2 / 4 B.Tech. THIRD SEMESTER

EM3T4 **DISCRETE MATHEMATICS** **Credits: 3**

Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Course Objectives:

- To know the notations used in the discrete mathematics associated with computer science and engineering.
- To learn the rudiments of elementary mathematical reasoning (elementary proofs; proofs by induction, Normal forms)
- To understand the theoretical parts of all further courses in Computer Sciences.
- To understand the fundamentals of counting and discrete probability
- To understand basic set-theoretical notions: relations, functions, graphs, equivalence relations, and orderings.
- To relate these notions to applications in Computer Sciences.

Course Outcomes:

- Able to understand truth tables, the concept of logical equivalence and its relationship to equivalent logic circuits and Normal Forms.
- Able to extend this to predicate calculus and in predicate calculus using quantifiers.
- Able to express English assertions in propositional calculus and in predicate calculus using quantifiers.
- Able to carry out simple direct and indirect proofs about domains like The integers and the real numbers, using quantified statements about these domains. Able to do simple proofs by mathematical induction.
- Understand binary relations and applications. Know the major types of binary relations on a set. Able to use graphs as representing relations, algorithms for relations based on graphs or matrices (e.g. transitive closure).
- Know the properties of equivalence relations and partial orderings. Understand lattices and Hasse Diagrams.
- Know the fundamentals of counting and discrete probability

UNIT- I

Statements and Notation, Connectives- Negation, Conjunction, Disjunction, Conditional and Bi-conditional, Statement formulas and Truth Tables. Well formed formulas, Tautologies, equivalence of formulas, Duality Law, Tautological Implications, Functionally Complete Sets of Connectives, Other connectives.

UNIT-II

Normal Forms: Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms(PDNF), Principal Conjunctive Normal Forms(PCNF).

UNIT-III

Logical inferences, Methods of proof of an implication, First Order Logic and other methods of proof, Rules of Inference for Quantified Propositions, Mathematical induction.

UNIT-IV

Basics of counting, Combinations and Permutations, Enumeration of combinations and permutations, Enumerating Combinations and Permutations with repetitions, Enumerating permutations with constrained repetitions, The Principle of Inclusion-Exclusion.

UNIT –V

Generating functions of Sequences, Recurrence relations, solving recurrence relations by Substitution and Generating functions, the method of Characteristic roots, Solutions of In-homogeneous Recurrence Relations.

UNIT –VI

Relations and Directed Graphs, Special properties of binary relations, Equivalence relation, Ordering relations, Lattices, and Enumerations.

UNIT –VII

Operations on relations, Paths and Closures, Directed graphs and Adjacency matrices. Warshall's algorithm- Transitive closure.

UNIT –VIII

Basic concepts, Representation of Graphs, Isomorphism and sub graphs, Planar graphs,Multi graphs, Euler circuits, Euler Graphs and Hamiltonian graphs, Chromatic number.

Learning resources

Text Books:

1. Joe L. Mott. Abraham Kandel and Theodore P.Baker, Discrete Mathematics for Computer Scientists & Mathematicians. PHI,Second Edition(For Units III to VIII).
2. J P Trembly and R Manohar , Discrete Mathematical Structures with Applications to Computer Science. TMH (For Units I and II).

Reference Books:

1. Swapan kumar Chakrabothy, Bikash Kanti Sarkar, Discrete Mathematics. Oxford
2. Dr.J Rajendra Prasad, T.Rama Rao, A.Madana Mohana Rao, Mathematical Foundations of Computer Science.