NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech.(CSE), Integrated B.Tech. (CSE)-MBA
Course Code:	2CS507
Course Title:	Digital Electronics
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical Component				C
		LPW	PW	W	S	
2	-	2	-	-	-	3

Course Learning Outcomes (CLO):

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

1. explain the basic building blocks of various digital circuits (BL-2)
2. build the minimised Boolean logic expression for developing the combinational and sequential circuits (BL-6)
3. design combinational circuits using MSI components (BL-6)
4. develop sequential and combinational logic for implementing digital systems (BL-6)

Syllabus: **Total Teaching hours: 30**

Unit	Syllabus	Teaching hours
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, synchronous counters	14

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

Suggested Readings/ References:

1. M.Morris Mano, Digital Logic and Computer Design, PHI
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 Science

Suggested List of Experiments:

Sr. No.	Title	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's 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

Suggested Case List: -NA-

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech.(CSE), Integrated B.Tech. (CSE)-MBA
Course Code:	2CS802
Course Title:	Mathematical Foundations for Computer Science
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical Component				C
		LPW	PW	W	S	
2	1	-	-	-	-	3

Course Learning Outcomes (CLO):

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

1. define preliminaries of discrete mathematics, concepts of sets, graphs, digraphs and trees (BL-1)
2. explain properties of relations and functions, identify equivalence and partial order relations, and sketch relations (BL-2)
3. analyse logic propositions (BL-3)
4. prove various theorems using mathematical induction and recurrence (BL-5)

Syllabus:

Total Teaching hours: 30

Unit	Syllabus	Teaching hours
Unit-I	**Basic Structures: Sets, Functions, Sequences, Sums, and Matrices:** Sets, Set Operations, Functions and its types, Sequences and Summations, Cardinality of Sets, Matrices **Relations:** Relations and their Properties, n-ary Relations and their applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings **Basic Counting techniques**: Pigeon-hole principle, principle of inclusion and exclusion	08
Unit-II	**Propositional Logic**: syntax, semantics, validity and satisfiability, basic connectives and truth tables, Applications of Propositional Logics, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference	07
Unit-III	**Proof Techniques**: proof methods and strategies, direct proof, indirect proof (proof by contraposition), proof by contradiction, principles of mathematical induction, strong induction, the well-ordering principle, recursive definition, proof of necessity and sufficiency.	04
Unit-IV	**Algebraic Structures**: Introductions to groups, Examples of groups, basic algebra in groups, the order of group element, isomorphism of groups, cyclic groups, and subgroups, Cosets and Lagrange's theorem, Characterisation of cyclic groups, introduction to rings and fields.	04
Unit-V	**Recurrence Relations:** Introduction to recurrence relations, Applications of Recurrence Relations, Solvi	03