NIRMA UNIVERSITY

Institute:	Institute of Technology, School of Technology
Name of Programme:	BTech CSE, Integrated BTech (CSE)-MBA, BTech AI&ML
Course Code:	2CS507CC23
Course Title:	Digital Electronics
Course Type:	Core
Year of Introduction:	2023-24

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Course Learning Outcomes (CLO):

At the end of the course, the students will be able to –

1. explain the basic building blocks of various digital circuits (BL2)
2. make use of the minimized Boolean logic expression for developing the combinational and sequential circuits (BL3)
3. design combinational circuits using MSI components (BL6)
4. develop sequential and combinational logic for implementing digital systems. (BL6)

Unit	Contents	Teaching Hours (Total 30)
Unit-I	**Binary Systems:** Introduction, Binary numbers, conversions, Octal, Hexadecimal Numbers, Complements, Binary Codes, binary storage, registers, Binary Logic, Boolean Algebra and Logic Gates, Boolean algebra, theorems and properties, Boolean functions simplification, canonical and standard forms, other logic operations, Digital logic gates, IC logic families	05
Unit-II	**Boolean Function Simplification:** The Map-method, SOP/POS Simplification with don't care conditions using basic and universal gates, Tabulation method	06
Unit-III	**Combinational Logic**: Introduction, analysis, and design of various combinational circuits such as Adders, Subtractors, Code Convertors, Comparators, Binary Parallel Adder, Decimal Adder, magnitude comparators, ROMS, decoders, multiplexers, PLA	05
Unit-IV	**Sequential Logic**: Introduction, flip-flops, triggering of flip-flops, analysis, and design of clocked sequential circuits, design with state equations, registers, shift registers, ripple counters, and synchronous counters.	14

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Suggested Readings/ References:
1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall
2. R. K. Gaur, Digital electronics and microcomputers, Dhanpati Publications
3. Malvino and Leach, Digital Principles and applications, McGraw Hill
4. Virendra Kumar, Digital Technology Principles and Practices, New Age International
5. Holdsworth, Digital logic design, Elsevier.

Suggested List of Experiments:

Sr. No.	Name of Experiments/Exercises	Hours
1	i) Study of basic logic gates and verification of their truth tables ii) Implementation of Boolean expressions using basic gates	02
2	Implementation of basic logic gates using NAND and NOR gates	02
3	Design of half and full adder and subtractor circuits	02
4	Design of i) Binary-to-Gray and Gray-to-Binary code converter ii) BCD-to-Excess3 code converter iii) Excess3-to-2421 code converter iv) 5421-to-BCD code converter	08
5	Design of i) BCD Adder ii) Excess-3 Adder	04
6	Implementation of the given Boolean function using multiplexers of different sizes	02
7	Verification of the characteristic tables of the basic flipflops	02
8	Design of a Modulo-N synchronous counter using JK Flipflops	04
9	Design of a Modulo-N ripple counter using JK Flipflops	02
10	Design of an n-bit bidirectional shift register with parallel load.	02