

# COMPUTER SCIENCE

## Semester III

### Core V

### Discrete Mathematical Structures

#### Course Outcomes:

- To learn the mathematical foundations required for computer science.
- This course will help in understanding other courses in computer science.

#### Learning Outcomes:

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

1. Learn propositional logic and set theory
2. Learn concept of functions and recurrence relations
3. Learn counting techniques, and relations
4. Learn concepts of graphs and its applications

#### Unit-I:

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

#### Unit-II:

Functions: One-to-One and Onto Functions, Inverse Functions and Compositions of Functions Partial Functions. Sequences, Recurrence Relations, Summations.

#### Unit-III:

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

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

#### Unit-IV:

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. Tree Traversal, Minimum Spanning Trees

**Text Books:**

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

**Reference Books:**

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