

# ECE 102: Digital Circuit Logic

IN

OUT

High-school Math/Science

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
- 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 - Array Multiplier
- Traffic light controller
- ALU design

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

## Number Systems and Binary Representations

- Understands fundamentals of number systems
- Understands binary representation of information

## Boolean Algebra

- Knows rules of Boolean algebra
- Can construct and use truth tables
- Can derive canonical expansions of Boolean logic functions
- Can use K-maps to minimize logic

## Gate-Level Schematics

- Understands representation of logic equations as gate-level schematics

## Finite State Machines

- Has knowledge of FSMs and sequential building blocks
- Able to design and optimize an FSM starting with design specifications

## Programmed Logic

- Can implement logic in programmable devices (PLA/PLD, ROM, FPGA)