

Sardar Patel Institute of Technology Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	Т	P	L	Т	Р	Total
ET34	Signals & Systems	3	1		3	1		4
		Examination Scheme						
		ISE			MSE	ESE		
		10			30	100 (60% Weightage)		

Pre-requisite Course Codes		e Codes	BS31 (Applied Mathematics I)				
After successful completion of the course, student will be able to							
	CO1	1 Classify and illustrate various operations on signals and systems.					
	CO2	Interpret and analyze LTI systems and report results.					
	CO3	Analyze the properties of a continuous and discrete time signal in frequency					
Course		domain and observe the spectrum.					
Outcomes	CO4	Analyze the system characteristics and evaluate the system response using Z -					
		Transform					
	CO5	Evaluate sys	stem response using Laplace - Transform which is useful in				
		understandi	ng behavior of Electronics circuits and communication systems.				

Module	Unit	Topics	Ref.	Hrs.
No.	No.			
1		Overview of Signal and Systems	1,2,	08
			3,4	
	1.1	Introduction:		
		Signals, systems, elementary signals, exponential, sine, step, impulse, ramp, rectangular, triangular and operations on signals		
	1.2	Classification of signals: Continuous and discrete time, deterministic and non deterministic, periodic and aperiodic, symmetric (even) and asymmetric (odd), energy and power, causal		
		and anti-causal signals.		
	1.3	Classification of systems: Static and dynamic, time variant and		
		time invariant, linear and nonlinear, causal and noncausal, stable		
		and unstable systems.		
2		Time domain analysis of Continuous Time and Discrete Time	1,3,	08
		systems	4,6	
	2.1	Linear Time Invariant (LTI) systems: Representation of systems using differential /difference equation, Impulse, step and		



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		exponential response, total response of a system, system stability, convolution, impulse response of interconnected systems, auto- correlation, cross correlation, properties of correlation, analogy between correlation and convolution, examples on applications of LTI systems		
3		Signals in Frequency Domain	1,2, 5	12
	3.1	Fourier series : Orthogonal representation of signals, magnitude and phase spectra, Gibbs phenomenon, Parsevel's relation, analogy between Continuous Time Fourier Series (CTFS) and Discrete Time Fourier Series (DTFS), Sampling theorem, sampling of continuous time signals.		
	3.2	Fourier Transform : Fourier Transform and Inverse Fourier Transform on periodic and non-periodic signals, limitations of Fourier Transform and need for Laplace and z-Transform, Properties of Fourier Transform, Parsevel,s relation, Energy and power spectral density and bandwidth. definition and problems on DTFT.		
4		Z-Transform Analysis	1,6, 7	08
	4.1	Z-Transform: z-Transform of finite and infinite duration sequences, properties, relation between discrete time Fourier Transform and z-Transform, Inverse z-Transform, one sided z–Transform.		
	4.2	Analysis of LTI Systems with Z- Transform: Transfer Function, causality and stability of systems, frequency response, Solution of difference equation using z- Transform		
5		Analysis of Systems with Laplace Transform and State Space Model	1,5, 6	06
	5.1	Analysis of LTI Systems with Laplace Transform: Transfer Function, causality and stability of systems, frequency response, relation between Laplace Transform and z–Transform, Solution of differential equation using Laplace Transform		
	5.2	State Space Model: Procedure to determine state equations, State equations from transfer function, Laplace transform solution of state equations		
			Total	42

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References:

- [1] B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
- [2] Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems", Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
- [3] Simon Haykin and Barry Van Veen "Signals and Systems", John Wiley & Sons, 2001.Reprint 2002
- [4] Nagoor Kani, Signals and Systems, Tata McGraw Hill, Third Edition, 2011.
- [5] C.L. Phillips et al., (2003) Signals, Systems and Transforms, (3rd Edition), Prentice Hall
- [6] Ganesh Rao and SatishTunga, "Signals and Systems", Sanguine Technical Publishers, 2004
- [7] H. P Hsu, R. Ranjan, "Signals and Systems", Scham" s outlines, TMH, 2006

E Books/signals and systems video links

- 1. NPTEL lecture Video on Signals and Systems by Prof. S.C.Dutta Roy, http://www.satishkashyap.com/2012/04/iit-video-lectures-on-signals-and.html
- 2. NPTEL lecture Video on Signals and Systems by Prof. T.K. Basu, IIT Kharagpur
- 3. MIT Open Course video lectures

https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/