CSBS2001 DISCRETE MATHEMATICS (3-0-0)

Course Objectives:

- To learn the mathematical foundations required for computer science.
- This course will help to provide mathematical concepts and build up strong mathematical fundamentals to support many subjects of computer science engineering such as design and analysis of algorithms, computability theory, software engineering, computer systems, syntactical analysis, information organization and retrieval, switching theory, computer representation of discrete structures and programming languages etc.

MODULE 1 (10 Hrs)

Logic and Proofs: Propositional logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs. Sets: Venn Diagrams, Subsets, The size of a set, Power Sets, Cartesian Products, Set Operations, Functions: One-to-One and Onto Functions, Inverse Functions and Compositions of Functions Partial Functions

MODULE 2 (10 Hrs)

Counting: The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients, Recurrence Relations.

Relations: Relations and their Properties, n-ary Relations and their Applications, Representing Relations, Closure of Relations, Equivalence Relations, Partial Orderings.

MODULE 3 (10 Hrs)

Concept of binary operations, Algebraic structures, Semigroup, monoid, Group, Abelian group with examples. Properties of groups, Cyclic groups and its generator, Sub group, cosets, Normal subgroup, Lagrange's Theorem, Homomorphism and Isomorphism, ring, field, Integral domain (Definition with examples)

MODULE 4(10 Hrs)

Graphs: Graph Terminology and Special Types of Graphs, Bipartite Graphs, Representing Graphs: Isomorphism of Graphs, Euler and Hamilton Paths, Shortest Path Problems: Dijkstra's Algorithm, Traveling Salesperson Problem, Planar Graphs, Graph Coloring. Trees: Tree Traversal, Minimum Spanning Trees

Learning Outcomes:

Upon completion of this course, students will be able to:

- CO1 Understand the basic concepts of set theory, relations and functions, propositional logic and apply the knowledge for modelling and solving various problems in computer sciences.
- CO2 Apply various methods of proofs and proof strategies.
- CO3 Model counting techniques using recurrence relations & generating functions for applications.
- CO4 Understand the concept of algebraic structuressuch as groups, semi group, subgroups and Lagrange theorem. Gets the idea of homomorphism and isomorphism of groups, definition and examples of ring, integral domain and field.
- CO5 Develop the concepts and applications of graphs in various computer science problems

Text Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Mc Graw Hills International Seventh Edition.
2. C. L. Liu, "Elements of Discrete Mathematics", McGraw Hills International Second Edition.

Reference Books:

1. Elements of Discrete Mathematics by C. L. Liu and D.P. Mohapatra, TMH, 2012
2. J. P Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TMH, 1997.