B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AEC65b-PRINCIPLES OF DIGITAL SIGNAL PROCESSING

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Course Objectives: The objectives of the course are to make the students learn about

- To understand the frequency domain analysis of discrete time signals.
- To learn the properties of discrete fourier series and fourier transforms.
- To design & analyze IIR digital filters from analog filters.
- To know various structures used in implementation of FIR digital filters.
- To grasp the importance and applications of Multirate Digital signal processing.

UNIT – I:

Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, LTI system Properties. Solution of Linear constant coefficient difference equations , frequency domain representation of discrete time signals and systems. Review of Z-transforms.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze and process signals in the discrete domain. **L4**
- Determine time domain representations and frequency domain analysis of discrete-time signals and systems. **L3**

UNIT – II:

Discrete Fourier Series and Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the pproperties of discrete fourier series. **L2**
- Describe DFT using FFT algorithms. **L1**

UNIT – III:

Design of IIR Digital Filters and Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design IIR digital filters from analog filters. **L6**
- Construct IIR digital filters with different realization techniques. **L6**

UNIT – IV:

Design of FIR Digital Filters and Realizations: Characteristics of FIR Digital Filters, frequency response. Design of FIR digital filters using window techniques and frequency sampling technique, comparison of IIR & FIR filters, basic structures of FIR systems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design FIR digital filters using window techniques. **L6**
- Construct the basic structures of FIR systems. **L6**

UNIT – V:

DSP Applications: Introduction to programmable DSPs, Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor; Adaptive filters: Introduction, Basic principles of Forward Linear Predictive filter and applications such as system identification, echo cancellation, equalization of channels, and beam forming using block diagram representation study only.

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply Interpolation and Decimation with help of sampling and filtering. **L3**
- Understand the principle and applications of Forward Linear Predictive filter. **L2**

Text Books:

1. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Principles, Algorithmsand Applications", Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, "Discrete Time Signal Processing",PHI.
3. B.Venkataramani and M. Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", TATA McGraw Hill, 2002.

Reference Books:

1. Andreas Antoniou, "Digital Signal Processing", TATA McGraw Hill, 2006
2. MH Hayes, "Digital Signal Processing", Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling and Sandra L. Harris, "Fundamentals of Digital Signal Processing using Matlab", Thomson, 2007.

Course Outcomes:

At the end of this Course the student will be able to

- Articulate the frequency domain analysis of discrete time signals. **L3**
- Understand the properties of discrete fourier series and fourier transforms. **L2**
- Design & analyze IIR digital filters from analog filters. **L6**
- Design various structures used in implementation of FIR digital filters. **L6**
- Summarize the importance and applications of Multirate Digital signal processing. **L2**