

Course Code	Course Title	L	T	P	C
1153EC107	DISCRETE TIME SIGNAL PROCESSING	2	2	0	3

a) Course Category

Program Core

b) Preamble

Digital Signal Processing provides an introduction to the basic concepts of signal processing methods and to acquire knowledge of analysis of systems using various transformation techniques. It provides students to realize about different filter structure and also to develop algorithm for signal processing.

c) Prerequisite

Transforms and partial Differential Equations, Signals and Systems

d) Related Courses

Advanced Digital Signal Processing, Statistical Signal Processing

e) Course Outcomes

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Compute Discrete Fourier Transform for the given signals.	K3
CO2	Design the Digital Infinite Impulse Response Filters (IIR) from given Specifications	K3
CO3	Analyze different windowing and sampling techniques to design FIR filter	K4
CO4	a. Analyze the finite word length effects in filters	K4
	b. Explain the basic signal processing concepts in DSP Processor	K2
CO5	Explain the basics of Multirate Signal Processing & its Applications.	K2

f) Course Contents

UNIT I DISCRETEFOURIERTRANSFORMS 12

Introduction & Properties of DFT – Linear & Circular Convolution Methods, FFT algorithms – Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms –Use of FFT algorithms in Linear Filtering and correlation

UNIT II IIRFILTERDESIGN 12

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by using Approximation of derivatives – Impulse Invariance – Bilinear transformation, (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT III FIRFILTERDESIGN 12

Structures of FIR – Linear phase FIR filter - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques, FIR Filter structures.

UNIT IV FINITE WORD LENGTH EFFECTS & DSP PROCESSOR 12

Finite word length effects: Quantization- Truncation and Rounding errors - Quantization noise-coefficient quantization error – Product quantization error - Overflow error – limit cycle oscillations, scaling. **Introduction to DSP architecture** – Harvard architecture - Dedicated MAC unit - Multiple ALUs, Advanced addressing modes, Pipelining, Overview of instruction setC54X.

UNIT V MULTIRATE SIGNAL PROCESSING&APPLICATIONS 12

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Application-Sub band coding, Musical Sound Processing, Digital Audio sampling rate conversion, Oversampling A/D &D/A

Total 60 Hrs

g) Learning Resources

Text Books

1. John G. Proakis&DimitrisG.Manolakis, “Digital Signal Processing – Principles, Algorithms & Applications”, 4th edition, Pearson Education / Prentice Hall,2007.
2. B. Venkataramani, M. Bhaskar, “Digital Signal Processors: Architecture,Programming

and Applications”, 2nd edition, Tata McGraw-Hill Education, 2002.

Reference Books

1. S.Salivahanan, A.Vallavaraj, C Gnanapriya, “Discrete Signal Processing”, Tata McGraw-hill Publication,2002.
2. Emmanuel C..Ifeachor, &Barrie.W.Jervis, “Digital Signal Processing”, 2nd edition, Pearson Education / Prentice Hall,2002.
3. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata McGraw Hill,2007.
4. A.V.Oppenheim, R.W. Schafer and J.R. Buck, “Discrete-Time Signal Processing”, 8th Indian Reprint, Pearson, 2004.

Online Resources

1. <http://nptel.ac.in/courses/117104070/>
2. <http://nptel.ac.in/courses/117102060/>
3. <http://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/video-lectures/>
4. <http://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/study-materials/>
5. <http://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/download-resource-materials/>