



# Digital Electronics & VLSI Design Track Overview

Comprehensive Program for Digital Design Expertise

Agnes

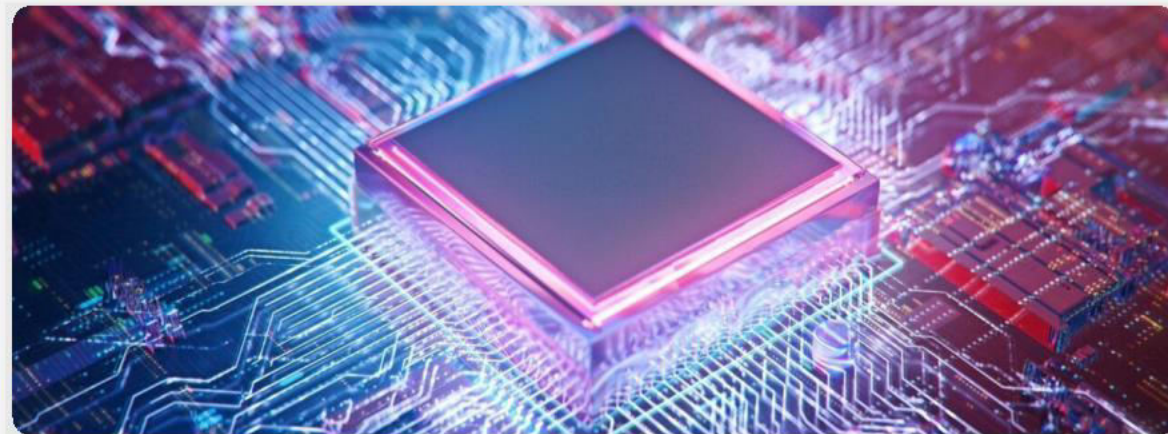
# Program Goal & Core Topics

## Program Goal

To provide a comprehensive understanding of:

- Digital electronics fundamentals
- VLSI design principles
- CMOS technology
- Hardware Description Languages (Verilog/VHDL)

...enabling participants to design and simulate digital circuits.



## Core Topics

Boolean Algebra & Logic Gates

Combinational & Sequential Circuits

Finite State Machines (FSM)

