GLOBAL INSTITUTE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)
COURSE CATALOGUE
REGULATIONS B.TECH – GR - 25
ELECTRONICS AND COMMUNICATION ENGINEERING
II YEAR I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods Per Week			Credits	Scheme of Examination Max Marks		
				L	T	P		CIA	SEE	Total
THEORY										
EC301PC	Probability Theory and Stochastic Processes	PCC	CORE	3	0	0	3	40	60	100
EC302PC	Signals and Systems	PCC	CORE	3	1	0	4	40	60	100
EC303PC	Electronic Circuit Analysis	PCC	CORE	3	0	0	3	40	60	100
EC304PC	Digital Logic Design	PCC	CORE	3	0	0	3	40	60	100
EC305PC	Control Systems Engineering	PCC	CORE	2	0	0	2	40	60	100
MS306HS	Quantitative Aptitude and Logical Reasoning	HSMC	Foundation	2	0	0	2	40	60	100
PRACTICAL										
EC307PC	Modelling and Simulation Lab	PCC	CORE	0	0	2	1	40	60	100
EC308PC	Electronic Circuit Analysis Lab	PCC	CORE	0	0	2	1	40	60	100
EC309PC	Digital Logic Design Lab	PCC	CORE	0	0	2	1	40	60	100
EC310SD	Verilog Programming Lab	SDC	Skill	0	0	2	1	40	60	100
			Total Credits	**16**	**1**	**8**	**21**			

COURSE CONTENT

PROBABILITY THEORY AND STOCHASTIC PROCESS								
II Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC301PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. **COURSE OVERVIEW**

A Probability Theory and Stochastic Processes (PTSP) course provides a deep understanding of random phenomena, covering probability concepts, random variables, stochastic processes (like Markov chains), and noise.

2. **COURSE OBJECTIVE**

The students will try to Learn:

1) This gives basic understanding of random variables and operations that can be performed on them.
2) To know the Spectral and temporal characteristics of Random Process.
3) To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

3. **COURSE OUTCOMES**

After successful completion of the course, students should be able to:

CO 1	Understand the concept of Probability, sample space. Know about Random variable and Distribution & Density functions.
CO 2	Perform operations on single and multiple Random variables.
CO 3	Determine the Spectral and temporal characteristics of Random Signals.
CO 4	Determine the spectral characteristics of Random Process.
CO 5	Understand the concepts of Noise and Information theory in Communication systems

4. **COURSE CONTENT**

UNIT - I

Probability: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events. Random Variables- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

UNIT – II

Operations on single Random Variable: Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable- Monotonic and Non-monotonic Transformations of Continuous and Discrete Random Variable, Generation of a Random Variable of a given PDF/CDF

UNIT - III

Multiple random variables and Operations on Multiple random variables: Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density– Point and Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution (Proof not expected). Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT - IV

Random processes– Temporal characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and WideSense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, MeanErgodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, CrossCorrelation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response– Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT - V

Random processes– Spectral characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output. Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

5. TEXT BOOKS

1) Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles, 4th Ed, TMH, 2001.
2) Murray R Spiegel, John Schiller, R. Alu Srinivasan, Probability and Statistics– Schaum's Outlines, 3ed., McGraw Hill Education.

6. REFERENCE BOOKS

1) P.RameshBabu, Probability Theory and Random Processes– McGraw Hill Education.
2) Athanasios Papoulis and S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes– McGraw Hill Education, 4ed.
3) K. N. Hari Bhat, K. Anitha Sheela and Jayant Ganguly, Probability Theory and Stochastic Processes for Engineers- Pearson, 1ed., 2011.
4) TaubandSchilling, Principles of Communication systems, TMH, 2008.
5) Y.Mallikarjuna Reddy, Probability Theory and Stochastic Processes, 4ed. Edition, University Press.

7. ELECTRONIC RESOURCES

https://nptel.ac.in/courses/111102111

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**2**
CO 2	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**3**
CO 3	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**2**
CO 4	**3**	**2**	**-**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**3**
CO 5	**3**	**2**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**3**	**2**

COURSE CONTENT

SIGNALS AND SYSTEMS								
II Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC302PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**1**	**-**	**4**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil				**Total Classes: 64**		
Prerequisite: Nil								

1. COURSE OVERVIEW

The course provides the fundamental mathematical tools to analyze how systems respond to inputs by examining signals, covering topics like signal classification, linear time-invariant (LTI) systems, convolution, and transforms such as Fourier, Laplace, and Z-transforms.

