MATHEMATICAL FOUNDATIONS OF COMPUTER APPLICATIONS

COURSE CODE: 20BM3101 **L T P C**

3 0 0 3

COURSE OUTCOMES:
At the end of the course, the student shall be able to

CO1: Test the validity of an argument using propositional, predicate logic and truth tables (L5)
CO2: Categorize the various types of relations and describe the properties of relations (L4)
CO3: Summarize certain properties of Lattices and Boolean algebra (L5)
CO4: Solve problems involving recurrence relations and generating functions (L3)
CO5: Determine isomorphism of graphs and spanning tree of a given graph using DFS / BFS. Also determine minimal spanning tree of a given graph (L3)

UNIT-I **(10 Lectures)**

Mathematical Logic:
Statements and notations, connectives, statement formulas and truth tables, well-formed formulas, tautologies, equivalence of formulas, duality law, Tautological Implications, other connectives, Normal forms, the theory of inference for statement calculus, validity using truth tables, rules of inference, consistency of premises and indirect method of proof, Predicates, the statement function, variables and quantifiers, predicate formulas, free and bound variables, universe of discourse, inference theory of the predicate calculus (Sections1-1, 1-2, 1-2.1 to 1-2.4, 1-2.6 to 1-2.11, 1-2.14, 1-3, 1-3.1 to 1-3.4, 1-4 to 1-4.3, 1-5.1 to 1-5.5 of text book 1)

Learning Outcomes:
At the end of the unit, the student will be able to

1. Determine the equivalence of formulas and implement the logic formathematical proofs (L3)
2. Infer the consistency of an argument (L4)
3. Test the validity of a conclusion based on a given set of premises (L5)

UNIT-II **(10 Lectures)**

Relations and Partially ordered set:
Relations, properties of binary relations in a set, Relation matrix and Graph of a relation, partition and covering of a set, equivalence relations, compatibility relation, composition of binary relations, partial ordering, partially ordered set.(Sections2-3 of the text book1)

Learning Outcomes:
At the end of the unit, the student will be able to

1. Explain the different types of relations (L2)
2. Classify the data into equivalence classes using an equivalence relation (L4)
3. Use the relation matrix to check equivalence relation (L3)

UNIT-III **(10 Lectures)**

Boolean Algebra:
Lattices, Definition and examples, some properties of lattices, some special lattices, Boolean algebra – Definition and Examples, Boolean forms and free Boolean algebra, Values Boolean Expressions.

dBoolean functions, representation of Boolean functions (Sections4-1.1, 4-1.2, 4-1.5, 4-2.1, 4-3.1, 4-3.2, 4-4.1 of the text book1).

Learning Outcomes:
At the end of this unit, the student will be able to

1. Discuss the properties of a lattice and a Boolean algebra (L2)
2. Apply the properties of Boolean algebra in minimization of switching circuits (L3)
3. Evaluate the value of given boolean expression (L5)

UNIT-IV **(10 Lectures)**

Recurrence relations:
Generating Functions of sequences, Calculating coefficients of generating functions, Recurrence relations, Solving Recurrence relations by substitution, generating functions and the method of characteristic roots (Sections3.1 - 3.5 of the text book2).

Learning Outcomes:
At the end of the unit, the student will be able to

1. Determine a generating function for a given sequences (L3)
2. Explain various methods of solving recurrence relations (L2)
3. Solve homogeneous linear recurrence relations (L3)

UNIT-V **(10 Lectures)**

Graph Theory:
Graph, Directed Graph, Multi Graph, Degree of vertex and their properties, Adjacency Matrix, Cycle Graph, Bipartite graphs, Isomorphism and Subgraphs, Trees and their properties, Spanning trees: DFS, BFS, Kruskal's Algorithm for finding minimal Spanning tree (Sections 5.1-5.4 of text book2).

Learning Outcomes:
At the end of this unit, the student will be able to

1. Discuss the various types of graphs(L2)

2. Illustrate the isomorphism of graphs(L3)
3. Determine the minimal spanning tree of a graph (L3)

TEXT BOOKS:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill,1997.
2. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2nd Edition, Prentice Hall of India Ltd, 2012.

REFERENCE BOOKS:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6th Edition, Tata McGraw-Hill, 2009.
2. Richard Johnsonburg, Discretemathematics,7th Edition, Pearson Education, 2008.
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/106/106106094/