COURSE OUTCOMES

S.No	Sem	Course Code	Course Name
1.	I	VL4153	Graph Theory and Optimization Techniques
2	I	RM4151	Research Methodology and IPR
3	I	VL4151	Analog IC Design
4	I	VL4152	Digital CMOS VLSI Design
5	I	VL4152	Advanced Digital System Design
6	I	AP4153	Semiconductor Devices and Modeling
7	I	VL4111	FPGA Laboratory
8	I	VL4112	Analog IC Design Laboratory
9	II	VL4251	Design for Verification using UVM
10	II	VL4291	Low Power VLSI Design
11	II	VL4292	RFIC Design
12	II	VL4252	VLSI Testing
13	II	VE4152	Embedded System Design
14	II	VL4006	Advanced Wireless Sensor Networks
15	II	VL4211	Verification using UVM Laboratory
16	II	VL4212	Term Paper and Seminar
17	III	VL4351	VLSI Signal Processing
18	III	VL4072	CAD for VLSI Design
19	III	DS 4151	Digital Image and Video Processing
20	III	ET4251	IoT for Smart Systems
21	III	VL4311	Project Work I
22	IV	VL4411	Project Work II

PROGRAM OUTCOMES (POs)

List of Program Outcomes

PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based Knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and Responsibilities and norms of the engineering practice.
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

List of Program Specific Outcomes

PSO1	To analyze, design and develop solutions by applying foundational concepts of electronics and communication engineering.
PSO2	To apply design principles and best practices for developing quality products for scientific and business applications.
PSO3	To adapt to emerging information and communication technologies (ICT) to innovate ideas and solutions to existing/novel problems

I SEMESTER

Course Code & Course Name : VL4153 Graph Theory and Optimization Techniques

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Apply graph ideas is solving connectivity related problems.
CO2	Apply fundamental graph algorithms to solve certain optimization problems.
CO3	Formulate and construct mathematical models for linear programming problems and solve the transportation and assignment problems.
CO4	Model various real life situations as optimization problems and effect their solution through Non-linear programming.
CO5	Apply simulation modeling techniques to problems drawn from industry management and other engineering fields.

Course Code & Course Name : RM4151 Research Methodology and IPR

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Ability to arrange the conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose.
CO2	Ability to gather information in a measured and systematic manner to ensure accuracy and facilitate data analysis.
CO3	Ability to transform and model the collected data to discover useful information for decision making.
CO4	Ability to awareness about the benefits of Intellectual property
CO5	Ability to take up legal certainty while applying for Patent.

Course Code & Course Name : VL4151 Analog IC Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Design amplifiers to meet user specifications.
CO2	Analyse the frequency and noise performance of amplifiers.
CO3	Design and analyse feedback amplifiers and one stage op amps.
CO4	Design and analyse two stage op amps.
CO5	Design and analyse current mirrors and current sinks with mos devices

Course Code & Course Name: VL4152 Digital CMOS VLSI Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Use mathematical methods and circuit analysis models in analysis of CMOS digital circuits.
CO2	Create models of moderately sized static CMOS combinational circuits that realize specified digital functions and to optimize combinational circuit delay using RC delay models and logical effort.
CO3	Design sequential logic at the transistor level and compare the tradeoffs of sequencing elements including flip-flops, transparent latches.
CO4	Understand design methodology of arithmetic building blocks.
CO5	Design functional units including ROM and SRAM.

Course Code & Course Name: AP4152 & Advanced Digital System Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Analyse and design synchronous sequential circuits.
CO2	Analyse hazards and design asynchronous sequential circuits.
CO3	Knowledge on the testing procedure for combinational circuit and PLA.
CO4	Able to design PLD and ROM.
CO5	Design and use programming tools for implementing digital circuits of industry standards.

Course Code & Course Name: AP4153 Semiconductor Devices and Modeling

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Explore the properties of MOS capacitors.
CO2	Analyze the various characteristics of MOSFET devices.
CO3	Describe the various CMOS design parameters and their impact on performance of the device.
CO4	Discuss the device level characteristics of BJT transistors.
CO5	Identify the suitable mathematical technique for simulation.

Course Code & Course Name : VL4111 FPGA Laboratory

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Understand and use the System Verilog RTL design and synthesis features, including new data types, literals, procedural blocks, statements, and operators, relaxation of Verilog language rules, fixes for synthesis issues, enhancements to tasks and functions, new hierarchy and connectivity features, and interfaces.
CO2	Appreciate and apply the System Verilog verification features, including classes, constrained random stimulus, coverage, strings, queues and dynamic arrays, and learn how to utilize these features for more effective and efficient verification.
CO3	The implementation of higher level of abstraction to design and verification.
CO4	Develop Verilog test environments of significant capability and complexity.
CO5	Integrate scoreboards, multichannel sequencers and Register Models.

Course Code & Course Name : VL4112 Analog IC Design Laboratory

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Design digital and analog Circuit using CMOS given a design specification.
CO2	Design and carry out time domain and frequency domain simulations of simple analog building blocks, study the pole zero behaviors and compute the input/output impedances.
CO3	Use EDA tools for Circuit Design.

