Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Second Year Bachelor of EC Engineering

Subject Code: EC307- N	Subject Title: SIGNALS AND SYSTEMS

Course Objective:

- To understand different types of signals and systems
- To provide sound knowledge in different transforms in the analysis of signals and systems

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	Total Marks
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
03	00	02	05	04	03	70	30	20	30	150

Outline of the Course:

Sr. No.	Title of the Unit	Hours
1	Signals and Systems	5
2	Liner Time-invariant System (Continuous and Discrete Time)	9
3	Fourier Transform and Its Application	9
4	Laplace Transform	7
5	Z-Transform	8
6	State Variable Analysis	10

Total hours (Theory): 48

Total hours (Tutorial): 32

Total hours: 80

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Detailed Syllabus:

Unit No.	Topic	Lecture Hours	Weightage (%)
1.	**Signals and Systems:** Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.	05	**10**
2.	**Liner Time-invariant System (Continuous and Discrete Time):** Linear shift-invariant (LSI) systems impulse response and step response, convolution, input output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.	09	**20**
3.	**Fourier Transform and Its Application:** Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases,	09	**20**
4.	**Laplace Transform:** The Laplace Transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.	07	**20**
5.	**Z-Transform:** The z-Transform for discrete time signals and systems- Eigen functions, region of convergence z-domain analysis	08	**15**
6.	**State Variable Analysis:** State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.	10	**15**
	Total	**48**	**100**

Instructional Method and Pedagogy (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Learning Outcomes:

At the end of this course, the student would be able

1. Analyze different types of signals

2. Represent continuous and discrete systems in time and frequency domain using different transforms

3. Investigate whether the system is stable

4. Sampling and reconstruction of a signal

Text Books:

1. Oppenheim A. V. & Schafer R. W., Signals and Systems, Pearson Education
2. Proakis J. G. & Manolakis D. G., Digital Signal Processing, Principles, algorithms & applications, Pearson Education.
3. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
4. Signals and Systems by Tarun Rawat Pub: Oxford

Reference Books:

1. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
2. Simon Haykin & Barry Van Veen, Signals and Systems, Wiley-India.
3. D. Ganesh Rao & Satish Tunga, Signals and Systems, Sanguine Technical Publishers
4. Roy Choudhury, Networks & Systems, New Age International publishers
5. S.Palani , Signals and Systems, Ane Books Pvt.Ltd

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LIST OF EXPERIMENTS

Sr. No.	Experiment Title
1.	Generations and capturing various continuous time signals from sensors.
2.	Generation and capturing of discrete time signals and plot them.
3.	Discretization using different sampling rate and observing aliasing effect.
4.	Observing the effects of lower sampling rate and higher sampling rate on CT signal.
5.	Performing various operations on the signal using circuits and computational software.
6.	Using digital circuit building block to perform operations on signals.
7.	Simulation of continuous time LTI system.
8.	Simulation of discrete time LTI systems
9.	Obtaining impulse response of the systems.
10.	Computing FT and DTFT of the CT signals and DT sequences.
11.	Study and use of Spectrum Analyzer