INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Course Code:13EE1116

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Pre requisites: Introduction to Signals & Systems

Course Educational Objectives:

To make the student understand the basic principles of digital signal processing and to gain the necessary background knowledge for the design of digital filters. Also to get basic knowledge about dedicated DSP processors

Course Outcomes:

After completion of the course the student should be able to know how to represent discrete time signals and systems and how periodic and aperiodic discrete signals can be digitally processed. Be able to design simple filters.

UNIT-I (12 Lectures)

INTRODUCTION:

Discrete – time signals and Systems, Representations, Elementary Signals, Basic Operations on signals, Classification of Signals, Classification of Discrete time systems.

Impulse Response and Convolution Sum, Convolution of Infinite sequences, Circular shift and Circular Symmetry. Periodic or Circular Convolution. Methods of obtaining Circular Convolution Examples.

UNIT-II (12 Lectures)

DISCRETE FOURIER SERIES, DISCRETE TIME FOURIER TRANSFORM, DISCRETE FOURIER TRANSFORM & FAST FOURIER TRANSFORM

Introduction, Discrete Fourier series, Properties of DFS. Discrete Time Fourier Transform, Relation between Z-Transform and DTFT, Inverse

DTFT, Properties of DTFT, Frequency Response of DT Systems, Transfer Functions.

Discrete Fourier Transform, IDFT, Properties of DFT, Relation between Z-Transform and DFT, Linear Convolution and Circular Convolution using DFT.

Fast Fourier Transform, Decimation in time radix – 2 FFT, Decimation in frequency radix-2 FFT, Butterfly Diagram, 8 – Point DFT Calculation.

UNIT-III (12 Lectures)

INFINITE IMPULSE RESPONSE FILTERS:

Introduction, Analog Filter Fundamentals, Transformation methods, Design of IIR Filters, Low Pass Filter specifications, Design by approximation of derivatives, Impulse invariant transformation, Bilinear transformation, LP Butterworth digital filter, Chebyshev filter, Inverse Chyebshev filter, Elliptic filters, Frequency transformation.

UNIT-IV (12 Lectures)

FINITE IMPULSE RESPONSE FILTERS:

Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using windows (Rectangular, Triangular, Raised Cosine, Hanning, Hamming, Blackman and Kaiser).

UNIT-V (12 Lectures)

INTRODUCTION TO DSP PROCESSORS:

Introduction, MAC operation, Multiple Access Memory, VLIW Architecture, Pipelining, Special Addressing Modes, On-chip peripherals, Architecture of TMS320C5x.

TEXT BOOKS:

1. John G.Proakis, Dimitris G.Manolakis, *"Digital Signal Processing, Principles, Algorithms and Applications"*, Pearson Education / PHI, 3rd Edition, 2007 (UNITS – I, II, III, IV)
2. A.V.Oppenheim and R.W.Schaffer, *"Discrete – Time Signal Processing"*, PHI, 4th Edition, 2007

3. A. Anand kumar, *"Digital Signal Processing"*, PHI, Eastern Economy Edition, 2013. (UNIT – V)

REFERENCES:

1. S.K.Mitra, *"Digital Signal Processing – A practical approach"*, Pearson Education, New Delhi, 2003.
2. M.H.Hayes, *"Digital signal processing: Schaum's Outlines"*, Tata Mc-Graw Hill, 2nd Edition, 2009
3. Robert J.Schilling, Sandra L.Harris, *"Fundamentals of Digital Signal Processing using Matlab"*, Thomson, 2007.
4. Ramesh Babu, *"Digital Signal Processing"*, SCITECH Publications, 4th Edition, 2009.