ECE 102: Digital Circuit Logic

IN

OUT

High School Math

- Algebra
- Trigonometry

Pre-requisites

- None

Concepts:
- Introduction to Digital Systems
- Number, character, and information representation
- Boolean Algebra
  - Algebraic simplification
  - Duality
  - Minterms and Maxterms
  - Karnaugh maps
- Combinational Logic Design
  - Two-level and multi-level networks
  - Design using NAND, NOR
  - Multiplexers, decoders
  - ROM, PLA, PLD based design
  - Adder and multiplier design
- Introduction to hardware description language (HDL)
- Sequential Circuit Design
  - Latches and Flip-flops
  - Counters
  - Mealy and Moore circuits
  - Analysis of synchronous sequential networks
  - Synthesis of synchronous sequential circuits
  - State graphs and tables
  - Reduction of state tables
  - Design examples

Applications:
- Adder/subtractor design
- Array multiplier
- ALU design
- Processor design

Tools:
- CAD tools for design, simulation and debugging, FPGA based implementation

Number Systems and Binary Representations
- Understand fundamentals of number systems
- Understand binary representation of information

Binary Logic
- Know the rules of Boolean algebra
- Construct and use truth tables
- Derive canonical expansions of Boolean logic functions
- Optimize logic using K-maps and algebraic techniques

Logic Circuit Analysis and Synthesis
- Implement logic circuits at gate- and register-transfer level to meet given specifications

Finite State Machines
- Has knowledge of FSMs and sequential building blocks
- Design, analyze, and optimize an FSM starting with design specifications

Programmed Logic
- Understand the role of HDL in logic synthesis
- Implement logic in programmable devices (PLA/PLD, FPGA)