SIGNALS AND SYSTEMS

(Core Subject)

Course Code:	10B11EC301	**Semester:**	3rd Semester, B. Tech (ECE) 4th Semester, B. Tech (CSE/IT)
Credits:	4	**Contact Hours:**	L-3, T-1, P-0

Course Objectives

1. To study the properties and representation of discrete and continuous signals.
2. To study the analysis and synthesis of discrete time systems.
3. To study the sampling process and analysis of discrete systems using z-transforms.
4. To represent periodic signals using Fourier series
5. To find the spectral components of signals using Fourier transform
6. To analyze continuous signals using Laplace transform
7. To analyze discrete signals using z- transform.

Course Outcomes

Students will be able to

1. Classify signals and systems based on their properties and determine the mathematical representations of signals and systems.
2. Explain the role of convolution in the analysis of LTI systems and also able to formulate and solve differential /difference equations describing LTI systems.
3. Analyze the spectral characteristics of signals using Fourier analysis and analyze system properties based on impulse response and Fourier analysis.
4. Apply the Laplace transform and Z- transform for analysis of continuous-time and discrete-time signals and systems.
5. Understand the process of sampling and the effects of under sampling.

Course Contents

Unit	Topics	References (chapter number, page no. etc)	Lectures
1.	Continuous-time and discrete-time signals, signal energy and power, periodic signals, even-odd signals, exponential and sinusoidal signals, Unit impulse and step functions, continuous and discrete time systems, System classifications, system properties.	A.V. Oppenheim: Chapter 1 B.P. Lathi: Chapter 1 & 8	8
2.	Convolution integral and convolution sum, properties of LTI systems, LTI systems described by differential and difference equation, response of LTI systems.	A.V. Oppenheim: Chapter 2 B.P. Lathi: Chapter 2 & 9	5
3	Fourier series representation of continuous and discrete time signals, properties, Fourier	A.V. Oppenheim : Chapter 3-5 B.P. Lathi: Chapter 3, 4	13

	Transform representation of continuous-time and discrete time signals, properties, system characterization by linear constant coefficient difference equation.	& 10	
4	The Laplace Transform, ROC, properties of Laplace-transform, analysis and characterization of LTI systems using Laplace Transform.	A.V. Oppenheim : Chapter 9 B.P. Lathi: Chapter 6	6
5	The z-transform, ROC and pole-zero-plot, properties of z-transform, analysis and characterization of LTI systems using z-transform. Stability criterion.	A.V. Oppenheim : Chapter 10 B.P. Lathi: Chapter 11	7
6	Sampling, types of sampling, Analog to digital conversion, Signal reconstruction.	A.V. Oppenheim : Chapter 7 B.P. Lathi: Chapter 5	3
		Total Number of Lectures	**42**

Evaluation Scheme

1. Test 1 : 15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
    - 10 Marks : Class performance, Tutorials & Assignments
    - 10 Marks : Quizzes
    - 5 marks : Attendance

Text Books

1. A.V. Oppenheim & A.S. Willsky & S.H. Nawab, "Signals & Systems", 2nd Ed., Prentice Hall.

Reference Books

1. B.P. Lathi, "Signal Processing and Linear Systems", 2nd Ed., Oxford University Press.
2. Simon Haykin, Barry Van Veen, "Signal & Systems", 2nd Ed., John Willey and Sons.