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: (tentative) Midterms 40% (20% each); Lab assignments & Project 25%; HWs 5%; Final 30%.