Course Outcome of M.Tech (VLSI Design)

PVL108: Device Physics and Technology

The students are able to:
1. Understand the basic physics of semiconductor devices and the basics theory of PN junction.
2. Understand the basic theory of MOS transistors.
3. Understand the basic steps of fabrication.
4. Learn the basics theory of Crystal Growth and Wafer Preparation.
5. Study the Epitaxy, Diffusion, Oxidation, Lithography and Etching.
6. Understand the basic theory of Nano-Fabrication.

PVL109: FPGA based System Design

The student will be able to
1. Model digital systems in VHDL and SystemC at different levels of abstraction.
2. Partition a digital system into different subsystems.
3. Simulate and verify a design.
4. Transfer a design from a version possible to simulate to a version possible to synthesize.
5. Use computer-aided design tools to synthesize, map, place, routing, and download the digital designs on the FPGA board.

PVL103: Digital VLSI Design

The students are able to:
1. Understand the basic Physics and Modelling of MOSFETs.
2. Learn the basics of Fabrication and Layout of CMOS Integrated Circuits.
3. Study and analyze the performance of CMOS Inverter circuits on the basis of their operation and working.
4. Study the Static CMOS Logic Elements.
5. Study the Dynamic Logic Circuit Concepts and CMOS Dynamic Logic Families.

PVL110 : VLSI Architectures

The students will able to:
1. To review the basics of different processors including architecture and organization
2. To foster ability of handling and designing different types of pipelinning techniques; exception
handling corresponding instruction scheduling.
3. To understand various memory organization and management techniques
4. To Understand the various advanced architectures.
5. To achieve the understanding of parallel, shared architectures and important organizational details of superscaler architecture

PVL206: Analog IC Design

The student will be able to:
1. Apply knowledge of mathematics, science, and engineering to design and analysis of analog integrated circuits.
2. Identify, formulates, and solves engineering problems in the area of analog integrated circuits.
3. Use the techniques, skills, and modern programming tools such as Mentor Graphics, necessary for engineering practice.
4. Participate and function within multi-disciplinary teams.

PVL207: Low Power System Design

The student will be able to:
1. Understand the need for low power in VLSI.
2. Understand various dissipation types in CMOS.
3. Estimate and analyse the power dissipation in VLSI circuits.
4. Understand the probabilistic power techniques.
5. Derive the architecture of low power SRAM circuit.

PVL208: VLSI Testing and Verification

The student will be able to
1. Analyse the use of procedural statements and routines in testbench design with system verilog.
2. Apply OOP concepts in designing testbench with system verilog.
3. Apply randomization concepts in designing testbench.
4. Understand use of multi threading and inter process communication in testbench design.
5. Interface a system verilog testbench with system C.

PVL203 VLSI SIGNAL PROCESSING

1. To learn performance optimization techniques in VLSI signal processing,
2. Transformations for high speed and power reduction using pipelining, retiming, parallel processing techniques, supply voltage reduction as well as for strength or capacitance reduction,
3. Area reduction using folding techniques, Strategies for arithmetic implementation,
4. Synchronous, wave, and asynchronous pipelining

PVL: Nanoelectronics

The student will be able to
1. Acquire knowledge about nanoelectronics and shrink down approach.
2. Understand concept behind nanomosfets and nano devices.
3. Set up and solve the Schrodinger equation for different types of potentials in one dimension as well as in 2 or 3 dimensions for specific cases.
4. Understand the nanofabrication and characterization facilities.

