

SHRI GOVIND GURU UNIVERSITY
Syllabus for B. Sc. Semester I (Mathematics)

BSC23SE106 Skill Enhancement Course: Discrete Mathematics

Hours: 2 /week

Credits: 2

Prerequisite: Introduction to set theory, logic, algebraic structures, understanding of basic mathematical concepts such as algebra, arithmetic, geometry, and basic calculus.

Course Objectives: The objectives encompass the wide range of knowledge and skills that students are expected to gain from a Discrete Mathematics course. The more detailed objective of the course includes a solid understanding of foundational concepts in Discrete Mathematics; Grasp Boolean algebra, simplify Boolean expressions, understand binary arithmetic, truth tables and applications in digital circuit design; Build a strong foundation for advanced courses in theoretical computer science, algorithms and cryptography; Consider ethical implications of solving problems and applying Discrete Mathematics concepts.

Course Learning Outcomes: The learning outcomes capture the comprehensive knowledge and skills that students are expected to acquire after completing this course. Upon completing the course, students should be able to:

1. Recognize discrete mathematics' application in computer science, including algorithms, data structures, and formal languages.
2. Demonstrate proficiency in simplifying Boolean expressions and Boolean Functions.
3. Work with propositional and predicate logic, construct truth tables, and utilize quantifiers for logical reasoning.
4. Build a strong foundation for advanced courses in areas like algorithm design, theory of computation, and cryptography.
5. Identify and apply Discrete Mathematics concepts in computer science, algorithms, data structures, and apply logical reasoning and analytical skills to solve complex problems in various areas.
6. Consider ethical implications when solving problems and applying Discrete Mathematics in real-world contexts.

Unit I: Propositions and compound statements, Basic logical operations, Propositions and truth tables, Tautologies and Contradictions, Logical Equivalence .

(4.1 to 4.6 of [1])

Unit II: Algebra of Propositions, Conditional Propositions, Biconditional Propositions, Propositional Functions, Quantifiers, Negation of Quantified Statements.

(4.7 to 4.11 of [1])

Unit III: Boolean Algebra: Boolean Functions, Boolean Expressions and Boolean Functions, Duality, Sum-of-Products Expression, Minimal Sum-of-Products, Prime Implicants.

(15.1,15.2,15.3,15.4,15.8,15.9 of [1])

Reference Books:

1. Theory and Problems of Discrete Mathematics, S. Lipschutz and M. L. Lipson, Schaum's Outline Series, Third Edition, McGraw-Hill, New Delhi, 2007.
2. Discrete Mathematics and its Applications, Kenneth H. Rosen, Eighth Edition, McGraw-Hill, New York, 2019.
3. Discrete Mathematics, B. S. Vatsa, Third Edition, Wishwa Prakashan, New Delhi, 2002.

Teaching Plan: The teaching plan may be followed as:

Weeks 1 and 2: Fundamental theory, Propositions and compound statements, and Basic logical operations.

Weeks 3 and 4: Propositions and truth tables, Tautologies and Contradictions, and Logical Equivalence.

Weeks 5, 6 and 7: Algebra of Propositions, Conditional Propositions, and Biconditional Propositions.

Weeks 8 and 9: Propositional Functions, Quantifiers, and Negation of Quantified Statements.

Weeks 10, 11 and 12: Boolean Functions, Boolean Expressions and Boolean Functions.

Weeks 13 and 14: Duality, Sum-of-Products Expression, Minimal Sum-of-Products, and Prime Implicants.

Week 15: Discussion about learning outcomes of the course.