



Course Outline

2026-2027 Catalog

ENGR 10 - Digital Logic Fundamentals

Catalog Description

Transfer Status: CSU/UC

Unit(s): 4.00

Lecture: 51.00 Contact hours/102.00 Out of class hours/153.00 Total hours/3.00 Unit(s)

Lab: 51.00 Contact hours/0.00 Out of class hours/51.00 Total hours/1.00 Unit(s)

Total: 102.00 Contact hours/102.00 Out of class hours/204.00 Total hours/4.00 Unit(s)

Course Description: In this course the student will be trained in the use of symbolic digital logic including switching algebra, optimization, Karnaugh map construction and use and the design of combinational logic networks. The student will develop skills in mapping of sequential logic theory to practical devices using flip-flops, registers and counters.

Objectives

Upon successful completion of this course, the student should be able to:

1. Apply principles of Boolean algebra to minimize logic functions.
2. Design commonly used elements using logic gates.
3. Design, build and analyze a state machine.
4. Design, build and analyze devices that can perform basic arithmetic on binary numbers.
5. Model simple logic systems using VHDL and compare to the behavior of realized circuits with logic gates.

Course Content

Topic Titles / Suggested Time Topic

Lecture

<u>Topics</u>	<u>Lec Hrs</u>
Generic Number Systems	3.00
Boolean Algebra	4.00
Applications of Boolean Algebra	3.00
Karnaugh Maps	4.00
Logic Gates	6.00
Combinational Design and Simulation Using Gates	3.00
Introduction to VHDL	3.00
Latches and Flip-Flops	3.00
Registers and Counters	3.00
Clocked Sequential Circuits	4.00
State Graphs and Tables	3.00
Sequential Circuit Design	3.00
Circuits for Arithmetic Operations	3.00
State Machines	6.00
Total Hours:	
51.00	

Lab

<u>Topics</u>	<u>Lab Hrs</u>
Safety and Use of a Multimeter	3.00
Introduction to Logisim	3.00
Power Supplies, Switches and Basic Logic in Integrated Circuits	3.00
Minterm and Maxterms: Karnaugh Mapping	6.00
Karnaugh Map Reduction	3.00
Logic Gates	3.00
Multiple Output Systems	3.00
Logic Blocks	6.00
Arithmetic	6.00
Counters	6.00
Shift Registers	3.00

Topics**Lab Hrs**

Circuit Design Applications

6.00

Total Hours: 51.00**Methods of Instruction**

- A. Class Activities
- B. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
- C. Instructor Demonstrations
- D. Laboratory Experiments
- E. Lecture
- F. Engineering

Methods of Evaluation

- A. Exams/Tests
- B. Quizzes
- C. Homework
- D. Lab Projects
- E. Practical Evaluations
- F. Mid-term and final examinations

Examples of Assignments**Reading Assignments**

1. Read the section in your text on binary arithmetic and be prepared to add or subtract binary numbers.
2. Read the factory information sheet on the NOR gate provided. Be prepared to include the gate in a circuit.

Writing Assignments

1. Construct a Karnaugh map for the solar heating system discussed in class.
2. Write a two-page introduction and procedure for the state machine activity done in lab.

Out-of-Class Assignments

1. Design a children's toy with three simple sensors (light/dark, quiet/loud, hot/cold) and construct the logic for 8 possible responses the toy can generate.
2. Design the logic table for a cooling fan for an automobile and spec out the parts list to implement the cooling fan control unit.

Recommended Materials of Instruction

Roth, C.H., Kinney, L.L. (2021). Fundamentals of Logic Design. *Cengage*, 7th. 978-1337620352.

Minimum Qualifications

Engineering (Masters Required)
Physics/Astronomy (Masters Required)
Computer Science (Masters Required)
Engineering Support
Engineering Technology (Masters Required)

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