Department of Electronics and Communication Engineering

Program: M. Tech – VLSI

Academic Year: 2025 – 2026

Course Code	Course Name	CO No	CO Description
25VL5001	TRANSFORMATION TECHNIQUES, RANDOM VARIABLES & STOCHASTIC PROCESSES	1	Apply Mathematical models of random phenomena and solve probabilistic problems.
		2	Analyze different types of random variables and compute statistical parameters of the random variables.
		3	Apply random processes in the time domain and model time varying linear systems.
		4	Analyze random processes in frequency domains and model spectral characteristics of LTI systems.
25VL5101	MOS CIRCUIT DESIGN	1	Apply basic concepts of VLSI design flow, Design styles,IC fabrication ,layout design rules for CMOS circuits. and MOS transistor and circuit modeling.
		2	Explain and Analyze MOS static characteristics and interconnect effects.
		3	Demonstrate the design concepts of *Combinational and Sequential MOS logic Circuits.*
		4	Apply Combinational and Sequential MOS logic Circuits to build different Dynamic logic circuits
		5	Construct of Various CMOS Circuits using EDA Tools.
25VL5102	DIGITAL VLSI DESIGN	1	Understand and apply the Verilog HDL concepts for combinational logic.
		2	Understand and apply the Verilog HDL concepts for sequential logics
		3	Apply the synchronous design and ASM techniques in design of digital systems
		4	Analyze the reliabilty of digital systems by applying testing techniques
		5	Design of various digital systems by using EDA tools
25VL5103	ANALOG IC DESIGN	1	Application of the MOS transistors for the design of single stage amplifiers.
		2	Analysis and design of active & passive current Mirrors and the differential amplifiers with qualitative and quantative analysis.
		3	Analyze the CMOS Op Amps, and various types of Op Amps with qualitative and quantative approaches.

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		4	Analyze the high frequency response of CS, CG and CD amplifiers and noise analysis of various amplifiers and analysis of non-linear analog circuits like switched capacitor circuits, PLL, ADC and DAC.
		5	Design and analysis of various MOS analog circuits using Cadence/ LT-SPICE environment for real time applications.
25EC5101	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	1	Apply the possibilities offered by AI in finding solutions to domain-independent engineering problems and examine the fundamental blocks for building AI-based computer searches.
		2	Analyze machine learning approaches for clustering and classification by demonstrating architecture formulations, learning algorithms, and performance measurements.
		3	Analyze and reconfigure the dimensionality of datasets for training and interpret numerically.
		4	Apply optimization algorithms and estimate unknown phenomena.
		5	Experiment and design AI models on multiple datasets by providing discriminative analysis of the evaluation metrics.
25IE5201	ESSENTIALS OF RESEARCH DESIGN	1	Analyze the steps involved in research and articulate appropriate Research Questions
		2	Analyze appropriate methods for Data collection
		3	Apply the data in tabular/Graphical form and prepare data for analysis
		4	Analyze statistical modelling to optimize the data, prepare the data for publishing.
25UC5201	PROFESSIONAL COMMUNICATION SKILLS	1	To develop the skill of contextual Vocabulary and Critical Reading
		2	To demonstrate different types of personal and professional skills and apply them for growth in professional zone.
		3	Apply the concepts of Mathematical Principles to solve problems on Arithmetic , Algebra & Geometry to improve problem solving ability.
		4	Apply the concepts and using Logical thinking to solve problems on verbal & Non-Verbal Reasoning to develop Logical thinking skills.
25VL5204	LOW POWER VLSI SYSTEM DESIGN	1	Understand the physics of power in CMOS circuits
		2	Apply low power techniques at circuit level for CMOS circuits
		3	Apply low power techniques at gate level, architecture level and system levels
		4	Realize essential tasks in algorithm and architecture level low power design environments and Apply low power clock tree distribution techniques to create low power devices
		5	Experiment and design VLSI circuits with various low power techniques using Cadence VLSI design suite.

Code	Course	No.	Course Outcome
25VL5205	ASIC AND FPGA DESIGN	1	Understand the different types of ASIC design methodologies.
		2	Understand and apply the VHDL concepts for Digital system design
		3	Understand the CPLD and FPGA logic cells
		4	Understand ASIC physical design process
		5	Analysis and testing of ASIC modules
25VL52B2	VLSI Physical Design	1	Apply optimization techniques to improve the quality of circuit partitioning.
		2	Analyze the algorithms in placement and the impact of placement on timing constraints in VLSI circuits.
		3	Apply appropriate routing strategies based on the specific requirements of the design and Analyze the benefits of topological routing in minimizing signal delays and optimizing performance
		4	Solve practical design problems using state-of-the-art optimization tools and methodologies.
		5	Implement the algorithms for physical design of VLSI circuits.
25VL52C1	TESTING OF VLSI CIRCUITS	1	Understand the Testing Strategies of Digital Circuits and Fault Modeling Analysis.
		2	Interpret the Test Pattern for Testable Combinational &Sequential Circuits
		3	Apply Ad-hoc DFT Techniques, Scan Chain Design Rules and test pattern generation for BIST Architectures
		4	Apply the Faults in Digital Circuits and Memory Architectures
		5	Design and Analyze a Digital Circuit using testing methods
25VL52D1	NANO ELECTRONICS	1	Understand nanoelectronics and shrink-down approach
		2	Interpret the concept behind nano MOSFET and nanodevices
		3	Apply and Analyze the Schrodinger equation for different types of potentials in one dimension
		4	Apply the process of nanofabrication and characterization facilities
25IE6103	TERM PAPER	1	Examining the Approach to Accessing Research Articles from Sci/Scopus Database
		2	Acquiring Data from Journals and Conducting Presentations
25VL5511M	FPGA-BASED WIRELESS SYSTEM DESIGN	1	Fundamentals of Digital Design for VLSI Chip Design
		2	Apply VLSI Chip Design and Simulation with Electric VLSI EDA Tool
		3	Design of Digital Circuits with VHDL Programming
		4	Design FPGA Architecture-Based System for Industrial Application

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25IE6150	DISSERTATION		1	Identify and articulate research problems within their field of study, demonstrating an understanding of current research gaps.
			2	Design and execute research methodologies, employing relevant techniques for data collection, analysis, and interpretation.
			3	Analyzing advanced critical thinking skills, analyzing research findings within the context of existing literature to draw meaningful conclusions.
			4	Communicate and report effectively project related activities and findings