II SEMESTER

Course Code & Course Name: VL4251 Design for Verification using UVM

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Understand the basic concepts of two methodologies UVM.
CO2	Build actual verification components.
CO3	Generate the register layer classes.
CO4	Code testbenches using UVM.
CO5	Understand advanced peripheral bus testbenches.

Course Code & Course Name: VL4291 Low Power VLSI Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Able to find the power dissipation of MOS circuits.
CO2	Design and analyze various MOS logic circuits.
CO3	Apply low power techniques for low power dissipation.
CO4	**A**ble to estimate the power dissipation of ICs.
CO5	Able to develop algorithms to reduce power dissipation by software tools.

Course Code & Course Name: VL4292 RFIC Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	To understand the principles of operation of an RF receiver front end.
CO2	To design and apply constraints for LNAs, Mixers and frequency synthesizers.
CO3	To analyze and design mixers.
CO4	To design different types of oscillators and perform noise analysis.
CO5	To design PLL and frequency synthesizer.

Course Code & Course Name: VL4252 VLSI Testing

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Understand VLSI Testing Process.
CO2	Develop Logic Simulation and Fault Simulation.
CO3	Develop Test for Combinational and Sequential Circuits.
CO4	Understand the Design for Testability.
CO5	Perform Fault Diagnosis.

Course Code & Course Name: VE4152 Embedded System Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Knowledge of different protocols
CO2	Apply state machine techniques and design process models
CO3	Apply knowledge of embedded sotware development tools and RTOS
CO4	Apply networking principles in embedded devices.
CO5	Design suitable embedded systems for real world applications

Course Code & Course Name: VL4006 Advanced Wireless Sensor Networks

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Design and implement simple wireless network concepts
CO2	Design, analyze and implement different network architectures
CO3	Implement MAC layer and routing protocols
CO4	Deal with timing and control issues in wireless sensor networks
CO5	Analyze and design secured wireless sensor networks

Course Code & Course Name : VL4211 Verification using UVM Laboratory

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Understand the features and capabilities of the UVM class library for system Verilog
CO2	Combine multiple UVCs into a complete verification environment
CO3	Create and configure reusable, scalable, and robust UVM verification components (UVCs)
CO4	Create a UVM testbench structure using the UVM library base classes and the UVM factory
CO5	Develop a register model for your DUT and use the model for initialization and accessing DUT registers

Course Code & Course Name : VL4212 Term Paper and Seminar

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Develop their scientific and technical reading and writing skills that they need to understand and construct research articles.
CO2	Obtain information from a variety of sources (i.e., Journals,Dictionaries, referencebooks) and then place it in logically developed ideas

III SEMESTER

Course Code & Course Name: VL4351 VLSI Signal Processing

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Ability to determine the parameters influencing the efficiency of DSP architectures and apply pipelining and parallel processing techniques to alter FIR structures for efficiency
CO2	Ability to analyse and modify the design equations leading to efficient DSP architectures for transforms apply low power techniques for low power dissipation
CO3	Ability to speed up convolution process and develop fast and area efficient IIR structures
CO4	Ability to develop fast and area efficient multiplier architectures
CO5	Ability to reduce multiplications and build fast hardware for synchronous digital systems

Course Code & Course Name : VL4072 CAD for VLSI Design

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Use various VLSI design methodologies
CO2	Understand different data structures and algorithms required for VLSI design
CO3	Develop algorithms for partitioning and placement.
CO4	Develop algorithms for floorplanning and routing.
CO5	Design algorithms for modelling, simulation and synthesis

Course Code & Course Name : DS 4151 Digital Image and Video Processing

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Analyze the digital image, representation of digital image and digital images in transform Domain.
CO2	Analyze the detection of point, line and edges in images and understand the redundancy in images, various image compression techniques
CO3	Analyze the video technology from analog color TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.
CO4	Obtain knowledge in general methodologies for 2D motion estimation, various coding used in video processing.
CO5	Design image and video processing systems

Course Code & Course Name : ET4251 IoT for Smart Systems

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Analyze the concepts of IoT and its present developments.
CO2	Compare and contrast different platforms and infrastructures available for IoT
CO3	Explain different protocols and communication technologies used in IoT
CO4	Analyze the big data analytic and programming of IoT
CO5	Implement IoT solutions for smart applications

Course Code & Course Name : VL4311 Project Work I

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Tackle challenging practical problems with confidence.
CO2	Formulate effective methodologies to address complex issues.
CO3	Apply theoretical knowledge to practical situations.
CO4	Develop critical thinking and problem-solving skills.
CO5	Collaborate effectively in team settings to achieve project goals.

IVSEMESTER

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING-M.E VLSI DESIGN

Course Code & Course Name : VL4411 Project Work II

COURSE OUTCOMES (COs)

List of Course Outcomes

CO1	Tackle challenging practical problems with confidence.
CO2	Formulate effective methodologies to address complex issues.
CO3	Apply theoretical knowledge to practical situations.
CO4	Develop critical thinking and problem-solving skills.
CO5	Collaborate effectively in team settings to achieve project goals.