EC3T3   **Signals and Systems**   **Credits: 4**

Lecture : 4 periods/week   **Internal assessment: 30 marks**
Tutorial: 1 period /week   **Semester end examination: 70 marks -------**
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Course Objectives:

- To introduce the basic concepts of signals, system modeling, and system classification.
- To understand time-domain and frequency-domain approaches to the analysis of continuous and discrete systems.
- To provide necessary tools and techniques to analyze various systems.
- To Develop Mathematical and computational skills needed in application areas like communications and signal processing.

Learning Outcomes:

At the end of this course, the Student will be able to

- Understand the classification of signals and systems.
- Get familiarized with the behavior of Linear Time Invariant Systems.
- Describe the concepts of Fourier series and Fourier Transform.
- Get familiarized with sampling and Reconstruction of Signals and Z-transforms.

UNIT- I
Introduction: Transformations of Independent Variables, Basic Continuous Time Signals, Basic Discrete Time Signals, Systems, Properties of Systems, Linear Time-invariant Systems.

UNIT- II
Linear Time Invariant (LTI) Systems: Representation of Signals in terms of Impulses, Discrete Time LTI Systems, Convolution Sum, Continuous Time LTI Systems, Convolution Integral, Properties of LTI Systems.

UNIT- III
Analogy between Vectors and Signals: Analogy between vectors and signals, Orthogonal Vector and Signal Spaces. Approximation of a Function by a Set of Mutually Orthogonal Functions, Mean square error, closed or complete set of orthogonal functions, orthogonally in complex functions.

UNIT- IV
Fourier Series : Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric and Exponential Fourier series, Complex Fourier spectrum.

UNIT- V

Fourier Transform: Aperiodic Signals and Continuous Fourier Transform, Periodic Signals and Continuous Fourier Transform, Properties of Fourier Transform, Frequency Response Characterized by Linear Constant Co-efficient Differential Equations.

UNIT- VI

Fourier analysis of Discrete-time signals: Discrete Fourier Series (DFS), Properties of DFS, Discrete-time Fourier Transform (DTFT), Periodic Signals and DTFT, Properties of DTFT.

UNIT- VII

Sampling: Sampling theorem – 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.

UNIT- VIII

Z-Transform: Z-transform of a Discrete Sequence, Region of Convergence for the Z-transform, Inverse Z-transform, Properties of Z-transform, Relation Between Z and Fourier Transform

Learning Resources

Text Books:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edition, 1996.
2. Signals, Systems and Communication - B. P. Lathi, BS Publication, 2003

References:

1. Signals & Systems - Simon Haykin and Van Veen,Wiley India Pvt Ltd, 2nd Edition, 2007.
2. Fundamentals of Signals and Systems - Michel J. Robert, MGH International Edition, 2008