B. P. Poddar Institute of Management & Technology

Department of Electronics & Communication Engineering

Academic Year: 2024-25

Lesson Plan

Course Name: Digital Signal Processing **Course Code: EC 504**

Lecture/tutorial. No.	Topics to be Covered	Text/ References	Teaching Pedagogy*
L1	Classifications of signals, Concept of frequency: continuous-time sinusoidal signal, Concept of frequency: discrete-time sinusoidal signal,	T1, T3	C&T.CD, Q, PS
L2	Advantages and Disadvantages of Digital Signal Processing, Analog-to-Digital Conversion, Sampling of Analog Signals, Quantization of Continuous-Amplitude Signals, Coding of Quantized Samples	T1, T3	C&T.CD, Q, PS
L3	Time domain representation of discrete-time signals, Some Basic sequences, Classification of discrete-time signals, Operations on discrete-time signals	T1, T3	C&T.CD, Q, PS
L4	Different discrete-time systems, Classification of discrete-time systems	T1, T2, T3	C&T.CD, Q, PS
L5	Interconnections of discrete-time systems, Techniques for analysis of linear systems, Resolution of discrete-time signal into impulses, Response of LTI systems to arbitrary inputs	T1, T3	C&T.CD, Q, PS
L6	Properties of convolution, Causal LTI systems, FIR systems, IIR systems, Recursive and Nonrecursive discrete-time systems, Direct form I and Direct form II structures of LTI systems	T1, T3	C&T.CD, Q, PS
L7	Response of LTI systems to complex and sinusoidal signals, Response of LTI systems to aperiodic input signals	T1, T3	C&T.CD, Q, PS
L8	Direct z-transform, Polar form, Inverse z-transform	T1, T3	C&T.CD, Q, PS
L9	Properties of z-transform, convolution, correlation and multiplication of two sequences, Parseval's relation, the Initial Value Theorem	T1, T3	C&T.CD, Q, PS
L10	Rational z-transform, pole location for causal signals, system function of LTI system, inverse z-transform by power series expansion	T1, T3	C&T.CD, Q, PS
L11	Inverse z-transform by partial-fraction expansion	T1, T3	C&T.CD, Q, PS

L12	Analysis of LTI systems in the z-domain, One-sided z-transform, Final Value Theorem	T1, T3	C&T.CD, Q, PS
L13	Sampling and reconstruction of continuous-time signals, sampling and interpolation of discrete-time signals	T1, T3	C&T.CD, Q, PS
L14	Discrete Fourier Transform, DFT as a Linear Transform, Relationship of DFT to Fourier series coefficients of a periodic sequence, Relationship of DFT to Fourier transform of an aperiodic sequence, Relationship of DFT to z transform, Relationship of DFT to Fourier series coefficients of a continuous-time signal, Relationship of DFT to DTFT	T1, T3	C&T.CD, Q, PS
L15	Definition of circular convolution, Properties of circular convolution, Matrix method, graphical method, tabular method of circular convolution, Properties of DFT	T1, T3	C&T.CD, Q, PS
L16	DFT computation examples, Overlap add method, Overlap save method	T1, T3	C&T.CD, Q, PS
L17	Radix-*r* FFT, Comparison of number of calculations between direct and radix-2 FFT, Decimation in Time (DIT) radix-2 FFT	T1, T3	C&T.CD, Q, PS
L18	8-point DFT using radix-2 DIT FFT	T1, T3	C&T.CD, Q, PS
L19	Decimation in Frequency (DIF) Radix-2 FFT, 8-point DFT using Radix-2 DIF FFT, Comparison of DIT and DIF Radix-2 FFT, Computation of Inverse DFT using FFT, Examples	T1, T3	C&T.CD, Q, PS
L20	Steps to design FIR filter, Advantages and disadvantages of FIR filter, LTI system as frequency selective filters	T1, T3	C&T.CD, Q, PS
L21	Ideal frequency response of linear phase FIR filters, Characteristics of practical frequency selective filters, Characteristics of FIR filters with linear phase, Windows, FIR filter design using windows	T1, T3	C&T.CD, Q, PS
L22	Spectrum of rectangular window, Gibbs phenomenon, Example of FIR LPF, Example of FIR HPF	T1, T3	C&T.CD, Q, PS
L23	Parks-McClellan algorithm	T1, T3	C&T.CD, Q, PS
L24	Introduction to IIR filters, Specifications, Impulse invariant transformation, Relation between analog and digital filter poles in impulse invariant transformation, Useful impulse invariant transformation	T1, T3	C&T.CD, Q, PS
L25	IIR filter design by Bilinear Transformation, Relation between analog and digital filter poles in Bilinear Transformation, Relation between	T1, T3	C&T.CD, Q, PS

	analog and digital frequency in Bilinear Transformation, Frequency Warping		
L26	Design of Lowpass Digital Butterworth Filter	T1, T3	C&T.CD, Q, PS
L27	Design of lowpass digital Chebyshev filter	T1, T3	C&T.CD, Q, PS
L28	Concept of probability, conditional probability, and total probability	T1, T3	C&T.CD, Q, PS
L29	PMF, CDF, PDF, expectation, variance, and standard deviation	T1, T3	C&T.CD, Q, PS
L30	Distribution functions	T1, T3	C&T.CD, Q, PS
L31	Applications of probability and statistics in communication system	T1, T3	C&T.CD, Q, PS
L32	Non-parametric spectral estimation	T1, T3	C&T.CD, Q, PS
L33	Application of DSP, Origin of wavelets	T1, T3	C&T.CD, Q, PS
L34	Digital filter banks, Biorthogonal and orthogonal wavelets	T1, T3	C&T.CD, Q, PS
L35	Discussions on previous year questions		C&T, Q, CD, PS
L36	Discussions on previous year questions		C&T, Q, CD, PS
L37	Discussions on model questions		C&T, Q, CD, PS