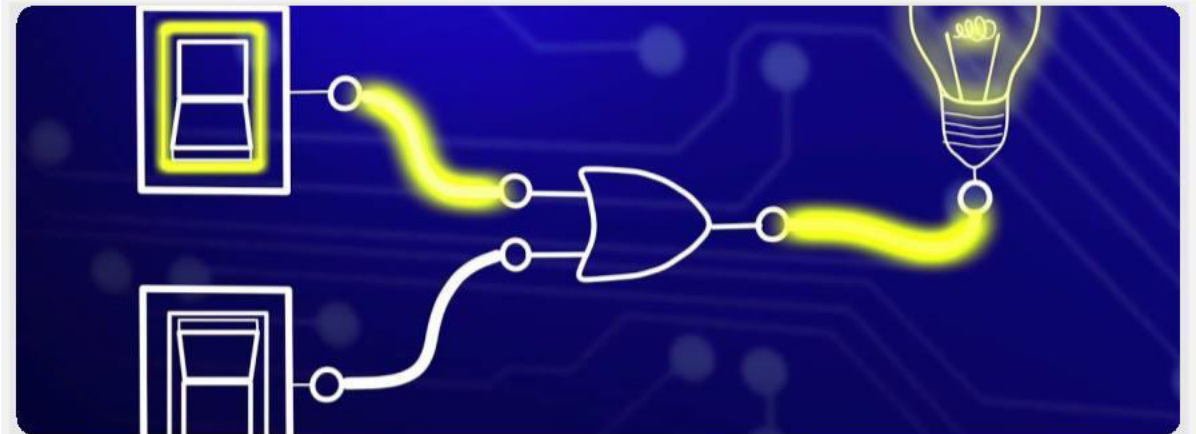
VLSI Design Methodologies

CMOS Design Principles

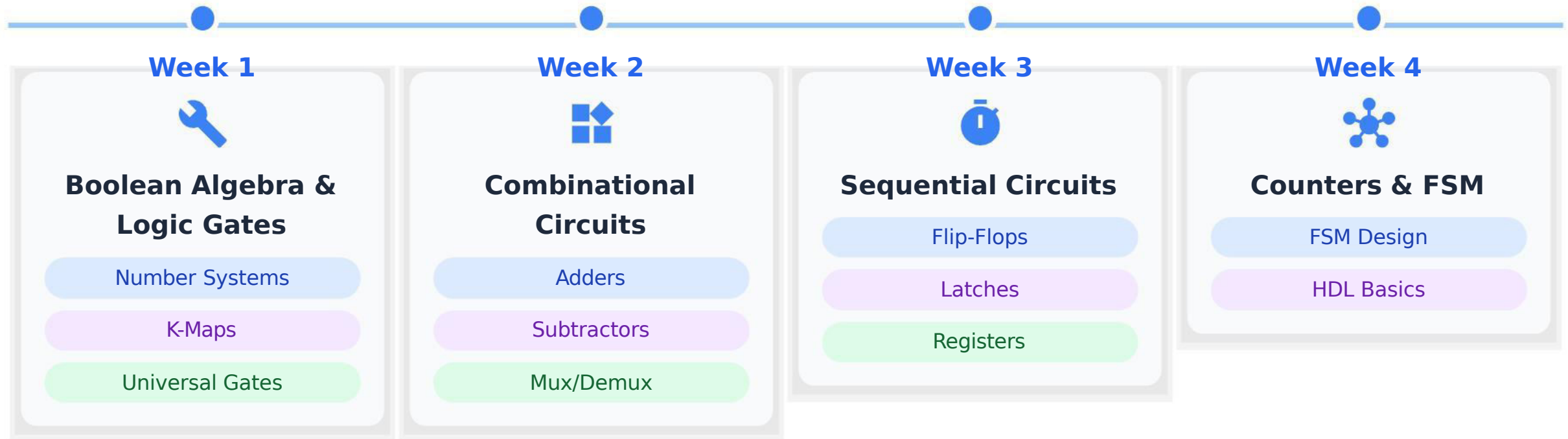
HDL Basics (Verilog/VHDL)

ASIC & FPGA Design

Mini Project



# Phase 1: Foundational Digital Electronics (Month 1)



## <> Deep Dive: Hardware Description Languages (HDL)

HDLs like Verilog and VHDL are crucial for modern digital design. They allow engineers to describe the behavior and structure of electronic circuits, from simple logic gates to complex VLSI systems. This foundational understanding is a





# Phase 1: VLSI Principles & Advanced HDL (Month 2)



## Week 5: VLSI Design Methodologies & CMOS Principles

- **Flow** VLSI Design Flow & Abstraction Levels
- **CMOS** CMOS Fundamentals: Gates & Logic
- **CAD** Physical Design & CAD Tools



## Week 6: HDL for Combinational Logic

- **HDL** Verilog/VHDL for Combinational Design
- **Ports** Module & Port Declarations
- **Testing** Testbench Development & Simulation



## Week 7: HDL for Sequential Logic

- **Modeling** Modeling Flip-Flops & Registers
- **FSM** Finite State Machine (FSM) Design in HDL
- **Assignments** Blocking vs. Non-Blocking Assignments



## Week 8: Introduction to ASIC & FPGA Design

- **Architecture** ASIC & FPGA Architectures
- **Synthesis** Synthesis Concepts & Flow
- **Comparison** Key Differences & Applications

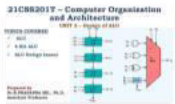
# Phase 2: Capstone Mini Project Overview

## LOGIC GATE



### Project Options

Participants choose one of two projects to apply their knowledge:



#### 4-bit ALU

Design a fundamental digital component capable of arithmetic and logic operations.

**DATA PATH DESIGN**



### Core Skills Applied

This project consolidates and showcases proficiency in key areas:



#### VERILOG HDL

Advanced coding, testbenches, and synthesis-aware design.



### Objective

Bridge theory with practice through tangible outcomes:



#### COMPLEX SYSTEM

Navigate the full design cycle from concept to simulation.





# Phase 2: Project Implementation & Verification (Month 3)



## Week 9: Kick-off & Spec

Initiate with team assembly, defining project scope, objectives, and detailed design specifications to translate requirements into actionable hardware descriptions.



