Course Type: - Major
Paper Title: - **DIGITAL ELECTRONICS**
Credit Weightage: - THEORY -04; PRACTICALS- 02

Semester: - 1st
Paper Code: - CAPC1123M
Batch: - 2023

Course Objective:

- Familiarize students with different number systems and coding schemes used in digital systems.
- Provide students with a strong foundation in digital logic concepts, including binary representation, Boolean algebra, truth tables, and logic gates.
- Teach students how to manipulate Boolean expressions, perform algebraic manipulations, and simplify logic circuits using algebraic laws and theorems.
- Enable students to analyze and design combinational circuits using various techniques such as Karnaugh maps, Boolean minimization, and multiplexers.
- Teach students how to analyze and design sequential circuits, including flip-flops, counters, and shift registers.
- Provide hands-on experience in simulating digital circuits using software tools.
- Introduce students to digital systems, including memory elements.

Course Outcomes:

- Demonstrate a clear understanding of binary number systems, logic gates, and Boolean algebra.
- Analyze and design combinational logic circuits using various methods like truth tables, Karnaugh maps, and Boolean algebra.
- Apply the principles learned to design basic digital systems to meet specific requirements.
- Understand the principles of sequential logic, including flip-flops and timing considerations.
- Explain the operation of memory devices and programmable logic devices programmable logic Array.

UNIT – I **[16 Hours]**

BOOLEAN ALGEBRA AND LOGIC GATES: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic. Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

UNIT – II **[16 Hours]**

GATE – LEVEL MINIMIZATION: The map method, Four-variable map, Sum of products & product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations and Exclusive OR function.

UNIT – III **[16 Hours]**

COMBINATIONAL LOGIC: Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

SEQUENTIAL LOGIC: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure. Registers shift Registers, Ripple counters, synchronous counters, other counters.

UNIT – IV **[16 Hours]**

MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array & programmable Array logic, Sequential Programmable Devices. Introduction to Integrated Circuits and digital Logic Families.

TEXT BOOKS:

1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.

REFERENCES:

2. Digital Fundamentals, Thomas L. Floyd.
3. Digital Logic Circuits, R. P. Jain.
4. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw Hill Edition.
5. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
6. NPTEL Digital Electronics Course @ https://nptel.ac.in/courses/117106086
7. SWAYAM Digital Electronics Course @ https://onlinecourses.swayam2.ac.in/cec20_cs35/preview

LAB WORK - DIGITAL ELECTRONICS (CAPC1123M)

List of Experiments/ Simulations:

1. To verify the truth tables of OR, AND, NOR, NAND, EX-OR, EX-NOR gates.
2. To obtain half adder, full adder and subtractor using gates and verify their truth tables.
3. To verify the truth tables of RS, JK and D flip- flops.
4. To design and study a binary counter.
5. To design and study synchronous counter.
6. To design and study ripple counter.
7. To convert BCD number into excess 3 form
8. To design and study a decade counter.
9. To design and study a sequence detector.
10. To implement a control circuit using a multiplexer.

TEXT BOOKS:

1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.