2. COURSE OBJECTIVE

The students will try to Learn:

1) Classify signals and systems and their analysis in time and frequency domains.
2) Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
3) Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4) Identify the need for sampling of CT signals, types and merits and demerits of each type.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Characterize various signals, systems and their time and frequency domain analysis, using transform techniques.
CO 2	Understand and apply the concepts of Fourier series and Fourier transforms for analysis of signals.
CO 3	Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
CO 4	Understand and apply Laplace, their properties for analysis of signals and systems. correlation and PSD functions for various applications.
CO 5	Use sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles. Apply the Z-Transfors, their properties for analysis of signals and systems.

4. COURSE CONTENT

UNIT – I

Signal Analysis: Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT – II

Fourier series: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT – III

Signal Transmission through Linear Systems: Linear System, Impulse response, Response of a Linear System, Linear Time Invariant(LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time. Extraction of Signal from Noise by Filtering.

UNIT – IV

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

Correlation: Auto Correlation and Cross Correlation Functions, Relation between Convolution and Correlation, Properties of Correlation Functions, Energy Density Spectrum, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Parseval's Theorem, Detection of Periodic Signals in the presence of Noise by Correlation.

UNIT – V

Sampling theorem: Graphical and analytical proof of Sampling Theorem for Base band/Band Limited and Band Pass Signals, Types of Sampling: Impulse Sampling, Natural and Flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

5. TEXT BOOKS

1) B.P. Lathi -Signals, Systems & Communications, BSP, 2013.
2) A.V. Oppenheim, A.S. Willsky and S.H. Nawabi -Signals and Systems, 2^{nd} Ed., Prentice Hall.

6. REFERENCE BOOKS

1) Simon Haykin and Van Veen, A. Rama Krishna Rao, -Signals and Systems, TMH, 2008.
2) Michel J. Robert - Fundamentals of Signals and Systems, MGH International Edition, 2008.
3) C. L. Philips, J. M. Parr and Eve A. Riskin -Signals, Systems and Transforms, 3^{rd} Ed., PE, 2004.

7. ELECTRONIC RESOURCES

https://onlinecourses.nptel.ac.in/noc21_ee28/preview

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**
CO 2	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**
CO 3	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**
CO 4	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**
CO 5	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**

COURSE CONTENT

ELECTRONIC CIRCUIT ANALYSIS								
II Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC303PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVERVIEW

This course provides a foundation in how electrical circuits, both analog and digital, function by studying their basic components and their interaction.

2. COURSE OBJECTIVE

The students will try to Learn:

1) Learn the concepts of Power Amplifiers.
2) To give understanding of tuned amplifier circuits
3) Understand various multivibrators using transistors and sweep circuits.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Analyze and classify multistage amplifier configurations and determine the impact of coupling schemes on amplifier performance and frequency response.
CO 2	Apply the hybrid-π transistor model to evaluate high-frequency behavior of common-emitter amplifiers and calculate gain-bandwidth product.
CO 3	Examine feedback amplifier types and assess the influence of negative feedback on gain stability, bandwidth, and distortion.
CO 4	Design and analyze LC, RC, and crystal oscillators based on the Barkhausen criterion to generate sinusoidal waveforms.
CO 5	Design power amplifiers and multivibrator circuits, and evaluate their performance in terms of efficiency, distortion, and waveform generation

4. COURSE CONTENT

UNIT - I:

Multistage Amplifiers: Classification of Amplifiers, Distortion in Amplifiers, Coupling schemes: RC, Transformer, Direct coupling, Frequency response of multistage amplifiers, Transistor configuration choice in cascade amplifiers, Cascade and Cascode amplifiers, Darlington pair amplifier. High-Frequency.

Transistor Model: Hybrid-π model, Hybrid-π parameters: Conductances and capacitances, CE short-circuit current gain, Gain with resistive load and gain-bandwidth product.

UNIT - II:

Feedback Amplifiers: Concept and need for feedback in amplifiers, Types and classification of feedback amplifiers, Characteristics of negative feedback: Gain stability, bandwidth, noise, distortion, Voltage series, Voltage shunt, Current series, Current shunt configurations.

UNIT - III:

Oscillators: Principle of positive feedback, Barkhausen Criterion for oscillations, LC Oscillators: Generalized analysis, Hartley, Colpitts, RC Oscillators: RC phase shift, Wien bridge, Crystal oscillator: Working and advantages.

