SKILL INTERN

VLSI

Designed for skill proficiency

PROGRAM HIGHLIGHITS

- **Basic-Advanced Level Training**
  By Experienced Mentors
- **Live & Recorded Lectures**
  At Your Flexible Schedule
- **Real Time Projects**
  Minor & Major Projects
- **Accredited certificates**
  Program approved ISO Certificate
- **Internships**
  Opportunities will be provided
- **Placement Guidance**
  Assistance from industrial EXPERTS

OUR MOTIVE

UPSKILL

Empowering Minds For Tomorrow

ENHANCE

Discover Your Next Ambition

MOTIVATE

Empowering Minds, Igniting Futures

ABOUT US

Skill Intern is a leading EdTech company dedicated to empowering engineering students with the skills and knowledge necessary to excel in today's competitive job market. Our mission is to bridge the gap between theoretical learning and practical application, enabling students to develop a strong foundation and enhance their employability.

This VLSI course syllabus offers a structured learning path from basic to advanced levels, encompassing digital and analog design, simulation, verification, physical design, and project-based learning. By integrating essential frameworks, tools, and recommended books, this syllabus provides a comprehensive roadmap for mastering VLSI technology, preparing students and professionals for careers in semiconductor design, IC fabrication, and related fields.

WHY VLSI?

- Miniaturization and High Performance
- Core Technology for Digital and Analog Systems
- Driving Innovation in Technology
- Economic Impact and Industry Growth
- Enhancing Power Efficiency and Performance
- Scalability and Flexibility
- Critical for Advancing Computing Power
- Improved Reliability and Quality
- Versatility Across Applications
- Educational and Research Opportunities

LEARNING PATH

- Introduction to VLSI
- Digital Logic Design
- Semiconductor Fundamentals
- CMOS Circuit Design
- Introduction to CAD Tools
- Advanced CMOS Design Techniques
- VLSI Design Methodologies
- Analog VLSI Design
- VHDL and Verilog for VLSI Design
- Digital System Design with FPGAs
- Physical Design and Verification
- Advanced VLSI Topics
- VLSI Testing and Verification
- VLSI Project and Capstone
- Emerging Trends in VLSI

Module 1: Introduction to VLSI

- Overview of VLSI Technology
- History and Evolution of VLSI
- Applications of VLSI in Various Industries
- Introduction to IC Fabrication Process
- Basic Concepts of Digital and Analog Circuits

Module 2: Digital Logic Design

- Boolean Algebra and Logic Gates
- Combinational Circuits: Adders, Multiplexers, Decoders
- Sequential Circuits: Flip-Flops, Counters, Registers
- Finite State Machines (FSM)
- Design of Simple Digital Systems

Module 3: Semiconductor Fundamentals

- Basic Semiconductor Physics
- PN Junctions and Diodes
- Bipolar Junction Transistor (BJT) Basics
- Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) Basics
- CMOS Technology Overview

- **Module 4: CMOS Circuit Design**
- CMOS Logic Gates: Inverter, NAND, NOR, XOR
- Static and Dynamic Power Dissipation
- CMOS Circuit Layout Design Rules
- CMOS Fabrication Process
- Basics of SPICE Simulation
- **Module 5: Introduction to CAD Tools**
- Overview of EDA (Electronic Design Automation) Tools
- Introduction to Schematic Entry and Simulation
- Basics of Layout Design and Verification
- Introduction to HDL (Hardware Description Languages): VHDL and Verilog
- **Module 6: Advanced CMOS Design Techniques**
- CMOS Circuit Design Styles: Static, Dynamic, and Pass Transistor Logic
- Designing High-Speed and Low-Power CMOS Circuits
- Interconnects and Parasitics in VLSI Design
- Clock Distribution and Synchronization
- Design for Testability (DFT)

Module 7: VLSI Design Methodologies

- Top-Down vs. Bottom-Up Design Approaches
- Design Flow: Specification, RTL Design, Synthesis, Place & Route
- Introduction to ASIC (Application-Specific Integrated Circuit) Design
- Introduction to FPGA (Field-Programmable Gate Array) Design
- RTL to GDSII Flow

Module 8: Analog VLSI Design

- Basics of Analog Circuit Design
- Operational Amplifiers, Current Mirrors, and Oscillators
- Mixed-Signal Design: ADCs, DACs, PLLs
- Analog Layout Considerations
- Noise and Signal Integrity Issues in Analog Design

Module 9: VHDL and Verilog for VLSI Design

- Overview of VHDL and Verilog Syntax
- Modeling Combinational and Sequential Circuits
- Writing Testbenches and Simulation
- Synthesizable and Non-Synthesizable Constructs
- Behavioral, Dataflow, and Structural Modeling

Module 10: Digital System Design with FPGAs

- FPGA Architecture and Programming
- Design Entry and Synthesis for FPGA
- Implementing Digital Systems on FPGA
- Timing Analysis and Optimization
- Case Studies: Implementing Common Digital Systems

Module 11: Physical Design and Verification

- Floorplanning, Placement, and Routing
- Timing Closure and Signal Integrity
- Power Grid Design and Clock Tree Synthesis
- Design Rule Checking (DRC) and Layout vs. Schematic (LVS)
- Post-Layout Simulation and Optimization

Module 12: Advanced VLSI Topics

- Low-Power VLSI Design Techniques
- High-Speed Digital Design
- 3D IC Design and Multi-Die Integration
- System-on-Chip (SoC) Design
- Hardware-Software Co-Design

Module 13: VLSI Testing and Verification

- Fundamentals of VLSI Testing
- Fault Modeling and Fault Simulation
- Built-In Self-Test (BIST)
- Design for Manufacturability (DFM)
- Test Pattern Generation and ATPG

Module 14: VLSI Project and Capstone

- Project Planning and Specification
- Design and Implementation of a Complete VLSI System
- Design Review and Iteration
- Performance Analysis and Optimization
- Project Documentation and Presentation

Module 15: Emerging Trends in VLSI

- Introduction to Quantum Computing and Nanoelectronics
- Memristors and Neuromorphic Computing
- VLSI for Artificial Intelligence and Machine Learning
- Advanced Packaging Technologies
- Future Directions in VLSI Research

Assignments & Assessments :

- Weekly assignments based on module topics
- **Mid-term project:** Wireframing and prototyping a small application
- **Final project:** Comprehensive VLSI project
- Participation in class discussions and activities

Recommended Reading :

- **"Mastering AutoCAD 2021 and AutoCAD LT 2021" by Brian C. Benton and George Omura**
- **"AutoCAD 2021 Beginning and Intermediate" by Munir Hamad**
- **"AutoCAD Exercise Workbook" by Cheryl R. Shrock and Steve Heather**

FRAME WORKS

TOOLS USED

AUTODESK

AUTOCAD APP

AUTODESK BIM 360

In case of additional tools used, It will be discussed in live class

CERTIFICATIONS

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THANK YOU

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