

# CS 303 - Logic and Digital System Design

Spring 2022-2023

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**Catalog Data:** Number systems and conversion, Boolean algebra, the assertion level concept; minterm and maxterm expansions, Karnaugh maps, and Quine McCluskey minimization, combinatorial logic circuit design, NAND and NOR gate based design. State machines and sequential circuits flip-flops, minimization of state tables, state assignment. Higher-level digital system design using SSI-MSI blocks such multiplexers/decoders, adders, memory and programmable gate arrays; bus oriented systems. Asynchronous sequential circuits, flow tables, timing hazards.

## Textbook:

- M. Morris Mano and Michael D. Ciletti. Digital Design, 5e/6e, Pearson.

**Computer Usage:** Logic Circuit Simulators / FPGA Development Tools

- Digital : <https://github.com/hneemann/Digital>
- Xilinx ISE : <https://www.xilinx.com/products/design-tools/ise-design-suite.html> (tentative)
- Virtual FPGA Lab : <https://github.com/os-fpga/Virtual-FPGA-Lab> (tentative)

**Goals:** To develop the engineering skills of the students to analyze and design digital systems.

## Course Outline:

- Number Systems & Arithmetic
- Boolean Algebra & Logic Operations
- Gate-Level Minimization
- Analysis & Design of Combinational Logic Circuits
- Analysis & Design of Synchronous Sequential Logic Circuits
- Registers & Counters
- Design with Algorithmic State Machines (ASM)
- Memory & Design with Programmable Logic

## General Rules

- Homework and lab assignments are announced one week before the deadline.
- Submission deadlines are never postponed.
- Laboratory sessions to be attended individually. Projects might be done in groups of two.
- Laboratory sessions to be held online.

**Grading:** Lab assignments & Project 40%; HWs 10%; Final 50%.