

DIGITAL LOGIC DESIGN

I Year B. Tech. I Semester
(Common to ECE, ECE (VLSI))

Course Code:

L	T	P	C
3	0	2	4

Course Outcomes: At the end of the course the student will be able to

CO1: Understand number systems and apply methods to simplify Boolean functions. (L2)

CO2: Apply K-map minimization and design basic combinational circuits (L3)

CO3: Analyze the design concepts of various combinational circuits.(L4)

CO4: Analyze the concepts of sequential logic design.(L4)

CO5: Differentiate Mealy & Moore models and implement Synchronous Sequential machines.(L4)

UNIT-I

10 Lectures

Number Systems and Code conversions

Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, BCD Code, Excess-3 code, Gray code, Sign Magnitude representation, Complement representation of negative numbers-1's compliment, 2's compliment.

Boolean Algebra & Logic Gates

Boolean operations, Boolean functions, min-terms and max-terms, sum- of-products and product-of-sum representations, Logic gates, NAND/NOR implementations

Learning outcomes: At the end of this unit, the student will be able to

1. describe different binary codes (L2)
2. apply basic laws & De Morgan's theorems to simplify Boolean expressions(L3)
3. realize the Digital circuits using universal logic gates (L3)

UNIT-II

8 Lectures

Minimization of Digital Logic Circuits

Minimization of Boolean functions using K - map, don't-care conditions, prime implicants.

Introduction to combinational circuits- Half Adder, Full adder, Ripple carry adder, BCD Adder, Subtractor

Learning outcomes: At the end of this unit, the student will be able to

1. describe K- Map method to minimize logic functions (L2)
2. understand the difference between implicants and prime implicants (L2)
3. apply adder and subtractor circuits for binary arithmetic operations. (L3)

UNIT-III

10 Lectures

Combinational Circuits

Comparators, decoders, encoders, multiplexers, demultiplexers, Code Converters, Parity generator and checker, Basic PLD's - PROM, PLA, PAL Realizations.

Learning outcomes: At the end of this unit, the student will be able to

1. outline the concepts of combinational digital circuits (L4)
2. describe combinational circuits such as multipliers, comparators (L2)
3. implement digital circuit using PLDs (L4)

UNIT-IV

10 Lectures

Sequential Circuits

Latches: RS latch and D latch, Flip-flops: RS, D, JK and T, Flipflop conversions, Shift registers, Ripple counters, Synchronous counters, Ring counter, Johnson counter.

Learning outcomes: At the end of this unit, the student will be able to

1. understand behaviour of Flip-Flops and Latches (L2)
2. summarize the concepts of Shift Registers (L2)
3. implement the different types of Counters (L4)

UNIT-V

10 Lectures

Finite State Machines

Analysis and Design of Synchronous Sequential Circuits: Moore and Mealy machine models, State Equations, State Table, State diagram, State reduction & assignment, Design of Sequential circuits- serial binary adder, sequence detector

Learning outcomes: At the end of this unit, the student will be able to

1. understand Moore and Mealy machine models (L2)
2. apply the concepts of state assignment and state reduction (L3)
3. implement various synchronous sequential circuits using FSM (L4)

LABORATORY

Course Outcomes: At the end of the course the student will be able to

CO1: Understand the concepts of digital arithmetic (L2)

CO2: Illustrate the functionality of different digital circuits (L3)

CO3: Analyze various Combinational circuits (L4)

CO4: Analyze different Sequential circuits (L4)

CO5: Demonstrate the simulation and synthesis of different digital circuits (L3)

List of Experiments:

1. Logic gates using universal gate
2. Half adder using Logic gates
3. Full Adder using Half Adder
4. 4- bit Parity Generator
5. Function realization using Multiplexer
6. 2 to 4 decoder
7. 8 to 3 encoder
8. 1x4 demultiplexer
9. Comparator
10. Binary to Gray Code converter
11. SR flip-flops, D flip-flops, T flip-flops
12. Flipflop conversions
13. 4 bit Shift Register
14. 4 bit Counter

Note: Any **TWELVE** of the experiments are to be conducted

Text Books:

1. M. Morris Mano and Michael D. Ciletti, *Digital Design*, 4th Edition, Pearson Education, 2013.

References:

1. A. Anand Kumar, *Switching Theory and Logic Design*, PHI, 2014.
2. Z. Kohavi, *Switching and Finite Automata Theory*, 2nd Edition, Tata McGraw Hill, 2008.
3. Charles H Roth (Jr), Larry L. Kinney, *Fundamentals of Logic Design*, 5th Edition, Cengage Learning India Edition, 2010.
4. John.M Yarbrough, *Digital Logic Applications and Design*, Thomson Learning, 2006.