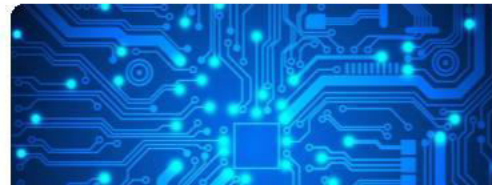
## Week 10: Implementation

Develop individual hardware modules using Verilog. Each module undergoes rigorous unit testing and meticulous debugging to ensure functional correctness.



## Week 11: Integration

Integrate all validated modules into a complete system. Conduct comprehensive system-level simulations and optimize for speed, area, and power.



## Week 12: Demonstration

Culminate with a formal presentation of the design process, verification results, and a live demonstration showcasing the functional digital system.



# Career Readiness & Launchpad (Month 3)



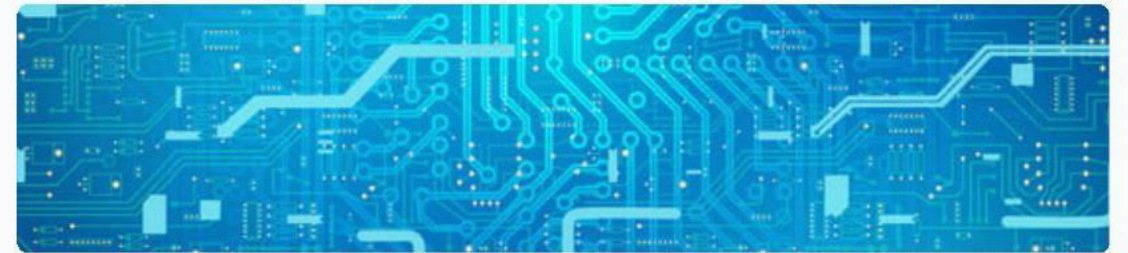
## Resume & Portfolio Building



**Tailored Resumes** Craft compelling resumes highlighting technical skills and project experience for VLSI roles.

**Strong Portfolio** Develop a portfolio showcasing designs, simulations, and the capstone project.

## LinkedIn Optimization & Networking



**LinkedIn Profile** Optimize your profile with industry keywords, showcasing projects and skills.

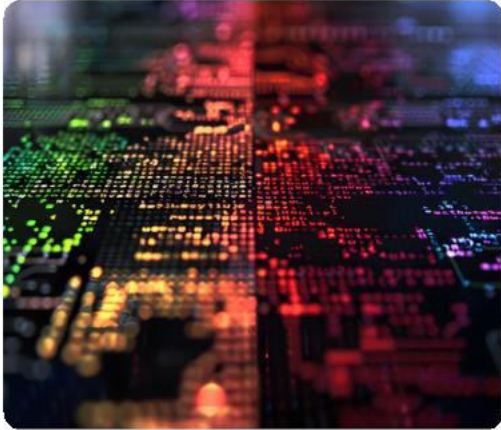
**Networking Strategy** Connect with professionals via events and alumni networks.

## Mock Technical & Behavioral Interviews

## Networking Sessions & Graduation



# Empowering Your Digital Design Journey



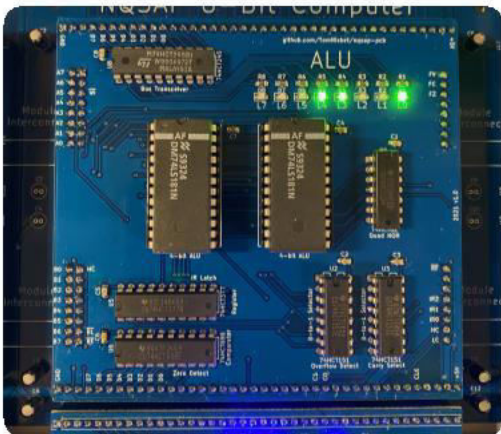
## Hands-on Learning

Extensive practical exercises and project-based experience ensure you transform theoretical knowledge into applicable, industry-ready skills.



## Industry-Relevant Skills

Master Verilog, the complete VLSI design flow, and advanced digital circuit design techniques for ASIC and FPGA development.



## Career Focus

Dedicated workshops on resumes, interviews, and networking sessions with industry leaders to bridge the gap between education and employment.



## Comprehensive Program

Our curriculum provides a complete spectrum of knowledge, from foundational logic gates to advanced VLSI concepts, for a holistic learning journey.

