Discrete Mathematics - Video course

COURSE OUTLINE

This course covers several important topics of Discrete Mathematics. This includes Set thoery and logic, relations, partially ordered sets, Boolean algebra and Boolean functions,analysis of algorithms, recurrence relations, finite state machines, discrete probability and graph theory. The applications of these topics are also discussed.

COURSE DETAIL

Lectures	Topic
1	**Set Theory** Introduction to the theory of sets; combination of sets; power sets; finite and infinite sets; principle of inclusion and exclusion; selected problems from each topic.
2-10	**Logic** Proposition, predicate logic, logic operators, logic proposition and proof, method of proofs.
11-12	**Mathematical Induction** Different forms of the principle of mathematical induction. selected problems on mathematical induction.
13-17	**Discrete Probability** Counting principles. Random experiment; sample space; events; axioms of probability; conditional probability. Theorem of total probability; Bayes' theorem. Application to information theory: information and mutual information.
18-23	**Graph theory** Path, cycles, handshaking theorem, bipartite graphs, sub-graphs, graph isomorphism, operations on graphs, Eulerian graphs and Hamiltonian graphs, planar graphs, Euler formula, traveling salesman problem, shortest path algorithms.
24-29	**Relations** Definitions and properties;Equivalence relations and equivalence classes. Representations of relations by binary matrices and digraphs; operations on relations. Closure of a relations; reflexive, symmetric and transitive closures. Warshall's algorithm to compute transitive closure of a relation.
30-32	**Partially Ordered Sets and Lattices** Partial order relations; POSETS; lattices
33-35	**Boolean Algebra and Boolean Functions** Introduction to Boolean algebra and Boolean functions. Different representations of Boolean functions. Application of Boolean functions to synthesis of circuits
36-37	**Discrete Numeric Functions** Introduction of discrete numeric functions; asymptotic behaviour; generating functions.

38-42	**Recurrence Relations** Linear recurrence relations with constant coefficients (homogeneous case); discussion of all the three sub-cases. Linear recurrence relations with constant coefficients (non-homogeneous case); discussion of several special cases to obtain particular solutions. Solution of linear recurrence relations using generating functions.

References:

1. Liu C. L. , Elements of Discrete Mathematics, Second Edition, Mc Graw Hill 1985.

2. Mott J. L. , Kandel A. and Baker T. P., Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice Hall India, 1986.

3. Harary F., Graph Theory, Narosa, 1969.

4. Thomas H. C., Leiserson C. E.; Rivest R. L.; Stein C., Introduction to Algorithms (2nd ed.). MIT Press and McGraw-Hill. 2001.