



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III Year - II Semester		L	T	P	C
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DIGITAL SIGNAL PROCESSING					

Course Objectives:

The student will be able to

- Analyze the discrete-time signals and systems in time and frequency domains.
- Know the importance of FFT algorithm for computation of Discrete Fourier Transform
- Understand the various implementations of digital filter structures
- Learn the FIR and IIR Filter design procedures
- Learn the concepts of DSP Processors

UNIT I INTRODUCTION: Introduction to Digital Signal Processing: Discrete-time signals & sequences, Classification of discrete-time systems, stability and causality of LTI systems, Response of LTI systems to arbitrary inputs. Solution of linear constant coefficient difference equations. Discrete-time Fourier Transform (DTFT), Frequency domain representation of discrete-time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, System function.

UNIT II DISCRETE FOURIER SERIES & 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, Circular convolution and linear convolution using DFT.

UNIT III DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.

UNIT IV DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics of FIR Digital Filters, Frequency response. Design of FIR Digital Filters using Window technique and Frequency Sampling technique, Comparison of IIR & FIR filters. Basic structures of FIR systems.

UNIT V INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multiported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.

Architecture of ARM processors: Technical details of ARM Processors, Introduction to



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Cortex-M3 and cortex M4 processors - Processor type, processor architecture, instruction set, block diagram, memory systems.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI,2007.
2. Discrete Time Signal Processing, A. V. Oppenheim and R. W. Schaffer,PHI,2010.
3. Digital Signal Processors, Architecture, Programming and Applications, B.Venkataramani, M. Bhaskar, TMH,2002.
4. Digital Signal Processing Using the ARM Cortex M4, Donald S.Reay,2015.

REFERENCE BOOKS:

- 1 Digital Signal Processing: MH Hayes, Schaum's Outlines, TMH,2007.
- 2 Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling,Sandra L. Harris, Thomson, 2007.
- 3 Digital Signal Processing, Alan V. Oppenheim, Ronald W. Schafer, PHI Ed.,2006
- 4 Digital Signal Processing, Tarun Kumar Rawat by OXFORD Publishers

Course Outcomes:

After going through this course the student will be able to

- Formulate engineering problems in terms of DSP operations
- Analyze digital signals and systems
- Analyze discrete time signals in frequency domain
- Design digital filters and implement with different structures
- Understand the key architectural