UNIT - IV:

Power Amplifiers and Tuned Amplifiers: Classification: Class A, B, AB, C, Series-fed Class A amplifier, Transformer-coupled Class A amplifier, Class B amplifier: Push-pull, Complementary Symmetry, Efficiency calculations and Crossover distortion, Concept of Tuned Amplifiers: Single Tuned and Double Tuned Amplifiers.

UNIT - V:

Multivibrators: Analysis and design of Bistable, Monostable and Astable multivibrators and Schmitt Trigger using transistors. Time Base Generators: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators, Linearity improvement techniques.

5. TEXT BOOKS

1) Jacob Millman, Christos C Halkias - Integrated Electronics, McGraw Hill Education.
2) J. Millman, H. Taub and Mothiki S. PrakashRao - Pulse, Digital and Switching Waveforms –2nd Ed., TMH, 2008.

6. REFERENCE BOOKS

1) David A. Bell - Electronic Devices and Circuits, 5th Ed., Oxford.
2) Robert L. Boylestead, Louis Nashelsky - Electronic Devices and Circuits theory, 11th Ed., Pearson, 2009
3) Ronald J. Tocci - Fundamentals of Pulse and Digital Circuits, 3rd Ed., 2008.
4) David A. Bell - Pulse, Switching and Digital Circuits, 5th Ed., Oxford, 2015.

7. ELECTRONIC RESOURCES

https://onlinecourses.nptel.ac.in/noc23_ee34/preview

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**-**	**-**	**-**	**-**	**1**	**3**	**3**
CO 2	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**3**	**3**
CO 3	**3**	**3**	**3**	**1**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**3**	**3**
CO 4	**3**	**3**	**3**	**1**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**3**	**3**
CO 5	**3**	**3**	**3**	**1**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**1**	**3**	**3**

COURSE CONTENT

DIGITAL LOGIC DESIGN								
II Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC304PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 48**		
Prerequisite: Nil								

1. COURSE OVERVIEW

Course is about to design and analyze digital circuits and systems using fundamental principles of binary numbers, Boolean algebra, and logic gates.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand common forms of number representation in logic circuits.
2) To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3) To understand the concepts of combinational logic circuits and sequential circuits.
4) To understand the Realization of Logic Gates Using Diodes & Transistors.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Apply Boolean algebra and minimization techniques to simplify Boolean functions
CO 2	Design combinational circuits using logic gates
CO 3	Analyze latches and flip-flops to design sequential logic circuits.
CO 4	Construct synchronous sequential circuits combining flip-flops and logic gates.
CO 5	Utilize programmable logic devices in digital system design.

4. COURSE CONTENT

UNIT - I

Number Systems: Number-Base conversion, Binary Arithmetic, Complements of Numbers, Arithmetic operations with Signed numbers, Digital Codes, Error Detection and Correction codes: Parity check and Hamming code.

Boolean algebra: Basic theorems and properties, Simplification using Boolean Algebra, Canonical and Standard form, Digital Logic Gates Overview

UNIT - II

Simplification of Boolean Functions: Karnaugh Maps– 2, 3, and 4variables, Sum-of-products (SOP) and product-of-sums (POS) simplification, NAND and NOR implementation, don’t care conditions.

Combinational Logic Design: Design procedure, Binary Adder and Subtractor, Decimal Adder, Code conversion, Magnitude comparator, Decoders and Encoders, Multiplexers and Demultiplexers, Boolean Function Implementation. Dataflow, Structural and Behavioral modeling of Combinational logic circuits using Verilog HDL

UNIT – III

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another. Dataflow modeling of Sequential logic circuits using Verilog HDL.

UNIT - IV

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers - Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters. Structural modelling of Sequential logic circuits using Verilog HDL.

UNIT – V

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo- N Counters. Behavioural modelling of Sequential logic circuits using Verilog HDL.

Programmable Logic Devices: Memory devices- RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL).

5. TEXT BOOKS

1) M. Morris Mano and Michael D. Ciletti, Digital Design. With an Introduction to Verilog HDL, Pearson Education, 6ed., 2018.
2) Samir Palnitkar, Verilog HDL, A Guide to Digital Design and Synthesis, Pearson Education, 2ed. 2008.

