DIGITAL LOGIC AND COMPUTER DESIGN

(Common to CSE (AI&ML), CSE (DS))

Course Code:22EC11D2

L	T	P	C
3	0	0	3

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

CO1: understand significance of number systems, conversions, binary codes (L2)

CO2: apply different simplification methods for minimizing boolean functions (L3)

CO3: illustrate knowledge on design of various combinational circuits (L3)

CO4: illustrate the concept of sequential logic design, analyze the operation of flip-flops, registers, and counters (L3)

CO5: discuss the basic structure and organization of computers (L2)

UNIT-I **8 Lectures**

Number Systems and Codes

Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess-3 code, Gray code, Complement representation of negative numbers: Signed Magnitude, One's complement method, Two's complement method, Binary Arithmetic.

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

1. understand the advantages of using different number systems (L2)
2. describe different binary codes (L2)
3. summarize representation methods of negative numbers (L2)

UNIT-II **10 Lectures**

Boolean Algebra

Boolean operations, Boolean functions, algebraic manipulations, min-terms and max-terms, sum-of-products and product-of-sum representations, two-input logic gates, NAND/NOR implementations, Minimization of Boolean functions using Karnaugh map, don't-care conditions, prime implicants, Tabular Method.

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

1. apply basic laws & De Morgan's theorems to simplify Boolean expressions (L3)
2. summarize sum-of-products and product-of-sum representations (L2)
3. demonstrate digital circuits using Karnaugh Map (L3)

UNIT-III **10 Lectures**

Combinational Logic Design:

Analysis of combinational circuits, Design Procedure – Binary Adder, Subtractor, BCD Adder, multiplier, comparator, decoders, encoders, multiplexers, demultiplexers, Code Converters.

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

1. illustrate the concepts of combinational digital circuits (L3)
2. describe combinational circuits such as adders, subtractors, multipliers, comparators (L2)
3. describe about various combinational circuits(L2)

UNIT-IV **10 Lectures**

Sequential Circuits:

Latches: RS latch and JK latch, Flip-flops: RS, JK, D, T flip flops, Master-slave flip flops, Edge-triggered flip-flops. Shift registers, Universal Shift register, ripple counters, synchronous counters, Ring counter, Johnson counter, Up-Down counter.

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

1. understand behavior of Flip-Flops and Latches (L2)
2. summarize the concepts of Shift Registers (L2)
3. demonstrate the working of Counters (L3)

UNIT-V **12 Lectures**

Computer Organization

Organization and Architecture, Structure and Function, Computer Components, Bus Interconnection, Processor Organization, Register Organization. Instruction codes, Computer instructions, Memory reference instructions, Instruction Cycle. Stack organization, instruction formats, addressing modes, program control

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

1. understand the Basic Structure of Computers (L2)
2. understand the concept of Basic Computer Organization and Design(L2)
3. describe about Central Processing Unit (L2)

Text Books:

1. M. Moris Mano, *Computer Systems Architecture*, 3rd Edition, Pearson Education, 2007.
2. William Stallings, *Computer Organization and Architecture: Designing for Performance*, 10th Edition, Pearson Education, 2016.

Reference Books:

1. David A. Patterson and John L. Hennessy *Computer Organization and Design: The Hardware/Software Interface*, 5th Edition, Elsevier, 2005.
2. Anand Kumar, *Switching Theory and Logic Design*, 2nd Edition, PHI, 2014.
3. M. Moris Mano, *Computer Systems Architecture*, 3rd Edition, Pearson Education, 2007.
4. John P. Hayes, *Computer Architecture and Organization*, 3rd Edition, WCB/McGraw-Hill.
5. M. Morris Mano and Michael D. Ciletti, *Digital Design*, 4th Edition, Pearson Education, 2013.
6. Vincent P. Heuring and Harry F. Jordan, *Computer System Design and Architecture*, 2nd Edition, Pearson Education, 2004.
7. Carl Hamacher, *Computer Organization and Embedded Systems*, 6th Edition, McGraw Hill Higher Education, 2002.