



MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Mathematics & Statistics

Course Hand-out

Discrete Mathematics | MA 1612 | 4 Credits | 3 | 0 4

Session: January 18 – May 18 | Faculty: Dr Dasari Nagaraju | Class: B. Sc.

COURSE OUTCOMES: At the end of the course, students will be able to

- [1612.1]. Apply the operations of sets, find the partition for a set through equivalence classes
- [1612.2]. Express a logic sentence in terms of predicates, quantifiers, and logical connectives which enhance their logical skills and make them employable in the relevant field.
- [1612.3]. Demonstrate an understanding of relations and functions and be able to determine their properties and also determine when a function is 1-1 and "onto".
- [1612.4]. Solve counting problems by applying elementary counting techniques using the product and sum rule, model a recurrent relation and finding solution to the problem by solving recurrence relation which enhance their employability skills.
- [1612.5]. Use tree and graph algorithms to solve problems and applications to develop skills.

A. SYLLABUS

Propositional Calculus: Logical connectives, Truth tables, Tautologies and contradictions, Contrapositive, Logical equivalences and implications, De Morgan's Laws, Normal forms, Rules of inference, Arguments, Validity of arguments. **Predicate Calculus:** Free and bound variables, Quantifiers, Theory of inference, The rules of universal specification and generalization, Validity of arguments. **Set Theory:** Types of relations on sets and their properties, Relational matrix and the graph of a relation, Partitions, Equivalence relations, Poset, Hasse diagram. Definitions & Classification of functions, Characteristic function of a set, Hashing functions, Recursive functions, Permutation functions. **Combinatorics:** Discrete numeric function, Basic counting principles, Generating functions, Recurrence relations, Inclusion and exclusion principle, Euler's ϕ function and its applications to Cryptography. **Graph Theory: Graphs:** Definition and examples of graphs, Incidence and degree, Handshaking lemma, Isomorphism Sub-graphs, Weighted Graphs, Eulerian Graphs, Hamiltonian Graphs Walks, Paths and Circuits. **Trees:** Definition and properties of trees Pendant vertices, centre of a tree Rooted and binary tree, spanning trees, minimum spanning tree algorithms Fundamental circuits, cutsets and cut vertices, fundamental cutsets, the four colour theorem **Directed Graphs:** Types of digraphs, directed paths and connectedness, Euler digraphs, Directed trees.

B. TEXT BOOKS

1. Trembly J.P and Manohar R, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 2003.
2. Ralph. P. Grimaldi, Discrete and Combinatorial Mathematics: An Applied Introduction, Fourth Edition, Pearson Education Asia, Delhi, 2002.