6. REFERENCE BOOKS

1) Zvi Kohavi &Niraj K. Jha, Switching and Finite Automata Theory, Cambridge, 3ed, 2010.
2) R.P.Jain, "Modern Digital Electronics", Tata McGraw Hill, 4ed., 2009.
3) Thomas L. Floyd, "Digital Fundamentals", Pearson, 11ed., 2015.
4) Charles H. Roth Jr., Larry L. Kinney, Fundamentals of Logic Design, Cengage Learning, 6ed.

7. ELECTRONIC RESOURCES

https://onlinecourses.nptel.ac.in/noc21_ee39/preview

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**3**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**
CO 2	**3**	**2**	**2**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**3**
CO 3	**2**	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**
CO 4	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**
CO 5	**3**	**2**	**3**	**1**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**2**

COURSE CONTENT

CONTROL SYSTEMS ENGINEERING								
II Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC305PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		2	**-**	**-**	**2**	**40**	**60**	**100**
Contact Classes: 32	Tutorial Classes: Nil	Practical Classes: Nil				**Total Classes: 32**		
Prerequisite: Nil								

1. COURSE OVERVIEW

The course begins with description with circuit elements, sources. Understanding of various interesting network theorems applied to solve linear, time invariant network problems efficiently in time and s-domain. Steady and transient solution of network problems with various sources including impulse source.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To introduce the fundamental concepts, classifications, and mathematical modeling of control systems for mechanical and electrical domains.
2) To analyze control system behaviour in time and frequency domains and stability criteria using root locus, Bode plot, Nyquist plot, etc.
3) Design and evaluate compensators and controllers to improve system performance.
4) Explain state-space representation, solution of state equations, and assess system controllability and observability.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Describe open- and closed-loop systems, and develop mathematical models using block diagrams and signal flow graphs.
CO 2	Analyze time response of second-order systems using time-domain specifications, and assess stability using Routh-Hurwitz criterion and root locus techniques.
CO 3	Analyse frequency response plots including Bode, Polar, and Nyquist plots, and investigate system stability.
CO 4	Design compensators and controllers to meet specific performance criteria in control systems.
CO 5	Apply the state-variable approach and analyze controllability and observability.

4. COURSE CONTENT

UNIT - I

Control System fundamentals: Classification of control systems, Open and Closed loop systems. Mathematical modeling of mechanical systems and their conversion into electrical systems. Block diagram reduction and Signal flow graphs

UNIT - II

Time response Analysis: Transfer function and Impulse response, types of input. Transient response of second order system for step input. Time domain specifications. Types of systems, static error coefficients, Routh- Hurwitz criterion for stability.

Root locus techniques: Analysis of typical systems using root locus techniques. Effect of location of roots on system response.

UNIT - III

Frequency response Analysis: Frequency domain specifications, bode plots, Gain margin and Phase Margin. Polar plot, Nyquist plot, and Nyquist criterion for stability

UNIT-IV

Compensators and controllers: Introduction to compensators, Lag compensator, Lead compensator, Lag- Lead compensator, Design of compensators using bode plot. Introduction to controllers, P, I, D, PI, PD, PID controllers.

UNIT – V

State space representation: Concept of state and state variables. State models of linear time invariant systems, State transition matrix, Solution of state equations. Controllability and observability.

5. TEXT BOOKS

1) I.J. Nagrath and M. Gopal, Control System Engineering, 5ed., New Age Publishers, 2009.
2) Benjamin C. Kuo, Automatic Control Systems, 7ed., PHI, 2010.

6. REFERENCE BOOKS

1) K. Ogata, Modern Control Engineering, 2ed., Prentice Hall, 2010.
2) M. Gopal, Control Systems: Principles and Design, Tata McGraw-Hill, 1997.
3) Norman S. Nise, Control Systems Engineering, 5ed., John Wiley & Sons, 2007.
4) A. K. Jairath, Solutions and Problems of Control Systems, CBS Publishers, 2013.
5) A. Nagoor Kani, Control Systems, 2ed., RBA Publications, 2007.

