

EM3T2

SIGNALS AND SYSTEMS

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Course Objectives:

Signals and Systems course brings the Continuous-time and Discrete time concepts together in a unified way and plays an important role in the engineering students preparation for the current and future developments in their chosen fields

Learning Outcomes:

The Student will be able to

- Understand the classification of signals and systems.
- Describe the concepts of Fourier series, Fourier Transform.
- Get familiarize with the behavior of Linear Time Invariant System.
- Get familiarize with ESD, PSD and L ,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, orthogonality 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 Edn.
2. Signals, Systems and Communication, B. P. Lathi, BS Publication.

Reference Books:

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