ENEE244: Digital Logic Design

Credits: 3

Description

Prerequisite: Must have completed or be concurrently enrolled in CMSC132 or ENEE150; and permission of ENGR-Electrical & Computer Engineering department.

Restriction: Sophomore standing or higher; and must be in one of the following programs (Engineering: Computer; Engineering: Electrical).

The design and analysis of combinational and synchronous sequential systems comprising digital logic gates and flip-flop memory devices; underlying tools such as switching and Boolean algebras and Karnaugh map simplification of gate networks; design and use of decoders, multiplexers, encoders, adders, registers, counters, sequence recognizers, programmable logic arrays (PLAs), read-only memories (ROMS, PROMS), and similar devices. Arbitrary radix conversion.

Semesters Offered

Fall 2017, Spring 2018, Summer 2018, Fall 2018, Spring 2019, Summer 2019, Fall 2019, Spring 2020, Summer 2020, Fall 2020, Spring 2021

Testudo

Learning Objectives

- Design and analyze combinational logic circuits
- Design and analyze synchronous sequential logic circuits

Topics Covered

- Binary Numbers; binary arithmetic and codes
- Boolean Algebra, switching algebra, and logic gates
- Karnaugh Maps, simplification of Boolean functions
- Combinational Design, two level NAND/NOR implementation
- Tabular Minimization (Quine McCluskey)
- Combinational Logic Design: adders, subtracters, code converters, parity checkers, multilevel NAND/NOR/XOR circuits
- MSI Components, design and use of encoders, decoders, multiplexers, BCD adders, and comparators
- Latches and flip-flops
- Synchronous sequential circuit design and analysis

- Registers, synchronous and asynchronous counters, and memories
- Control Logic
- Wired logic and characteristics of logic gate families
- ROMs, PLDs, and PLAs
- State Reduction and good State Variable Assignments (Optional, as time permits)
- Algorithmic State Machine (ASM) Charts (Optional, as time permits)
- Asynchronous circuits (Optional, as time permits)

Learning Outcomes

- Ability to apply knowledge of math, science, & engineering (Significant)
- Ability to design a system, component, or process to meet needs (Significant)
- Ability to identify, formulate, and solve engineering problems (Significant)
- Ability to communicate effectively (Moderate)
- Techniques, skills, and modern engineering tools necessary for engineering practice (Moderate)