MANGALORE UNIVERSITY

DEPARTMENT OF MATHEMATICS

MSC MATHEMATICS

MTS 556	**Advanced Discrete Mathematics**	**4 Credits (48 hours)**

Prerequisite: Knowledge of syllabus prescribed for the course MTH 401 (Algebra - I).

Course Outcome: Students will have the knowledge and skills to develop techniques for constructing mathematical proofs, illustrated by discrete mathematics examples, to design and simplify the logic gate networks by using lattices and Boolean algebra and Karnaugh Maps, and highlight some important applications of graph theory in the development of algorithms in rooting and designing computer network finding optimal solutions to some construction problems.

Course Specific Outcome: At the end of the course Students will have the knowledge and skills to understand, explain in depth and apply in various situations the concepts-

- Advanced Counting Principles to solve problems on combinatorics.
- the Polya's counting principle andPolya's inventory problems to solve the problems on coloring.
- Design and simplify the logic gate networks by using lattices and Boolean algebra and Karnaugh Maps.
- Solving problems on extremal graph theory and develop DFS, BFS, and Shortest Path Algorithms.

Unit I

Basic Counting Principles: Number of one-one functions, Permutations, Combinations, Number of onto functions. Partitions and Stirling Numbers of Second kind.

Advanced Counting: Pigeon-hole Principle, Inclusion-Exclusion Principle, Putting Ballsinto boxes, Round Table Configurations, Counting using Lattice Paths, Catalan Numbers. Recurrence Relations, Generating Functions, Using generating functions to prove resultsrelated to certain binomial coefficients.

(18 Hours)

Unit II - Applications of Group Theory:

Recapitulation of Group Action, Orbit Stabilizer Theorem and its applications to Polya's Counting Principle (Polya's Theorem (Special Case) and Polya's Theorem (General Case))and Polya's Inventory Problems.

(10 Hours)

Unit III - Boolean Algebras and Switching Functions:

Introduction, Boolean Algebras, Boolean Functions, Switching Mechanisms, Minimization of Boolean Functions, Applications to Digital Computer Design. Switching Functions:Disjunctive and Conjunctive Normal Forms, Gating Networks, Minimal sums of products,Karnaugh Maps and further Applications.

(10 Hours)

Unit IV - Graph Theory:

Introduction, Matching and Factorization. Extremal Graph Theory - Turans Theorem. DFS,BFS, Shortest Path Algorithms.

(10 Hours)

References

[1] D. I. A. Cohen, *Basic Techniques of Combinatorial Theory*, John Wiley and Sons, New York, 1978.

[2] G. E. Martin, Counting: *The Art of Enumerative Combinatorics*, UTM, Springer, 2001.

[3] Ralph P. Grimaldi, *Descrete Combinatorial Mathematics*, 5th Ed., Pearson, 2006.

[4] Mott J. L. , Kandel A. and Baker T. P., *Discrete Mathematics for Computer Scientists and Mathematicians*, 2nd Ed., Prentice Hall India, 1986.

[5] Kenneth H. Rosen, *Discrete Mathematics and its Applications*, 7th Ed., McGraw Hill, 2012.

[6] F. Bukley and Frank Harary, *Distance in Graphs*, Addition Wisley Publishing Comany, 1990.

[7] G. Chartrand, L. Lesniak and P. Zhang, *Graphs and Digraphs*, 5th Ed., CRC Press, 2011.