



# VLSI Design and Development

## Course Objectives

- Understand the fundamentals of VLSI design, technology evolution, and applications.
- Learn HDL programming (Verilog, VHDL) for digital design.
- Gain hands-on experience with FPGA and ASIC design flows.
- Develop skills in timing analysis, floor planning, and power optimization.
- Understand CMOS logic design basics and their role in modern ICs.

## Prerequisites

- Basic understanding of digital electronics and Boolean algebra.
- Familiarity with at least one programming language, preferably C or HDL.
- Knowledge of logic gates, combinational and sequential circuits.
- Understanding of semiconductor basics is a plus.

## Tools & Environment

- Hardware: FPGA boards, ASIC kits.
- Software: Xilinx ISE, Model Sim, synthesis tools.
- Languages: Verilog, VHDL.
- Simulation & Debugging Tools: Testbench frameworks, logic analyzers.

## Modules

| Sr. | Title                                | Topic                                                       | Objective                                                                    |
|-----|--------------------------------------|-------------------------------------------------------------|------------------------------------------------------------------------------|
| 1   | Introduction to VLSI Design          | Basics of Digital Electronics, Evolution of VLSI Technology | Understand digital electronics, Boolean logic, and VLSI integration scales.  |
| 2   | VLSI Design Flow                     | Stages from concept to chip manufacturing                   | Learn the structured process of IC creation, optimization, and verification. |
| 3   | CMOS Technology                      | CMOS fundamentals, advantages, applications                 | Understand CMOS operation, benefits, and challenges.                         |
| 4   | HDL Programming                      | Verilog and VHDL basics                                     | Write and simulate hardware designs using HDL languages.                     |
| 5   | Combinational & Sequential Circuits  | Design principles                                           | Differentiate and implement both circuit types.                              |
| 6   | FPGA and ASIC Design Flow            | Architecture, synthesis, implementation                     | Design, synthesize, and implement digital systems on FPGA/ASIC.              |
| 7   | Timing Analysis & Power Optimization | STA, floorplanning, power management                        | Perform timing verification and optimize for low power.                      |
| 8   | CMOS Logic Design Basics             | Fabrication, applications                                   | Apply CMOS principles in IC design.                                          |



## Minimum Completion Criteria

Complete all modules and quizzes.

Submit at least one hands-on embedded systems project.

Participate in weekly practical sessions.

Maintain at least 80% attendance.

## Certificate Details

Upon successful completion, learners will receive a Government-Recognized Certificate from Vidyawan, a registered MSME enterprise.



One Month Internship Certificate



Weekly Marathon Participation Certificate

## Performance-Based Badge System

- Gold Badge – For Top Performers (90%+ score, completed 4+ projects)
- Silver Badge – For consistent performance (70–89%)
- Copper/Participant Badge – For all learners who complete the program

## Contact Information

For queries, registration, or collaboration, feel free to contact us:

Vidyawan – Internship & Skill Development Platform

(A Government-registered MSME – UDYAM-WB-14-0205610)

- Email: [contact.vidyawan@gmail.com](mailto:contact.vidyawan@gmail.com)
- Website: [www.vidyawan.in](http://www.vidyawan.in) (Get in touch section)
- Location: West Bengal, India
- Follow us for updates and upcoming internships