

## Discrete Structures – Syllabus

### SECTION-A

**Set theory:** Definition of sets and proof by induction; Peano postulates; Relations; representation of relations by graphs; properties of relations; equivalence relations and partitions; Partial orderings; Posets; Linear and well-ordered sets.

**Functions:** Mappings; injection and surjections; composition of functions; inverse functions; special functions; pigeonhole principle.

**Mathematical reasoning:** Propositions; negation disjunction and conjunction; implication and equivalence; truth tables; predicates; quantifiers; natural deduction; rules of Inference; methods of proofs used in program proving.

### SECTION-B

**Combinatorics:** Elementary combinatorics; counting techniques; recurrence relation; generating functions.

**Graph Theory:** Introduction, Graphs Multigraph, Isomorphic Graph, Homeomorphic Graphs, Paths and Circuits, Shortest Paths in weighted Graphs, Eulerian and Hamiltonian Paths and Circuits, Königsberg Bridge, Complete, Regular, Bipartite Graphs, Planar Graphs, Graph Coloring, Graph Traversal Techniques. Trees, Binary Search Trees, Complete & Extended Binary Trees.

**Groups:** Definition and elementary properties of groups, semigroups, monoids, rings, fields and lattices.