PARUL UNIVERSITY - Faculty of Engineering and Technology

Department of Computer Science & Engineering

SYLLABUS FOR 4th Sem BTech PROGRAMME

Signals and Systems (203105257)

Type of Course: BTech

Prerequisite: Basic Knowledge of Digital Electronics, Basic Electronics

Rationale: This course will provide strong foundation on signals ans systems which will be useful for understanding communication and signal processing. The student will learn continuous and discrete time signals and systems. This course will be foundation for learning digital signal processing,

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
				External		Internal			
Lect Hrs/	Tut Hrs/	Lab Hrs/		T	P	T	CE	P	
3	0	0	3	60	-	20	20	-	100

Lect - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	**Unit 1: Introduction to Signals and Systems**: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.	15%	7
2	**Unit 2: Behavior of continuous and discrete-time LTI systems**: Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.	30%	14

3	**Unit 3: Fourier, Laplace and z- Transforms**: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The DiscreteTime Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.	40%	17
4	**Unit 4: Sampling and Reconstruction**: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.	15%	7

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

Reference Books:

1. Signals & Systems
   Oppenheim & Wilsky, Oppenheim& Wisk; Printice Hall India Publication
2. “Digital Signal Processing: Principles, Algorithms, & Applications”,
   Proakis, J.G., & Manolakis, D.G.,; Prentice Hall of India.
3. Signals and Systems
   K. Gopalan; Cengage Learning; India Edition
4. Signals and Systems
   Simon Haykin; Wiley Publication
5. Linear Systems and Signals
   B.P.Lathi; Oxford University Press
6. Signals and systems
   H. P. Hsu; Schaum’s series, McGraw Hill Education, 2010
7. Fundamentals of Signals and Systems
   Govind Sharma,Michael J. Roberts; TATA McgrawHill

Course Outcome:

After Learning the course the students shall be able to:

At the end of this course, students will demonstrate the ability to
1.Understand working of logic families and logic gates.
2.Design and implement Combinational and Sequential logic circuits.
3.Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4.Be able to use PLDs to implement the given logical problem.