PVL: VLSI Interconnects

The student will be able to
1. Acquire knowledge about Technology trends, Device and interconnect scaling.
2. Identify basic device and Interconnect Models.
3. Perform RLC based Interconnect analysis.
4. Understand the Problem with existing material in deep submicron.
5. Understand the advanced interconnect materials

PVL216: VLSI Subsystem Design

The student will be able to
1. Acquire knowledge to Design of Data Processing Elements.
2. Design of Control Part of digital logic circuit.
3. Acquire knowledge about Structuring of Logic Design.
4. Identify Clocking Issues in digital system design

PVL224: MOS Device Modeling

The student will be able to
1. Acquire knowledge about physics involved in modelling of semiconductor device.
2. Acquire the basic knowledge about quantum mechanical fundamentals.
3. Model MOSFET devices.
4. Identify characteristics of Advanced Device Technology

PVL: Photonics Integrated Devices and Circuits

The student will be able to
1. Understand the fundamentals, advantages and advances in optical communication and integrated photonic devices and circuits.
2. Introduce optical waveguides, detectors, amplifiers, silicon photonics and MEMS applications in photonics.
3. Design, operate, classify and analyze Semiconductor Lasers, LEDs, modulators and other Integrated photonic devices.
4. Identify, formulate and solve engineering-technological problems related optoelectronic integration.

PVL: Memory Design and Testing

The student will be able to
1. Acquire knowledge about Basics of memory chip Design and Technology.
2. Acquire knowledge about RAM and DRAM Design.
3. Know about On-Chip Voltage Generators.
4. Work using Laplace Trans., CTFT and DTFT.
5. Acquire knowledge about High-Performance Subsystem Memories

PVL332: Mixed Signal Circuit Design

The student will be able to
1. Apply knowledge of mathematics, science, and engineering to design CMOS analog circuits to achieve performance specifications.
2. Identify, formulates, and solves engineering problems in the area of mixed-signal design.
3. Use the techniques and skills for design and analysis of CMOS based switched capacitor circuits.
4. Work as a team to design, implement, and document a mixed-signal integrated circuit.

PVL334: High Speed VLSI Design

The student will be able to
1. Acquire knowledge about High Speed VLSI Circuits Design.
2. Identify the basic Back-End-Of -Line Variability Considerations.
3. Understand the Method of Logical Effort.
4. Understand the Circuit Design Margining and Latching Strategies.
5. Understand the Clocking Styles.

PVL: Fault Tolerance in VLSI

The student will be able to
1. Acquire knowledge about fault tolerance in arithmetic circuits.
2. Learn about Fault diagnosis, Fault tolerance measurement.
3. Acquire knowledge about Fault tolerance strategies.
4. Enhance capabilities about applications of fault tolerant designs in arithmetic units and systems.
5. Acquire knowledge on Software reliability models, and methods.

PVL: Sensor Technology and MEMS

The student will be able to
1. Acquire knowledge about MEMS & Micro Sensors.
2. Understand various micro fabrication technologies.
3. Gather knowledge of characterization tools.
4. Acquire knowledge about Device Applications

PVL: Physical Design Automation

The student will be able to
1. Understand of VLSI Design Automation.
2. Acquire knowledge about CAD tools used for VLSI design.
3. Able to understanding Algorithms for VLSI Design Automation.
4. Able to gather knowledge of High Level Synthesis.
5. Understand Timing Analysis

PVL: Advanced Analog Circuit Design Techniques

The student will be able to
1. Apply knowledge of mathematics, science, and engineering to design and analysis of modern analog integrated circuits.
2. Emphasize the design of practical amplifiers, small systems and their design parameter trade-offs.
3. Understand the relationships between devices, circuits and systems.
4. Participate and function within multi-disciplinary teams.

PVL: System on Chip

The student will be able to
1. Acquire knowledge about Top-down SoC design flow.
2. Understand the ASIC Design flow and EDA tools.
3. Acquire knowledge about Front-end and back-end chip design.
4. Understand the designing communication Networks.
5. Understand the design space exploration.
6. Understand the design methodologies for SoC

PVL: Hardware Algorithms for Computer Arithmetic

The student will be able to
1. Understand power fundamentals: design objective, quantification of energy and power.
2. Work with fast adders.
3. Analyze the issues related to trade-off between cost, speed and accuracy.
4. Work with high throughput, low power algorithms.