NIRMA UNIVERSITY

Institute:	Institute of International Study
Name of Programme:	Bachelor of Science (Computer Science and Engineering) [2+2 Dual Degree]
Faculty	Faculty of Technology & Engineering
Course Code:	~~1XXXX~~ 2CS801
Course Title:	Discrete Mathematics
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. make use of concepts of sets to perform various operations
2. determine properties of relations, functions, trees and graphs
3. analyze logical propositions
4. prove mathematical theorems using mathematical induction and recurrence

Syllabus:

Total Teaching hours: 45

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, Problem-solving and applications related to the sets, functions and relations.	10
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. Problem-solving and applications related to prepositional logics.	09
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. Problem-solving and applications related to different proof techniques.	07
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, Characterization of cyclic groups, introduction to rings and fields. Problem-solving and applications related to Groups and rings.	07

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Unit-V	**Recurrence Relations:** Introduction to recurrence relations, Applications of Recurrence Relations, Solving Linear Recurrence Relations. Applications of recurrence relations	05
Unit-VI	**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. Problem-solving and applications related to Trees and graphs	07

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-