Course Facilitator: Lavanya Kovvuru		**L**	**T**	**P**	**C**
	Course/subject Name: Signals and Systems	**3**	**1**		**4**
	Total Contact Hours: 70				
	Prerequisite: Ordinary differential equations and Integrals				

Course Objective:

- Understand the representation of continuous time and discrete time signals and be able to do the transformations on them
- Use the convolution tool to find the response of an Linear Time Invariant Systems
- Express any periodic waveform in terms of linear combination of harmonically related signals
- Provide the knowledge about the principles behind the Fourier transform in both CT and DT
- Understand how Laplace Transforms converges for a broader class of signals than does the Fourier Transform
- Analyze the discrete time systems using Z - Transforms
- Give the knowledge about the most important issues in sampling and reconstruction

Syllabus:

Unit-I: Basics of Signals and Systems

Introduction, Representation of signals, Continuous time and discrete time signals, Exponential and sinusoidal signals, Transformations of the independent variable, Elementary signals in CT and DT, Expressing signals in terms of elementary signals**,** Continuous and discrete time systems, Basic system properties

Unit-II: Linear Time Invariant Systems

Introduction, Discrete Time LTI Systems: The convolution sum, Continuous Time LTI Systems: The convolution Integral, Properties of LTI systems

Unit-III: Signals in Frequency Domain

Introduction, Response of LTI systems to complex exponentials, Fourier series representation of periodic continuous time signals, Convergence of Fourier series, Properties of continuous time Fourier series, Representation of Aperiodic signals:

Continuous time Fourier transform, Fourier transform of periodic signals, Properties of continuous time Fourier transform, Discrete Time Fourier Transform and its properties

UNIT -IV: Laplace Transforms

Introduction, The Region of Convergence for Laplace transforms, Inverse Laplace transform, Properties of Laplace transform, Analysis and Characterization of LTI systems using Laplace transform, Unilateral Laplace transform

UNIT -V: Z-Transforms

Introduction, The Region of convergence for the Z-Transform, The inverse Z-Transform, Properties of Z-Transforms, Analysis and Characterization of LTI systems using Z-Transforms, Unilateral Z-Transforms

UNIT -VI: Sampling

Introduction, Representation of continuous time signals by its samples, Sampling theorem, Reconstruction of signal from its samples, Effect of under sampling: Aliasing

Lecture Plan:

Lecture No	Lecture name	Topics	Video reference
1	Basics of Signals and Systems	Introduction to the course and basic concepts	Lecture 1
2		Signals and their Transportation	Lecture 2
3		Elementary signals	Lecture 3
4		Characterization of signals	Lecture 4
5	LTI Systems	Basic concepts of Linear Time Systems	Lecture 5
6		Convolution Inevitability, & Stability Causality	Lecture 6
7		Stability Unit, Step Response and Differential Equations	Lecture 7
8		Systems described by Differential & Difference Equations	Lecture 8
9	Signals in Frequency Domain	Fourier Series	Lecture 9
10		More About Fourier Series (With Uncomfortable Questions)	Lecture 10

11		Those Uncomfortable Questions about the Existence of Fourier & Series and Some More	**Lecture 11**
12	Continuous Time Fourier Transform	Introduction to Fourier Transform	**Lecture 12**
13		Fourier Transform of Periodic Function & Fourier Transform Properties	**Lecture 13**
14		More Properties of Fourier Transformation	**Lecture 14**
15		Modulation, Convolutions and Other Interesting Properties of Fourier Transform	**Lecture 15**
16		A Deeper Look at the Modulation Property of Fourier Transform	**Lecture 16**
17	Discrete Time Fourier Transform	More About Fourier Transform of Discrete Time Signals	**Lecture 17**
18		Further Look into the Properties of DTFT	**Lecture 18**
19		Convolution, Modulation & Other Properties of DTFT	**Lecture 19**
20	Laplace Transforms	Introduction to Laplace Transform	**Lecture 20**
21		Region of Convergence of Laplace Transform & Properties of Laplace Transform	**Lecture 21**
22		Properties of Laplace Transform (Contd.)	**Lecture 22**
23		Concluding Discussion on Laplace Transform	**Lecture 23**
24	Z-Transforms	Introduction to Z Transform	**Lecture 24**
25		Properties of Z Transform	**Lecture 25**
26		Further Discussion on Properties of Z Transform	**Lecture 26**
27	Sampling	Introduction to sampling	**Lecture 27**
28		More About Sampling	**Lecture 28**

Text books:

1. Allan V Oppenheim. , S. Wilsky and S. H. Nawab, “Signals and systems", 2nd edition, PHI
2. B.P.LATHI," Signal Processing and Linear Systems", Barkley Cambridge Press