Discrete Mathematical Structures (NMA 302)

UNIT I: Fundamentals of Logic

Propositional Logic: Propositions, Basic logic operations and truth tables, Tautologies, Contradictions, Algebra of propositions, Logical equivalence: the laws of logic, Logical implication: Rules of inference, Logical analysis of argument, Some computing application (Normal forms)

First Order Logic: Predicates & quantifiers, Use of quantifiers, Rules of inference, Validity of arguments, proof methods.

UNIT II: Set Theory, Relations and Functions

Set Theory: Sets & subsets, Venn diagrams, set operations and laws, countable set, Cartesian product, Cardinality,

Relations: Relation, Representation & properties, n-ray relations and applications, Composition of relations, Equivalence relation & partitions.

Functions: Functions and its types, Inverse function, Composition of functions, Special functions.

Theorem Proving Techniques: Mathematical induction, Proof by contradiction, Pigeonhole principle.

UNIT III: Algebraic Structures and Coding Theory:

Algebraic Structures: Definition, Properties, Semi group, Monoid, Group, properties of groups, Subgroup, Cyclic group, Cosets and Lagrange's theorem, Homomorphism and isomorphism of groups

Coding Theory: Elements of coding theory, Hamming matric, Parity-check and generator matrices, Coding and error detection,

UNIT IV: Partially Ordered Structures

Posets: Definitions, ordered set, Hasse diagram, isomorphic ordered set, well ordered set, Minimal and Maximal elements, LUB & GLB etc.

Boolean Algebras: Definitions & Properties, Logic gates and minimization of circuits, Quine-McClusky method.

UNIT V: Combinatorics and Graph Theory:

Combinatorics: Discrete numeric functions and properties, Recurrence relations, Solution of recurrence relation, OGF & EGF.

Graphs: Graphs and graph models, terminology, Euler and Hamilton graphs with their applications, trees with properties, MST, planer graphs and applications, criteria of planarity.

Books Recommended:

1. Trembley, J.P. & R. Manohar, "Discrete Mathematical Structures with applications to Computer Science", McGraw Hill.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill.
3. Ralph, P. Garimaldi, "Discrete& Combinatorial Mathematics" Pearson Publication, Asia.
4. Deo, narsingh, "Graph Theory with applications to Engineering & Computer Science", PHI.
5. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi