DEPARTMENT CORE COURSE-3 (DCC)
EC205- SIGNALS AND SYSTEMS

Details of course: -

Course Title	Course Structure			Pre-Requisite
	L	T	P	
Signals and Systems	3	0	2	Knowledge of basic of mathematics and physics

Course Objective: Describe signals and systems mathematically in time domain and transform domains, and demonstrate the mathematical modeling of signals and systems in engineering.

Course Outcomes:

1. Classification of signals and systems with understanding of LTI system
2. Apply various transform techniques for the analysis and design of continuous time signals on LTI systems.
3. Apply various transform techniques for the analysis and design of discrete time signals on LTI systems
4. Appraise sampling theorem, reconstruction of a signal from its discrete samples.
5. Analyze LTI systems using power/energy spectral density.

S. No.	Content	Contact Hours
Unit 1	Introduction: Basic concepts & definitions of continuous and discrete time Signals & their classification, continuous & discrete time system and their properties, elementary Signals. Linear time invariant systems response for continuous time systems and discrete time systems. Properties of continuous and discrete LTI systems. System representation through differential equations and difference equations.	8
Unit 2	Introduction to Fourier Transform Analysis: continuous and discrete time Fourier series and its properties, Fourier Transform for continuous and discrete time signals/system. Concept of bandwidth estimation for signal and system. Magnitude and phase spectra of continuous and discrete time signal, response of LTI system using Fourier transform. Application Fourier transform as linear filtering.	10
Unit 3	The Laplace Transform. The Region of Convergence for Laplace Transforms. The Inverse Laplace Transform. Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot. Properties of the Laplace Transform. Some Laplace Transform Pairs. Analysis and Characterization of LTI Systems Using the Laplace Transform. System Function Algebra and Block Diagram Representations. The Unilateral Laplace Transform.	8
Unit 4	Z-Transform: Basic principles of z-transform, z-transform definition, Relationship between z-transform and Fourier transform, Region of Convergence, Properties of ROC, Properties of z-transform, Poles and Zeros,	8

	Inverse z-transform using Contour integration, Residue Theorem, Power Series expansion and Partial fraction expansion.	
Unit 5	Sampling: Representation of continuous time signals by its sample –Types of sampling, sampling theorem, aliasing. Reconstruction of a Signal from its samples. Mathematical Background: Representation of signals using ortho-normal basis functions. Power and Energy spectral density. Correlation functions. Hilbert Transform and its properties. Pre-envelope and Complex Envelope.	8
	Total	42

Books:-

S. No	Name of Books/Authors/Publisher
1	Signals & Systems by Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, Pearson, 2nd Edition, Pearson Education,2013.
2	Signal & Systems by Simon Haykin and Barry Van Veen; 2nd Edition, John Wiley & Sons, 2007.
3	Linear Systems and Signals by B.P. Lathi, Oxford Publication, 2nd Edition, 2009.
4	Schaum's Outline of Signals and Systems, 4th Edition, by HweiP. Hsu, McGraw Hill, 2020.
5	Fundamentals of Signals and Systems, 2nd Edition by Roberts, McGraw Hill, 2007.
6	Signal & Systems by Tarun Kumar Rawat, Oxford University Press, 2020, 2nd edition