

1. *Course number and name*

ENGR 378: Digital System Design

2. *Credits and contact hours*

3 credit hours; one 100-minute lecture session/week and one 2-hour-45-minute lab session/week

3. *Instructor's or course coordinator's name*

Instructor: Hamid Mahmoodi, Professor of Electrical and Computer Engineering

Course coordinator: Hamid Mahmoodi, Professor of Electrical and Computer Engineering

4. *Text book, title, author, and year*

Charles H. Roth, Jr, *Digital Systems Design Using Verilog*, Cengage Learning, 2016

a. *other supplemental materials*

(none)

5. *Specific course information*

a. *brief description of the content of the course (catalog description)*

CMOS digital circuits and their electrical properties. Logic circuit design with functional units. Algorithmic sequential machine design. Design with programmable logic devices. Hardware description and simulation language.

b. *prerequisites or co-requisites*

grade of C- or better in ENGR 356

c. *indicate whether a required, elective, or selected elective course in the program*

Required for Computer Engineering; elective for Electrical Engineering.

6. *Specific goals for the course*

a. *specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.*

- The student will demonstrate an ability to analyze combinational and sequential circuits.
- The student will demonstrate an ability to design combinational and sequential circuits.

- The student will demonstrate knowledge of structural, dataflow, and behavioral modeling of digital system.
- The student will demonstrate knowledge of Hardware Description Language (HDL) for digital system design and simulation.
- The student will demonstrate a skill in using software tools.
- The student will demonstrate a working knowledge of programmable logic devices
- The student will demonstrate a skill in using tools for digital design with programmable logic devices.

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

Course addresses ABET Student Outcome(s): a, c, e, b, k.

7. Brief list of topics to be covered

- 1. Introduction to Verilog HDL
- 2. Basic methods for circuit specification
- 3. Programmable logic devices and FPGA's
- 4. Design and specification of simple circuits
- 5. Arithmetic unit design
- 6. State Machine design
- 7. SM Charts
- 8. Design with FPGAs
- 9. Lab: Computer-aided design and simulation tools; digital circuit verification and troubleshooting, synthesis and implementation to FPGA