

ECE 450/1: Digital System Design

IN

OUT

Number Systems and Boolean Algebra

- Understands fundamentals of number systems and Boolean algebra

Logic

- Knows truth tables and canonical expansions
- Has introduction to K-maps

Gates and Logic

- Understands representation of logic as gate-level schematics

Finite-State Machines

- Has knowledge of sequential building blocks
- Has exposure to FSMs

Pre-requisites:

- ECE102

Concepts:

- Basic implementation of logic gates
- Design representation (gate schematics, HDL)
- Logic families and digital circuit behavior
- Boolean algebra, switching theory, logic minimization (algebra, cubes, QM, CAD tools)
- Logic synthesis (multi-level gates, function blocks, programmable logic)
- Advanced finite state machine synthesis (state enumeration, minimization, encoding, partitioning)
- Synchronous design (clocking methods, timing parameters, metastability)
- Computer system design fundamentals (ALU, data path, control)
- Design trade-offs (area, speed, power)
- Design methodology and design flow for complex logic circuit

Applications:

- Complex combinational circuits
- Complex sequential circuits: counters, FIFOs, sequence generators
- Systems and subsystems: CPU, I/O controller, memory management

Tools:

- Design tools: schematic capture, digital simulation, HDL compilation and synthesis, debugging and validation of hardware

Switching Theory

- Has foundation in switching theory for logic in minimization

Hardware Description Language

- Can use schematic and HDL representation of combinational and sequential logic functions

Logic Minimization

- Understands complex logic minimization through QM and CAD methods

Finite State Machine Design

- Can design and optimize a complex finite state machine from design specifications

Programmed Logic

- Understands complex logic implementation in programmable devices: PLA/PLD, FPGA

Micro-Architecture

- Has knowledge of aspects of computer system micro-architecture and design

Knowledge of Design Methodology and Design Flow

- Can use a variety of design and simulation tools to design and validate complex logic circuits

As of 12/9/08