Course code: Course Title	Course Structure			Pre-Requisite
SE313: Digital Signal Processing	L	T	P	NIL
	3	1	0	

Course Objective: The objective of the course is to understand and learn the basics of digital signal processing.

S. NO	Course Outcomes (CO)
CO1	Understand and classify the signal continuous time and discrete time signals and systems, and describe the characteristics.
CO2	Define and describe the frequency domain representation of discrete time signals and systems, and different properties.
CO3	Demonstrate the concepts, representation, and properties of discrete Fourier transform, fast Fourier transform, and Z- transform.
CO4	Understand and evaluate the difference equations of digital systems.
CO5	Analyze the finite impulse response (FIR) systems and infinite impulse response (IIR) systems and evaluate the different methods in IIR filter design and FIR filter design.

S. NO	Contents	Contact Hours
UNIT 1	**Introduction:** Introduction to Signal-continuous time and Discrete time signals and systems, characteristics of discrete time sinusoidal signals. **Discrete–time description of signals and systems:** Representation of elementary sequences, signal classification, basic operations, classification of discrete time systems. Linear convolution.	6
UNIT 2	**Frequency Domain Representation of Discrete - Time Signal and Systems:** Discrete time Fourier transform (DTFT). Different properties of DTFT. Frequency domain representation of linear time invariant system.	6
UNIT 3	**Discrete Fourier Transform (DFT):** Introduction, Fourier representation of periodic signal DFT, properties of DFT. Linear convolution using the DFT. **Fast Fourier Transform (FFT):** Decimation- in- time and Decimation- in-frequency FFT Algorithms (Radix 2 only).	10
UNIT 4	**Z-Transform:** Introduction, region of convergence for the Z-transform. The Inverse Z-transform. The Inverse Z-transform. One sided Z-transform. Solution of difference equation using Z-transform. System function.	6
UNIT 5	**Realization of Digital Systems:** System describe by difference equation, recursive and non-recursive systems, linear constant coefficient difference equation, Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) systems, Direct, cascaded and parallel form structure for IIR system. Direct and cascaded form structure for FIR system	6
UNIT 6	**IIR Filter Design:** Impulse invariance, Bilinear transform method, Butterworth filter. **FIR FILTER DESIGN:** FIR versus IIR, Linear phase FIR filter, FIR filter design by Rectangular, Hanning and Hamming window.	8
	TOTAL	42

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint

1	Alan V. Oppenheim, Ronald W. Schafer, "Digital Signal Processing", PHI.	**1988**
2	B. P. Lathi, "Principles of Linear Systems and Signals", Oxford, 2nd Edition.	**2009**
3	A. K. Mitra, "Digital Signal Processing", PHI.	**2009**
4	John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson, 5th Edition.	**2021**