JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

II Year-I Semester		L	T	P	C
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	SIGNALS AND SYSTEMS				

CourseObjectives:
Themain objectives of thiscoursearegiven below:
- Tostudyabout signalsand systems.
- ToanalyzethespectralcharacteristicsofsignalusingFourierseriesandFouriertransforms.
- Tounderstandthecharacteristicsofsystems.
- Tointroducetheconceptofsampling process
- Toknowvarious transformtechniquestoanalyzethesignals andsystems.

UNIT- I: INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonalfunctions, Mean square error, closed or complete set of orthogonal functions, Orthogonality incomplex functions. Related problems.

UNIT–II: FOURIER SERIES AND FOURIER TRANSFORM:

Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relationbetween Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform, Related problems.

UNIT-III: ANALYSIS OF LINEAR SYSTEMS: Introduction**,** Linear system, impulseresponse, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV)system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTIsystem, Related problems. Filter characteristics of linear systems. Distortion less transmission through asystem, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidthand risetime.

UNIT–IV:
CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction ofsignal from noise by filtering.
SAMPLINGTHEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling –Aliasing, Introduction to Band Pass sampling, Relatedproblems.

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UNIT–V:

LAPLACE TRANSFORMS: Introduction**,** Concept of region of convergence (ROC) forLaplace transforms, constraints on ROC for various classes of signals, Properties of L.T's,Inverse Laplace transform, Relation betweenL.T's, and F.T. of a signal. Laplace transformofcertain signals usingwaveform synthesis.

Z–TRANSFORMS: Concept of Z-Transform of a discrete sequence. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms. Distinction between Laplace, Fourierand Z transforms.

TEXTBOOKS:
1. Signals, Systems&Communications-B.P.Lathi, BS Publications, 2003.
2. Signals and Systems-A.V. Oppenheim, A.S. Willsky and S.H. Nawab,PHI, 2ndEdn, 1997
3. Signals & Systems-Simon Haykinand Van Veen, Wiley, 2ndEdition, 2007

REFERENCEBOOKS:
1. PrinciplesofLinearSystemsandSignals–BPLathi,OxfordUniversityPress,2015
2. SignalsandSystems–TK Rawat,Oxford University press,2011

CourseOutcomes: At the end of this course the student will able to:
- Differentiate the various classifications of signals and systems
- Analyze the frequency domain representation of signals using Fourier concepts
- Classify the systems based on their properties and determine the response ofLTISystems.
- Know the sampling process and various types of sampling techniques.
- Apply Laplace and z-transforms to analyze signals and Systems (continuous&discrete).