B.Tech II Year I Semester

SIGNALS AND SYSTEMS

Course Code: 21EC305PC **L/T/P/C 3/0/0/3**

Course Objectives

- To understand various fundamental characteristics of signals and systems.
- To study the importance of transform domain.
- To analyze and design various systems.
- To study the effects of sampling.

Course Outcomes: Upon successful completion of the course, students will be able to:

- Classify the signals and systems and determine the response of the systems.
- Analyze the spectral characteristics of signals and systems
- Design the continuous-time and discrete-time systems

UNIT I

Representation of Signals:

Continuous time and Discrete Time signals, Classification of Signals – Periodic and aperiodic, even and odd, energy and power signals, deterministic and random signals, complex exponential and sinusoidal signals. Concepts of Impulse function, Unit step function, Signum function. Various operations on Signals.

Signal Transmission through Linear Systems:

Classification of Continuous time and discrete time Systems, impulse response, Response of a linear system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley -Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT II

Signal Analysis:

Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Closed or complete set of orthogonal functions

Fourier Series Representation of Periodic Signals:

Representation of Fourier series, Continuous time periodic signals, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum, Gibb's Phenomenon.

UNIT III

Fourier Transforms:

Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signals, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms

Laplace Transforms:

Concept of region of convergence (ROC) for Laplace transforms. Properties of ROC. Relation between Laplace Transforms and Fourier transform of a signal. Introduction to Hilbert Transform.

UNIT IV

Convolution and Correlation of Signals:

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Properties of Convolution, Concepts of correlation, properties of correlation. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation**.**

Sampling Theorem:

Representation of continuous time signals by its samples - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals.

UNIT V

Z –Transforms:

Basic principles of z-transform, region of convergence, properties of ROC, Properties of z- transform , Poles and Zeros. Inverse z-transform using Contour integration, Residue Theorem, Convolution Method and Partial fraction expansion.

TEXT/ REFERENCE BOOKS

1. Signals, Systems and Communications - B.P. Lathi, BS Publications, 2009.
2. Signals and Systems – Alan V.Oppenheim, Alan S.Willsky and S.Hamid Nawab,2nd Edition, PHI.
3. Signals and Systems- A.Anand Kumar, 2nd Edition, PHI,2012
4. Signals and Systems -Simon Haykin and Barry Van Veen, 2nd Edition, John Wiley.
5. Signals and Systems- Cengage Learning, Narayana Iyer, 2011.
6. Signals, Systems and Transforms –C.L.Philips,J.M Parr and Eve A. Riskin,3rd Edition, Pearson, 2004 .
7. Signals and Systems Schaum's Outlines - HWEI P. HSU , Tata Mc Graw Hill, 2004.