COURSE CONTENT

DISCRETE MATHEMATICS								
III Semester: CSD / CSE / CSM								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2436703	**Professional Core**	2	0	0	2	40	60	100
Contact Classes: 30	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 30**		
Prerequisites: There are no prerequisites to take this course.								

Course Overview:

Discrete mathematics is the branch of mathematics that deals with structures that are fundamentally discrete rather than continuous. Unlike calculus, which deals with continuous quantities, discrete mathematics involves objects such as integers, graphs, and statements in logic. It is widely used in computer science, information theory, cryptography, algorithm design, and more. Here are the main areas of discrete mathematics: Set Theory, Logic, Combinatorics, Number Theory, Algebraic Structures, Probability, Relations and Functions.

Course Objectives:

1. Concepts of mathematical logic.
2. The concepts of sets, relations, and functions.
3. Algebraic structures
4. Perform the operations associated with sets, functions, and relations.
5. Recurrence relations

Course Outcomes: After Completion of the Course, Students should be able to

- Apply principles of mathematical logic, including propositional and predicate calculus, for constructing valid arguments and derive logical inferences.
- Analyze sets, relations, and functions, and evaluate properties of binary relations, equivalence relations, partial orders, and recursive functions in mathematical structures.
- Demonstrate understanding of algebraic structures such as semigroups, monoids, lattices, and Boolean algebra.
- Solve counting problems using combinatorial techniques including permutations, combinations, binomial and multinomial theorems, and the principle of inclusion–exclusion.
- Formulate recurrence relations using methods such as substitution, characteristic roots, and generating functions for analyzing discrete sequences.

Module-I

Mathematical logic: Introduction, Statements and Notation, Connectives, well formed formula, Equivalence of formulas, Normal forms, Theory of inference for the statement calculus, predicate calculus, Inference theory of predicate calculus

Module – II

Set theory: Basic concepts of set theory, Set and Operations on sets, Relations and ordering, properties of binary relations in a set, Equivalence relation,

Compatibility of relation, partial order relation, partial order set, Functions, Composition of functions, Inverse function, Recursive functions.

Module–III
Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

Module–IV
Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and permutations, Binomial Coefficients, Binomial and Multinational Theorems, Principle of Inclusion-Exclusion.

Module–V
Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of generating functions, Recurrence relations, Solving recurrence relations by substitution and generating functions, Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R. Manohar, McGraw-Hill, 1sted.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe l. Mott, Abraham Kandel, Teodore P. Baker, Prentis Hall of India, 2nd ed.

REFERENCES:

1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearson education, 5th edition.
2. Discrete Mathematical Structures: Thomas Kosy, Tata McGraw Hill publishing co.

ELECTRONIC RESOURCES:

1. https://www.coursera.org/learn/discrete-mathematics

2. https://onlinecourses.nptel.ac.in/noc22_cs123/preview

MATERIALS ONLINE:

1. Course template
2. Assignments
3. Model question paper – I
4. Model question paper – II
5. Lecture notes
6. E-Learning Readiness Videos