

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
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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

Unit-VI **ng Linear Recurrence Relations** 04
Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring
Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees

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. C. L. Liu, "Elements of Discrete Mathematics", McGraw Hill
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill
3. Norman L. Biggs, "Discrete Mathematics", Oxford Press
4. Tremblay, J.P. & Manohar, Discrete mathematical structures with application to computer science, McGraw Hill
5. Susanna S. Epp, Discrete Mathematics with Applications, Wadsworth Publishing Co. Inc.

Suggested List of Experiments: -NA-

Suggested Case List: -NA-

