

Gujarat Technological University

Master of Computer Applications

Semester-I

Subject Name: **Discrete Mathematics for Computer Science (DMCS)**
Subject Code: **2610003**

Objectives: The objective of this course is to present the foundations of many basic computer related concepts and provide a coherent development to the students for the courses like Fundamentals of Computer Organization, RDBMS, Data Structures, Analysis of Algorithms, Theory of Computation ,Cryptography, Artificial Intelligence and others. This course will enhance the student's ability to think logically and mathematically.

Prerequisites: Knowledge of basic concepts on Sets, different operations on sets, binary operations, functions.

Contents:

- 1. Introduction and Pre-requisites** **[6 Lectures]**
Importance & Purpose of Discrete Mathematical Structures; Applications; Set Theory, Functions, Relations, etc.
- 2. Mathematical Logic:** **[8 Lectures]**
Introduction, Connectives, statement formulas, principle of substitution, validity of arguments, Quantifiers, Proof techniques.
- 3. Lattices and Boolean Algebra:** **[10 Lectures]**
Relation and ordering, partially ordered sets, Lattices as poset, properties of lattices, Lattices as algebraic systems, sub-lattices, direct product and homomorphism, complete lattices, bounds of lattices, distributive lattice, complemented lattices.
Introduction, definition and important properties of Boolean Algebra, Sub Boolean algebra, direct product and homomorphism, join-irreducible, meet-irreducible, atoms, anti atoms, Stone's representation theorem. (Without Proof),

Note: No proof is required for Theorems or Results on lattices and Boolean Algebra. Theorems should be justified and explained by suitable examples.
- 4. Applications of Boolean Algebra :** **[10 Lectures]**
Boolean expressions and their equivalence, Minterms and Maxterms, Free Boolean algebra, Values of Boolean expression, canonical forms, Boolean functions, representation of Boolean function, Karnaugh maps, minimization of Boolean function, Quine-Mccluskey algorithm, Application to Relational Database.

- 5. Group Theory :** **[6 Lectures]**
Definition and examples of groups, abelian group, cyclic groups, permutation groups, subgroups & Homomorphism, Cosets and Lagrange's Theorem (without proof), Normal subgroups, Quotient Groups.
- 6. Graph Theory:** **[8 Lectures]**
Basic concepts of Graph theory, paths, reachability and connectedness, matrix representation of graph, trees.

Text Books:

1. "Discrete Mathematical Structures with Applications to Computer Science", J. P. Tremblay and R. Manohar, Tata McGraw-Hill
2. "Discrete Mathematical Structure", D. S. Malik, M. K. Sen, Cengage Learning

Reference Books:

1. Discrete Mathematics and its applications, Tata McGraw-Hill, 6th edition, K. H. Rosen.
2. Discrete Mathematical Structure, Pearson Education, Bernard Kolmann & others, Sixth Edition
3. Discrete Mathematics with Graph Theory, PHI, Edgar G. Goodaire, Michael M. Parmenter.
4. Logic and Discrete Mathematics, Pearson Education, J. P. Tremblay and W. K. Grassman.

Chapter wise coverage from the Text Books:

1. From Book # 1
Chapter – 2, article 2-3 (2-3.1 to 2-3.9)
Chapter-3, article 3-5 (3-5.1 to 3-5.4) up to Theorem 3-5.8
Chapter – 4, articles 4-1 to 4-4
Chapter – 5, article 5-1 (5-1.1 to 5-1.4)
2. From Book # 2
Chapter – 1, articles 1.2 to 1.5
Chapter-3 article 3.3

Accomplishment of the student after completing the course :

The student will be able to apply concepts to RDBMS, perform minimization of Boolean functions, shall learn the fundamental representations methods of graphs and trees. They shall be able to use different logical reasoning to prove theorems.