

Branch Name:	Information and Communication Technology
Program Code:	ET107
Course Title:	Signals and Systems
Course Code:	2ET1070401T
Pre-requisite:	Basic Mathematics

Course Objectives:

1. To train students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, image processing, communication theory
2. To study continuous and discrete-time signals and systems, their properties and representations and methods those are necessary for the analysis of continuous and discrete time signals and systems
3. To study frequency-domain representation and analysis concepts using Fourier analysis tools, Laplace Transform and Z-transform

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory(Marks)				Practical(Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Elementary signals, classification and representation of continuous time and discrete time signals, signal operations, continuous time and discrete time systems–classification, properties, differential equation representation of continuous time systems, difference equation representation of discrete time systems	8	20	
2	Continuous time LTI systems and convolution integral, discrete time LTI systems and linear convolution, stability and causality of LTI systems, correlation between signals	8	20	
3	Frequency domain representation of continuous time signals-continuous time Fourier series and its properties, convergence, continuous time Fourier transform and its properties, Laplace transform, ROC, Inverse transform, properties, relation between Fourier and Laplace transforms, Analysis of LTI systems using Laplace and Fourier transforms. Concept of transfer function, Frequency response, Magnitude and phase response.	10	25	

4	Z-transform, ROC, inverse transform, properties, frequency domain representation of discrete time signals, discrete time Fourier series and its properties, discrete time Fourier transform (DTFT) and its properties, relation between DTFT and Z-Transform, Analysis of discrete time LTI systems using Z-transforms and DTFT, Transfer function	10	25
5	Sampling & Reconstruction- Representation of digital signals, The Sampling Theorem, Sampling with a zero order hold, Reconstruction of a signal from its samples using interpolation, Aliasing and its effects.	4	10

Course Outcome:

The student will be able to:

1. Define, represent, classify and characterize basic properties of continuous and discrete times signals and systems
2. Outline the relation between convolutions, correlation
3. Represent the CT signals in Fourier series and interpret the properties of Fourier transform and Laplace transform
4. Determine z transforms, inverse z transforms and analyze LTI systems using z transform

List of References:

1. Alan V. Oppenheim and Alan Willsky, Signals and Systems, PHI, 2/e, 2009
2. Simon Haykin, Signals & Systems, John Wiley, 2/e, 2003
3. Signals and Systems by K. Gopalan, Cengage Learning (India Edition)
4. Digital Signal Processing Fundamentals and Applications by Li Tan, Elsevier, Academic Press

E-Resources:

1. SCILAB
2. NPTEL Videos
3. MIT open course ware website
4. MATLAB

Course Learning Outcomes(CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Generations of various types of signals	2 Understanding 3 Applying
CLO2	Discretization using different sampling rate and observing aliasing effect.	3 Applying 4 Analyze
CLO3	Appreciate use of transforms in analysis of signals and system	3 Applying 4 Analyze
CLO4	Simulation of continuous time LTI system.	3 Applying 4 Analyze
CLO5	Computing FT and DTFT of the CT signals and DT sequences.	3 Applying 4 Analyze

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	H	M	L	M	M				M		L	H	M		
CLO2	M	M	M	L	M	M				M			M	L		
CLO3	H	M	M	L	M	H				L		L	M	H		
CLO4	H	M	M	L	M	M				M			M	H		
CLO5	H	M	M	H	M	H				L	M	M	H	H		

H:High, M:Medium, L:Low