FR. Conceicao Rodrigues College Of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Electronics Engineering

Subject: Signals and Systems (PCE-ELX 604) **Credits-5**

T.E. (Electronics) (Semester 6)(2018-19)

1.Syllabus

Module No.	Unit No.	Topics	Hrs.
1.		**Continuous and Discrete Time Signals**	8
	1.1	Mathematical Representation and Classification of CT and DT signals, Orthogonality of signals	
	1.2	Arithmetic operations on the signals, Time Shifting, Time scaling, Time Reversal of signals	
	1.3	Sampling and Reconstruction, Aliasing effect	
2		**Continuous and Discrete Systems**	8
	2.1	Mathematical Representation and classification of CT and DT systems	
	2.2	Properties of LTI systems, impulse and step response.	
	2.3	Use of convolution integral, convolution sum and correlation for analysis of LTI systems	
	2.4	Properties of convolution integral and convolution sum	
3		**Frequency Domain Analysis of Continuous Time System using Laplace Transform**	6
	3.1	Concept of Complex frequency, Region of Convergence for Causal, Non-causal and Anti-causal systems, Poles and Zero of transfer function	
	3.2	Unilateral Laplace Transform	
	3.3	Analysis and characterization of LTI system using Laplace Transform: Impulse and Step Response, Causality, Stability, Stability of Causal system	
4		**Frequency Domain Analysis of Discrete Time System using Z Transform**	12
	4.1	Need for Z transform, definition, properties of unilateral and bilateral Z Transform, mapping with s plane, relationship with Laplace transform	
	4.2	Z transform of standard signals, ROC, poles and zeros of transfer function, Inverse Z transform	
	4.3	Analysis and characterization of LTI system using Z transform: impulse and step response, causality, stability, stability of causal system	
	4.4	System realization-Direct, Direct Canonic, Cascade and Parallel forms	
5		**Frequency Domainc Analysis of Continuous Signals**	6
	5.1	Frequency Domain Analysis of periodic non-sinusoidal signals	
	5.2	Frequency Domain Analysis of aperiodic Signals-Introduction, Properties of Fourier Transform, Fourier Transform based amplitude and phase response of standard signals, Relationship with Laplace and Z transform, Energy Spectral	
6		**Frequency Domain Analysis of Discrete Signals**	8
	6.1	Discrete Time Fourier Series, Evaluation of DTFS coefficients, Magnitude and Phase Spectrum of Discrete time periodic signals, Power Spectral Density	
	6.2	Discrete Time Fourier Transform – Concept of discrete time signal in frequency domain, definition of DTFT, determination of magnitude and phase functions using DTFT	
		Total	48

2.Course outcome

Upon completion of this course students will be able to:

ELX604.1: Differentiate and classify CT and DT signals and systems

ELX604.2 :Understand time domain analysis of CT and DT system

ELX604..3 :Analyse CT and DT system using Laplace and Z transform

ELX604.4 :Apply frequency domain techniques for analysis of CT and DT systems.

3. Relationship of course outcomes with program outcomes: indicates 1-low importance,2-Moderate importace,3-High importance in each mapping cell

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
ELX 604.1	3												3	
ELX 604.2	3	2												
ELX 604.3	3												2	
ELX 604.4	3			2									2	

4.CO Assessment Tools:

Course Outcome	***Direct Method***				***Indirect method***
	Unit Tests		Tutorial	End Sem Exam	Course exit survey
	1	2			
ELX604.1	30%	--	20%	50%	100%
ELX604.2	30%		20%	50%	100%
ELX604.3	--	40%	--	50%	100%
ELX604.4	--	40%	--	50%	100%

CO calculation= (0.8 *Direct method + 0.2*Indirect method)

5.Curriculam Gap /content beyond syllabus (if any)

6.Lecture plan

CLASS		TE Electronics, Semester VI	
Academic Term		Jan – April 2019	
Subject		**Signals and Systems (ELX 604)**	
Periods (Hours) per week	***Lecture***	***4***	
	Practical	***--***	
	Tutorial	***2***	
Evaluation System		***Hours***	***Marks***
	Theory examination	3	80
	Internal Assessment	--	20
	Practical Examination	--	--
	Oral Examination	--	--
	Term work	--	25
	Total	--	125
Time Table	***Day***	***Time***	
	Monday	9.45-10.45 am	
	Wednesday	1.30 – 2.30 pm	
	Thursday	9.45-10.45 am	
	Thursday(Tutorial)	2.30-4.30 pm	
	Friday	11.00 – 12.00 pm	
	Friday(Tutorial)	2.30-4.30 pm	