7. ELECTRONIC RESOURCES

https://nptel.ac.in/courses/107106081

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**3**	**2**
CO 2	**2**	**3**	**2**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**3**
CO 3	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**3**	**2**
CO 4	**2**	**3**	**3**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**2**	**3**
CO 5	**3**	**2**	**1**	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**1**	**3**	**2**

COURSE CONTENT

<table>
<tr><th colspan="9">QUANTITATIVE APTITUDE AND LOGICAL REASONING</th></tr>
<tr><td colspan="9">II Year - I Semester: ECE</td></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">MS306HS</td><td rowspan="2">Foundation</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
<tr><td>2</td><td>-</td><td>-</td><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td>Contact Classes: 32</td><td>Tutorial Classes: Nil</td><td colspan="4">Practical Classes: Nil</td><td colspan="3">Total Classes: 32</td></tr>
<tr><td colspan="9">Prerequisite: Nil</td></tr>
</table>

1. COURSE OVERVIEW

The **Quantitative Aptitude and Logical Reasoning** course is designed to strengthen numerical ability, analytical thinking, and problem-solving skills required for competitive examinations, campus placements, and professional aptitude tests. The course covers fundamental arithmetic, algebra, data interpretation, and logical reasoning techniques, enabling learners to analyze problems systematically, apply appropriate methods, and arrive at accurate solutions efficiently. Emphasis is placed on speed, accuracy, and logical thinking to enhance overall aptitude and decision-making skills.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To answer general problems in his everyday life within in short time and to improves the certain skills of a student such as numerical and logical ability, mental capacity and also in sharpening minds.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Apply concepts of number systems, HCF and LCM, averages, ages, and ratio and proportion to solve quantitative problems.
CO 2	Solve problems related to various important topics of quantitative aptitude using appropriate mathematical techniques.
CO 3	Analyze and solve problems involving mensuration and data interpretation.
CO 4	Apply logical reasoning techniques to solve analytical and reasoning-based problems.
CO 5	Solve problems based on Venn diagrams, cubes and dice, and clock and calendar concepts.

4. COURSE CONTENT

UNIT – I **(6L)**

Number System: Test for Divisibility, Test of prime number, Division and Remainders – HCF and LCM of Numbers–Fractions and Decimals -Average-Problems on Ages- Problems on Numbers- Ratio and Proportion.

UNIT -- II **(6L)**

Percentage – Profit, Loss and Discount – Partnership and Share-Simple Interest – Compound Interest. Time and Work- Pipes and Cisterns-Time and Distance- Problems on Trains- Boats and Streams.

UNIT -- III **(6L)**

Allegation or Mixtures, Clocks &Calendar, Mensuration : Area of Plane Figures, Volume and Surface Area of Solid Figures.

Data Interpretation: Tabulation, Bar Graphs, Pie Charts, Line Graphs.

UNIT -- IV **(7L)**

Series Completion: Number Series, Alphabet Series, Alpha – Numeric Series.

Classification: Word Classification, Number Classification and Letter Classification.

Mathematical Operations-Arithmetical Reasoning. Puzzle Test: Classification Type Questions, Seating Arrangements, Comparison Type Questions, Sequential Order of Things, Selection Based on Given Conditions, Jumbled Problems.

UNIT -- V **(7L)**

Logical Venn Diagrams –Cubes and Dice – Analytical Reasoning-Assertions and Reason– Logical Deductions-Syllogism -Statement and Arguments-Statement and Conclusions- -Data Sufficiency.

5. TEXT BOOKS:

1. R. S. Agarwal, *Quantitative Aptitude*, Revised Edition, S. Chand Publishing, New Delhi.
2. R. S. Agarwal, *Verbal and Non-Verbal Reasoning*, Revised Edition, S. Chand Publishing, New Delhi.

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**										**2**	**3**	**1**
CO 2	**3**	**3**	**1**									**2**	**2**	**1**
CO 3	**2**	**3**	**2**	**1**								**1**	**3**	**1**
CO 4	**2**	**3**	**1**						**1**			**2**	**2**	**1**
CO 5	**2**	**2**	**1**									**1**	**2**	**1**

COURSE CONTENT

MODELLING AND SIMULATION LABORATORY								
II Year - I Semester: ECE								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
EC307PC	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	**-**	**2**	**1**	**40**	**60**	**100**
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 32				**Total Classes: 32**		
Prerequisite: Nil								

1. **COURSE OVERVIEW**

The course provides the fundamental mathematical tools to analyze how systems respond to inputs by examining signals, covering topics like signal classification, linear time-invariant (LTI) systems, convolution, and transforms such as Fourier, Laplace, and Z-transforms.

2. **COURSE OBJECTIVE**

The students will try to Learn:

1) Classify signals and systems and their analysis in time and frequency domains.
2) Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
3) Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4) Identify the need for sampling of CT signals, types and merits and demerits of each type.

