20MA206T					Discrete Mathematical Structures: CSE / ICT					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand the concept of sets, relations, functions and logic.
- To understand Combinatorics as an analytical method for problem solving.
- To apply graph theory-based modeling to solve real life problems.
- To explain the basics of algebraic structures.

UNIT 1 SETS, RELATIONS, FUNCTIONS AND LOGIC **10 Hrs.**

Finite and Infinite sets, Countable and Uncountable sets, Mathematical Induction, Functions and Relations, Types of Relation, Partial Ordered Relations, Hasse diagram and Lattice. Propositions - Simple and Compound. Basic logical operators. Implication. Truth tables. Tautologies, Contradictions and Contingency. Valid arguments and Fallacy.

UNIT 2 COMBINATORICS **10 Hrs.**

Recursive functions, Recurrence relations, Solutions of recurrence relations (Direct Method and by using Generating Function), Counting principles, Permutation, Combination, Derangement, inclusion-exclusion principle, Pigeon hole principle, Extended Pigeon hole principle.

UNIT 3 GRAPH THEORY AND ITS APPLICATIONS **12 Hrs.**

Binary Operation, Graphs and related definitions, Sub graphs, Homomorphism and Isomorphism, Paths and Connectivity. Bipartite graph. Eulerian graph and Konigsberg Bridge problem. Hamiltonian graph. Labeled and weighted graphs. Graph coloring. Four color problem. Planar Graphs. Digraphs and related definitions. Trees. Algebraic expressions and Polish notation. Sequential representation. Adjacency matrix. Shortest path Algorithms (Dijkstra), Binary trees, Strongly and weakly connected graphs, Powers of the adjacency matrix, Floyd-Warshall algorithm, Application of Graph theory in real-life applications.

UNIT 4 ALGEBRAIC STRUCTURES **08 Hrs.**

Group, Semi group, Monoids, Properties of a Group, Composition table for finite Group, Order of a group, Order of its elements, Cyclic Group, Generator, Lagrange's Theorem. Ring, Properties of Rings, Integral Domain, Field.

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Identify structures of algebraic nature, prove and use their properties.
CO2 – Understand the basic concepts of sets, relations, functions, logic and be able to determine their properties.
CO3 – Apply the basic techniques of Combinatorics and Counting.
CO4 – Apply Graph theory in related areas such as minimal-path problems and network flow problems.
CO5 – Defend and point out fallacious reasoning and propositions.
CO6 – Construct and solve recurrence relations that arise in counting problems including problems of determining the time complexity of recursively defined algorithms.

TEXT / REFERENCE BOOKS

1. Seymour Lipschutz and Marc Lipson, Discrete Mathematics, Schaum's Series, 3rd ed., McGraw-Hill Education, 2009.
2. Kenneth Rosen, Discrete Mathematics and Its Applications, 7th ed., McGraw Hill Education, 2017.
3. Bernard Kolman, Robert Busyb and Sharon C. Ross, Discrete Mathematical Structures, 6th ed., Pearson, 1998.
4. Thomas Koshy, Discrete Mathematics with Applications, Academic Press Inc., 2004.
5. Ralph P. Gramaldi, Discrete and Combinatorial Mathematics, 5th ed., Pearson, 2006.
6. C.L. Liu, D.P. Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, 4th ed., McGraw Hill Education, 2017.