CENG 203 Digital Design

Lecturer: Asst. Prof. Dr. Asaf ŞAHİN

CATALOG DESCRIPTION:

This course provides a modern introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic: logic gates, minimization techniques, arithmetic circuits, and modern logic devices such as field programmable logic gates. The second part of the course deals with sequential circuits: flip-flops, synthesis of sequential circuits, and case studies, including counters, registers, and random access memories. State machines will then be discussed and illustrated through case studies of more complex systems using programmable logic devices. Different representations including truth table, logic gate, timing diagram, switch representation, and state diagram will be discussed.

OBJECTIVES:

Student will learn:

* to apply the principles of Boolean algebra to manipulate and minimize logic expressions.
* to use K-maps to minimize and optimize two-level logic functions up to 5 variables.
* the operation of latches, flip-flops, counters, registers, and register transfers.
* to analyze the operation of sequential circuits built with various flip-flops.
* the concepts of datapaths, control units, and micro-operations and building blocks of digital systems.

In addition, student will learn to design:

* two-level logic functions with AND, OR, NAND, NOR and XOR gates with minimum number of gate delays or literals.
* to design combinational circuits using decoders, ROM and transmission gates.
* the operation of state-of-the-art components to design and build complex digital systems.
* such as memories, PLA, PALs and programmable logic devices (such as FPGAs).
* to use state machine diagrams to design finite state machines using various types of flip-flops and combinational circuits with prescribed functionality.
* to identify a paper related to the application of digital systems in society, read and summarize the paper.
* to articulate how modern microelectronics has impacted society.

GRADING POLICY:

Students will be graded based on 1 midterm exam (30% of the total grade), 1 final exam (50% of the total grade), quizzes (10% of the total grade), and computer assignments (10% of the total grade).

TEXTBOOKS:

1.) Fundamentals of Digital Logic with VHDL Design, Brown and Vransic

2.) Digital Design: With an Introduction to the Verilog HDL by M. Morris Mano and Michael D. Ciletti