3. **COURSE OUTCOMES**

After successful completion of the course, students should be able to:

CO 1	Generate, analyze and perform various operations on Signals/Sequences both in time and Frequency domain.
CO 2	Analyze and Characterize Continuous and Discrete Time Systems both in Time and Frequency domain along with the concept of Sampling.
CO 3	Generate different Random Signals and capable to analyze their Characteristics
CO 4	Apply the Concepts of Deterministic and Random Signals for Noise removal Applications and on other Real Time Signals

4. **LIST OF EXPERIMENTS/DEMONSTRATIONS:**

Part-A: Signals and Systems (Minimum 9 Experiments)

1) Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Sawtooth, Triangular, Sinusoidal, Ramp, Sinc and Nonstandard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis.
2) Write the code / script for performing different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.
3) Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.
4) Write the code / script for finding the output of a System for a given input and Impulse Response and finding Auto Correlation and Cross Correlation of Signals / sequences.

5) Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.

   a) Plot the Real and Imaginary part and

   b) Magnitude and Phase Plot of the response

6) Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.
7) Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever required. Also plot pole-zero diagram in S-plane.
8) Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform by using the properties wherever required. Also plot pole – zero diagram in Z-plane.
9) Design a Simulink or equivalent model for

   a) Solving Differential Equations.

   b) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses.

10) Gibbs Phenomenon and waveform synthesis.
11) Write the code / script for verifying sampling theorem for different sampling rates, sampling types and duty cycles and for plotting the sampled and reconstructed signals.

Part- B: Probability Theory and Stochastic Processes (Minimum 3 Experiments)

12) Write the code / script for generating various Random Variables with different CDFs/ PDFs
13) Write the code / script for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
14) Write the code / script for finding Auto Correlation and Cross Correlation of signals / sequences.
15) Write the code / script for removal of noise from the signal using Correlation.
16) Write the code / script for extraction of periodic signal masked by noise using Auto Correlation.

Part- C: Control Systems (Minimum 2Experiments)

17) Build and Simulate a DC Motor using Simulink.
18) Implementation of a PID Controller from equations using Simulink.
19) Time response analysis of second order systems or stability analysis using root locus.
20) Controllability and observability of Linear systems.

Note: For the experiments with code/scripts written in MATLAB or equivalent (1-8, 12-16), the student can design a user interface or app using MATLAB App Designer or equivalent.

Application on Real Time signals

1) Application of Autocorrelation: GPS Synchronization Satellite communication toolbox is required for this experiment.
   Generate the GPS signal. Visualize the GPS signal. Plot of autocorrelation of C/A code and visualize the spectrum of GPS signals. For exact steps, go through the following page:
   https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html
2) Sampling of Speech Signals Record and play speech in MATLAB. For steps, go through the following page:
   https://in.mathworks.com/help/matlab/import_export/record-and-play-audio.html
   Change the sampling rate of the recorded speech signal and play back to see the effect of aliasing. For steps, go through the following page: https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html

5. REFERENCE BOOKS

Lab manual

6. MATERIALS ONLINE

Course template

Lab manual

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**3**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**
CO 2	**3**	**2**	**2**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**
CO 3	**2**	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**3**
CO 4	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

COURSE CONTENT

<table>
<tr><th colspan="9">ELECTRONIC CIRCUIT ANALYSIS LABORATORY</th></tr>
<tr><td colspan="9">II Year - I Semester: ECE</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">EC308PC</td><td rowspan="2">Core</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
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<tr><td colspan="9">Prerequisite: Nil</td></tr>
</table>

1. COURSE OVERVIEW

This course provides a foundation in how electrical circuits, both analog and digital, function by studying their basic components and their interaction.

2. COURSE OBJECTIVE

The students will try to Learn:

1) Learn the concepts of Power Amplifiers.
2) To give understanding of tuned amplifier circuits
3) Understand various multivibrators using transistors and sweep circuits.

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Design and analyze multistage and power amplifiers and evaluate their frequency response and efficiency
CO 2	Implement and examine feedback and oscillator circuits and validate theoretical conditions for sustained oscillations.
CO 3	Develop and interpret waveform generation circuits such as multivibrators and time base generators.
CO 4	Perform simulations to validate analog circuit performance using industry-standard software tools.
CO 5	Correlate practical results with theoretical predictions and identify deviations due to real-world constraints

4. LIST OF EXPERIMENTS/DEMONSTRATIONS:

PART-A Hardware Experiments (7):

Perform practical design, implementation, and waveform analysis of amplifiers, oscillators, power stages, and multivibrators to validate theoretical concepts and observe real-world circuit behavior.

