Kadi Sarva Vishvavidyalaya, Gandhinagar
Bachelor of Engineering (Electrical Engineering Syllabus)

B.E Semester: Vth (EE)

Subject Name & code: Signals and Systems (EE-506)

Course Objective:

- This course aims to give an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing (including audio, image and video processing), communication theory, and system theory, control, and robotics.

A. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Examination Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EE-506	Signals and Systems	3	0	0	3	3	3	70	30	20	0	120

Introduction:

Classification of Signals, Transformation of Independent Variable, Energy and Power Signals, Periodic Signals, Even/ Odd Signals, Exponential and Sinusoidal Signals, Discrete Time Signal representation, Operations upon Signals; Sampling, Aliasing and Sampling Theorem; Classification of Systems, System Modeling, Invertability, Ideal, Energy and Power Signals, Related Examples.

Analysis of LTI Continuous-time System – Time Domain and Frequency Domain:

Properties of Elementary Signals, Linear Convolution Integral, Response of Causal LTI systems Described by Differential Equations; Fourier Series and its Properties; Fourier Transform and its properties, Fourier Transform of Periodic Signals; The Laplace Transform, One sided (Unilateral) and Two Sided (Bilateral) Laplace Transform, Properties of Laplace Transform, Inverse Laplace Transform, Laplace Transform of LTI Differential Equation and their solutions, Related Examples.

Analysis of LTI Discrete-time Systems – Time Domain and Frequency Domain

Properties of Discrete-time Sequences, Linear Convolution, Difference Equations, Fourier Series of Discrete-time Periodic Signals; Z- transform Analysis of Discrete-time system, Z-transform properties, Inverse Z-Transform, Response of LTI Discrete-time Systems using Z-Transform, Related Examples.

Discrete Fourier Transform and Fast Fourier Transform

Discrete Fourier Transform (DFT), its properties; DFT-errors and their minimization; Fast Fourier Transform (FFT), FFT algorithm (Radix-2), Decimation in Time and Decimation in Frequency, Related Examples.

B. **Lesson Planning:**

SR No.	Lectures (Hours)	Weigh tage in % in Exam	Topic
1	06	30	Classification of Signals, Transformation of Independent Variable, Energy and Power Signals, Periodic Signals, Even/ Odd Signals, Exponential and Sinusoidal Signals, Discrete Time Signal representation, Operations upon Signals;
2	02		Sampling, Aliasing and Sampling Theorem
3	04		Classification of Systems, System Modeling, Invertability, Ideal, Energy and Power Signals
4	06	30	Properties of Elementary Signals, Linear Convolution Integral, Response of Causal LTI systems Described by Differential Equations; Fourier Series and its Properties
5	04		Fourier Transform and its properties, Fourier Transform of Periodic Signals
6	04		The Laplace Transform, Properties of Laplace Transform, Inverse Laplace Transform, Laplace Transform of LTI Differential Equation and their solutions
7	05	20	Properties of Discrete-time Sequences, Linear Convolution, Difference Equations, Fourier Series of Discrete-time Periodic Signals
8	04		Z- transform Analysis of Discrete-time system, Z-transform properties, Inverse Z-Transform, Response of LTI Discrete-time Systems using Z-Transform
9	05	20	Discrete Fourier Transform (DFT), its properties; DFT-errors and their minimization
10	05		Fast Fourier Transform (FFT), FFT algorithm (Radix-2), Decimation in Time and Decimation in Frequency
	45	100	

C. **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.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures, which carries five marks in overall evaluation.
- One internal exam will be conducted of 30 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students for each unit/topic and will be evaluated at regular interval. It carries a weightage of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted having a share of five marks in the overall internal evaluation.

D. STUDENTS LEARNING OUTCOME:

- Understand the concept of a signal and a system; evaluate the periodicity of a signal; Identify properties of continuous-time systems such as linearity, time-invariance, and causality.
- Compute convolution of continuous-time functions; Concept of the impulse response functions of a linear system, its use to describe the input/output relationship.
- Compute the Fourier series representation of a periodic function; Evaluate the response of a linear time-invariant system to periodic inputs.
- Evaluate the Fourier transform of a continuous function, and be familiar with its basic properties. Relate it to the Laplace transform.

E. SUGGESTED BOOKS:

Text Books:

1. I. J. Nagrath, S. N. Sharan, " Signals and Systems" , Tata Mc Graw Hill Publication

Reference Books:

1. Alan V Oppenheim, Alan S Willsky and A Hamid Nawab, "Signal and Systems", Pearson Education Asia/ PHI.
2. B. P. Lathi, "Linear Systems and Signals", Oxford University Press.
3. Ganesh Rao and Satish Tunga, "Signals and Systems", Sanguine Technical Publishers.
4. N. G. Palan, "Digital Signal Processing", Tech Max Publication.
5. A. G. Phadke, "Power System Relaying"