notes/notes.html>