1) Design and analyze a two-stage RC coupled amplifier to demonstrate gain enhancement and study coupling capacitance effects.
2) Design Hartley and Colpitts oscillators for a specified frequency and observe their output waveforms.
3) Design an RC phase shift oscillator and derive the practical gain condition for oscillations at a given frequency.
4) Design a transformer-coupled class A power amplifier, observe input/output waveforms, and calculate efficiency.
5) Design a class B power amplifier, analyze input/output waveforms, and evaluate harmonic distortion.
6) Design a bistable multivibrator, analyze commutating capacitor effects, and record transistor waveforms.
7) Design an astable multivibrator and observe transistor base and collector wave forms.

PART-B Software Simulations (7):

Use circuit simulation software to design, analyze, and verify the performance of feedback amplifiers, waveform generators, and power amplifier circuits through virtual experimentation and frequency response evaluation.

1) Simulate four feedback amplifier topologies and compare their frequency responses with and without feedback.
2) Simulate a monostable multivibrator and analyze its input/output waveforms.
3) Simulate a Schmitt trigger for gain values greater than and less than one and analyze response behavior.
4) Simulate a bootstrap time base generator using BJT and observe the output sweep waveform.
5) Simulate a Miller sweep circuit using BJT and observe the time base output waveform.
6) Simulate a complementary symmetry push-pull amplifier and verify elimination of crossover distortion.
7) Simulate a single tune 8. damplifier and determine the quality factor (Q) of its tuned circuit.

Software Requirements: Simulation Tools: LTspice / Multisim / PSpice / Proteus / NI Multisim Live or equivalent Operating System: Windows 10/11 or Linux (Ubuntu preferred)

Hardware Requirements:

1) Dual Power Supply (±15V, 0–30V)
2) Function Generator (up to 1 MHz)
3) CRO/DSO(Dual Channel, 20 MHz or more)
4) Digital Multimeters
5) Breadboards and Connecting Wires
6) BJTs: BC107, BC547, BC557, 2N2222, etc.
7) Resistors, Capacitors (Wide range of values)
8) Transformers (for power amplifiers)
9) Inductors, Crystals (1 MHz, 4 MHz, etc.)
10) 10.Heat sinks, transistors for power stages (e.g., TIP41, TIP42 etc.)

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5. REFERENCE BOOKS

Lab manual

6. MATERIALS ONLINE

Course template
Lab manual

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**1**	**0**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**1**	**1**	**1**
CO 2	**1**	**0**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**1**	**1**	**1**
CO 3	**1**	**0**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**1**	**1**	**1**
CO 4	**1**	**0**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**1**	**1**	**1**
CO 5	**1**	**0**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**-**	**1**	**1**	**1**

COURSE CONTENT

<table>
<tr><th colspan="9">DIGITAL LOGIC DESIGN LABORATORY</th></tr>
<tr><td colspan="9">II Year - I Semester: ECE</td></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">EC309PC</td><td rowspan="2">Core</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
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<tr><td colspan="9">Prerequisite: Nil</td></tr>
</table>

1. COURSE OVERVIEW

The Course is about to design and analyze digital circuits and systems using fundamental principles of binary numbers, Boolean algebra, and logic gates.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand common forms of number representation in logic circuits.
2) To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3) To understand the concepts of combinational logic circuits and sequential circuits.
4) To understand the Realization of Logic Gates Using Diodes & Transistors

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Analyze and simplify Boolean expressions and implement them using logic gates and ICs.
CO 2	Design and realize combinational and sequential logic circuits using logic gate hardware.
CO 3	Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.
CO 4	Simulate and verify digital designs using industry-standard EDA tools and test benches.
CO 5	Build modular and hierarchical designs such as counters, FSMs, and shift registers.

4. LIST OF EXPERIMENTS/DEMONSTRATIONS:

PART-A

Realization in Hardware Laboratory (Using Logic ICs)

These are fundamental hands-on experiments conducted using logic ICs such as AND, OR, NOT, NAND, NOR, XOR gates, flip-flops, multiplexers, and decoders.

