

2/4 B.Tech - THIRD SEMESTER

EC3T3

Signals and Systems

Credits: 3

Lecture: 3 periods/week

Internal assessment: 30 marks

Tutorial/Interaction Session: 1 period/week

emester end examination: 70 marks

Prerequisites: Engineering Mathematics (EC1T1)

Course Objectives:

- To introduce the basic concepts of signals, system classification and system modeling.
- To understand time-domain and frequency-domain approaches to the analysis of continuous and discrete-time 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:

Student will be able to

- Analyze various signals and systems in time domain and frequency domain.
- Determine the response of an LTI system to arbitrary input signals.
- Apply the concepts of Fourier series, Fourier Transform and Laplace transforms to solve engineering problems.
- Sample and Reconstruct Signals.

UNIT- I

Introduction: Transformations of Independent Variables, Basic Continuous Time Signals, Basic Discrete Time Signals, Systems, Properties of Systems, Linear Time-Invariant (LTI) Systems, Convolution Sum, Convolution Integral, Properties of LTI Systems.

UNIT- II

Fourier analysis of Continuous-time signals: Fourier series, Convergence of Fourier series, Trigonometric and Exponential Fourier series, Fourier Transform, Properties of Fourier Transform, Fourier transform of periodic signals, Frequency Response Characterized by Linear Constant Co-efficient Differential Equations.

UNIT- III

Laplace Transforms: Introduction, Region of convergence (ROC) for Laplace transforms, Constraints on ROC for various classes of signals, Properties of Laplace Transforms, Inverse Laplace transform, Relation between Laplace transform and Fourier transform.

UNIT- IV

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

UNIT- V

Z-Transforms: Definition, Region of Convergence of Z-transform, Properties of Z-Transform, Inverse Z Transform, Analysis of LTI systems using Z Transforms.

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.

Learning Resources

Text Books:

1. Signals and Systems – Alan V Oppenheim, Alan S Willsky and Young, PHI/Pearson, 2003.

References:

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

Web Resources:

1. [http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Signals%20and %20System/TOC-M1.htm](http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Signals%20and%20System/TOC-M1.htm)
2. <http://www.stanford.edu/~boyd.ee102>
3. <http://www.ece.gatech.edu/users/bonnie/book>
4. <http://ocw.mit.edu>