Course Content and Lesson plan

Module 1 **Continuous And Discrete Time Signals**

	Lecture No.	Date		Topic	Remarks(If any)
		Planned	Actual		
	1	1-1-19	1-1-19	Introduction to Signals and Systems, Classification of CT and DT signals	
	2	2-1-19	2-1-19	Mathematical representation and arithmetic operations on the signals	
	3	3-1-19	3-1-19	Examples based on arithmetic operations on the signals	
	4	4-1-19	4-1-19	Transformation of independent variable for CT signals and problems on it	
	5	7-1-19	7-1-19	Transformation of independent variable for DT signals and problems on it	
	6	8-1-19	8-1-19	Mathematical representation and classification of CT and DT signal	
	7	9-1-19	9-1-19	Problems based energy and power of CT and DT signal	
	8	10-1-19	10-1-19	Problems based energy and power of CT and DT signal	
	9	11-1-19	11-1-19	Problems based on periodicity of signals	
	10	14-1-19	14-1-19	Sampling and reconstruction, aliasing effect	
Module 2 **Continuous and Discrete system**					
	11	16-1-19	16-1-19	Mathematical representation and classification of CT and DT sytem	
	12	17-1-19	17-1-19	Problems based on classification of CT system	

	13	18-1-19	18-1-19	Problems based on classification of DT system	
	14	21-1-19	21-1-19	Use of convolution integral for analysis of LTI systems	
	15	23-1-19	23-1-19	Use of convolution sum for analysis of LTI systems	
	16	24-1-19	24-1-19	Problems based on convolution integral/sum.	
	17	25-1-19	25-1-19	Problems based on convolution integral/sum	
5	18	28-1-19	28-1-19	Problems based on convolution integral/sum	
	19	30-1-19	30-1-19	Problems based on system properties in terms of impulse response	
	20	1-2-19	1-2-19	Problems based on system properties in terms of impulse response	
	21	7-2-19	7-2-19	Revision of module 1 and 2	**UT1: 4,5,6 Feb2019**
Module 3 **Frequency Domain Analysis of Continuous Time System Using Laplace Transform**					
	22	8-2-19	8-2-19	Need of Laplace transform and review of Laplace transform	
	23	11-2-19	11-2-19	Properties of Laplace transform and inverse of Laplace transform, Concept of ROC and poles and zeros	
	24	18-2-19	18-2-19	Unilateral Laplace transform	Euphoria 13,14,15 Feb2019

	25	20-2-19	20-2-19	Analysis and characterization of LTI system using Laplace transform: impulse and step response	
	26	21-2-19	21-2-19	causality, stability, stability of causal system	
	27	22-2-19	22-2-19	Block diagram representation	
Module 4 **Frequency Domain Analysis of Discrete Time System Using Z Transform**					
7	28	25-2-19	25-2-19	Need of Z transform and its definition, properties of unilateral and bilateral Z transform	
	29	27-2-19	27-2-19	mapping of Z transform with s plane, relationship with Laplace transform	
	30	28-2-19	28-2-19	Z transform of standard signals, ROC, poles and zeros of transfer function	
	31	1-3-19	1-3-19	inverse Z transform	
	32	6-3-19	6-3-19	Analysis and characterization of LTI system using Z transform: impulse response	
	33	7-3-19	7-3-19	Analysis and characterization of LTI system using Z transform: step response, causality, stability and stability of causal system	
	34	8-3-19	8-3-19	Problems on causality and stability	
	35	11-3-19	11-3-19	Problems on Block diagram representation	
	36	13-3-19	13-3-19	Problems on system realisation	
Module 5 **Frequency Domain Analysis of Continuous Signals**					
	37	14-3-19	14-3-19	Frequency domain analysis of periodic non sinusoidal signal	

	38	18-3-19	18-3-19	Frequency domain analysis of aperiodic non sinusoidal signal	
	39	20-3-19	20-3-19	Properties of Fourier transform,	
	40	22-3-19	22-3-19	Fourier transform based on amplitude and phase response standard signal	
	41	25-3-19	25-3-19	Relationship between Laplace and ZT	
Module 6 **Frequency Domain Analysis of Discrete Signals**					
	42	27-3-19	27-3-19	Discrete time Fourier series	
	43	28-3-19	28-3-19	Evaluation of DTFS coefficient,Magnitude and phase spectrum Concept of DTFT and numericals based on that	
	44	29-3-19	29-3-19	Numericals based on DTFT(Contd…)	
	45	1-4-19	1-4-19	Determination of magnitude and phase function using DTFT	
	46	3-4-19	3-4-19	Problems from university papers	**UT2:8,9,10 April 2019**

Recommended Books:

1. Alan V. Oppenheim, Alan S. Willsky, and S. Hamid Nawab, "*Signals and Systems*", 2nd Edition, PHI learning, 2010.
2. Tarun Kumar Rawat, "*Signals and Systems*", Oxford University *Press 2010.*
3. John Proakis and Dimitris Monolakis, "*Digital Signal Processing*", Pearson Publication, 4th Edition.

7.Tutorials

8 tutorials will be conducted covering each topic in syllabus