1) Realize and minimize Boolean functions using basic gates and universal gates (NAND/NOR) in SOP/POS form.
2) Design and implement Half Adder, Full Adder, Half Subtractor, and Full Subtractor using logic gates.
3) Construct and analyze basic logic gates (AND, OR, NOT, XOR, XNOR) using only NAND and NOR gates.
4) Design and implement parity bit generators (even and odd) and a 4-input majority logic circuit.
5) Design and implement code converters such as Binary to Gray, Gray to Binary, and BCD to Excess-3 using gates.
6) Design and implement simple combinational circuits: 2-to-1 multiplexer, 1-bit comparator, and 7-segment decoder logic.

PART-B

Verilog HDL-Based Digital Design Experiments(Simulation-Based)

These experiments are implemented using Verilog HDL with different modeling styles (dataflow, behavioral, structural) and simulated using tools like Vivado, ModelSim, or Equivalent.

1) Design and simulate a 2-bit comparator using dataflow modeling; extend it to 4-bit using structural modeling.
2) Implement a 2:1 multiplexer using dataflow modeling and design an 8:1 multiplexer using structural modeling.
3) Design a 2-to-4 decoder using dataflow modeling and realize a 3-to-8 decoder using structural modeling.
4) Implement agiven Boolean function using a decoder-based approach in behavioural modeling.
5) Design and simulate a universal n-bit shift register (left, right, hold, parallel load) using behavioural modeling.
6) Design asynchronous MOD-n counter using behavioural modeling with D or JK flip-flops.
7) Design and simulate an asynchronous (ripple) counter for a custom sequence using structural modeling.
8) Implement a sequence detector for a given binary pattern using FSM (Moore/Mealy) in behavioural modeling.

Realize one of the designs simulated in Part-B using discrete components / ICs.

5. REFERENCE BOOKS

Lab manual for Digital Logic Design.

6. MATERIALS ONLINE

Course template

Lab manual

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**3**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**
CO 2	**3**	**2**	**2**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**
CO 3	**2**	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**3**
CO 4	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**
CO 5	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**

COURSE CONTENT

<table>
<tr><th colspan="9">VERILOG PROGRAMMING LABORATORY</th></tr>
<tr><td colspan="9">II Year - I Semester: ECE</td></tr>
<tr><th>Course Code</th><th>Category</th><th colspan="3">Hours/Week</th><th>Credits</th><th colspan="3">Maximum Marks</th></tr>
<tr><td rowspan="2">EC310SD</td><td rowspan="2">Skill</td><td>L</td><td>T</td><td>P</td><td>C</td><td>CIA</td><td>SEE</td><td>Total</td></tr>
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1. COURSE OVERVIEW

The Course is about to design and analyze digital circuits and systems using fundamental principles of binary numbers, Boolean algebra, and logic gates.

2. COURSE OBJECTIVE

The students will try to Learn:

1) To understand common forms of number representation in logic circuits.
2) To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3) To understand the concepts of combinational logic circuits and sequential circuits.
4) To understand the Realization of Logic Gates Using Diodes & Transistors

3. COURSE OUTCOMES

After successful completion of the course, students should be able to:

CO 1	Design and realize Flip Flops
CO 2	Design and realize combinational logic circuits using logic gate hardware.
CO 3	Design and realize sequential logic circuits using logic gate hardware
CO 4	Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.

4. LIST OF EXPERIMENTS/DEMONSTRATIONS:

Verilog HDL-Based Digital Design Experiments (Simulation-Based)

These experiments are implemented using Verilog HDL with different modeling styles (dataflow, behavioral, structural) and simulated using tools like Vivado, ModelSim, or Equivalent.

1) To write a VERILOG code for a master slave D-flip flop & simulate
2) To write a VERILOG code for an 8-bit Synchronous Counter with LOAD, RESET & up/down controls & simulate
3) To write a verilog code for 8 bit parity checker & generator and simulate
4) To write a verilog code for 4 digit decade counter and simulate
5) To write a VERILOG code for a 4-bit combinational multiplier
6) To write a verilog code for 4-bit sequential multiplier and simulate
7) To write a verilog code for PIPO type registers and simulate
8) To write a verilog code for PISO type registers and simulate
9) To write a verilog code for SISO & simulate
10) To write a verilog code for SIPO & simulate

5. **REFERENCE BOOKS**
Lab manual

6. **MATERIALS ONLINE**
Course template
Lab manual

CO-PO-PSO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	**3**	**2**	**3**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**
CO 2	**3**	**2**	**2**	**1**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**2**	**3**	**2**
CO 3	**2**	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**3**
CO 4	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**