ETUA20181: SIGNALS AND SYSTEMS

Unit.No	Unit Name	Resource		Topics
1	Introduction to Signals		1	Definition of signal (Signals related to Communication, control systems etc.)
			2	Elementary signals: exponential, sine, step, impulse and its properties, ramp, rectangular, triangular, signum, sinc.
			3	Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration,
			4	Operations on signals: time scaling, time shifting and folding, precedence rule.
			5	Sketch signal from mathematical equation
			6	Write mathematical equation of signal from sketch
			7	Classification of signals: Continuous time and discrete time, even/odd, deterministic/ non deterministic
			8	Classification of signals: periodic/non periodic, energy and power.
2	Introduction to Systems		1	Definition of system, Classification of system: linear/non-linear
			2	Classification of system: time variant/invariant, causal/non-causal
			3	Classification of system: static/dynamic, stable/unstable, invertible/non-invertible
			4	System modeling: Input output relation, impulse response, block diagram, integro-differential equation.
			5	block diagram, integro-differential equation.
3	Linear Time Invariant (LTI) System Analysis		1	Definition of convolution, convolution integral, computation of convolution integral using

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				graphical method and mathematical definition for following signals: unit step with unit step, unit step with exponential
			2	convolution integral: exponential with exponential and unit step with rectangular, rectangular with rectangular only.
			3	Computation of convolution sum by mathematical definition
			4	Computation of convolution sum by graphical method, matrix multiplication
			5	Properties of convolution, system interconnection
			6	system properties in terms of impulse response, step response in terms of impulse response
			7	Numericals
4	System Analysis in Frequency Domain using Fourier Transform		1	Definition and necessity of continuous time (CT) and discrete time (DT) Fourier series and Fourier transforms.
			2	Analogy between continuous time Fourier series (CTFS), discrete time Fourier series (DTFS) and continuous time Fourier transform (CTFT), discrete time Fourier transform (DTFT).
			3	continuous time Fourier series (CTFS),
			4	continuous time Fourier transform (CTFT) and its properties
			5	problem solving using properties, amplitude spectrum, phase spectrum.
			6	Interplay between time and frequency domain.
			7	Numericals
5	Laplace Transform		1	Limitations of Fourier transform (FT) and need of Laplace transform (LT).

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			2	Definition and properties of Laplace transform (LT)
			3	Region of convergence (ROC) and pole zero concept
			4	Application of Laplace transforms to the Linear Time Invariant (LTI) system analysis.
			5	Inversion using duality, numerical based on properties
			6	Signal analysis using Laplace transform (LT).
6	Correlation and Spectral Analysis		1	Definition of Correlation and Spectral Density
			2	correlogram, comparison between computation of correlation and convolution
			3	auto-correlation and its properties
			4	cross correlation and its properties
			5	energy/power spectral density, properties of correlation and spectral density
			6	relation between correlation and spectral density