18BC107DISCRETE MATHEMATICAL STRUCTURES

Course Description and Objectives:

This course deals with the analysis of computational processes using analytical and combinatorial methods such as propositional logic, predicate logic, set theory, relations, functions, recurrence relations and graph theory. The objective of this course is to make the students to familiarize with required mathematical foundations of Computer Science.

Course Outcomes:

The student will be able to:

- Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, recurrence relations and graph theory applications.
- Evaluate elementary mathematical arguments, identify erroneous reasoning, and combine induction hypotheses and simple induction proofs.
- Prove elementary properties of modular arithmetic and explain their applications in Computer Science.

Skills:

- Design of logical gates using propositions.
- Prove the basic mathematical theorems through direct or indirect proofs.
- Solvingvarioustypesofproblemsonsets&relationstounderstandsomebasic.
- Properties of trees, graphs and related discrete structures.
- Solving a problem in recursive manner and estimation of time complexity.

Activities:

- Construction of Logical circuits using Truth tables.
- Gates minimization using Normal forms.
- Finding shortest path in graphs using different algorithms.
- Study on Pigeonhole principle.
- Finding solutions to non-homogeneous linear equations.
- Study on different tree traversals.
- Checking logical equivalences.

Syllabus

UNIT - 1 **12 Hours**

MATHEMATICAL LOGIC:Propositions, Negation, Disjunction and Conjunction, Well-formed formulas,Truth Tables, Tautology, Implication and Equivalence, Normal forms – DNF, CNF, PDNF, PCNF.

UNIT – 2 **12 Hours**

PREDICATES AND QUANTIFIERS:Natural Deduction, Rules of Inference, Methods of proofs,Mathematical Induction.

UNIT – 3 **12 Hours**

SET THEORY:Set, Properties, Relation, Properties of Binary Relations, Equivalence, Compatibilityand partial ordering relations, Hasse diagram, Lattice and its Properties, Peano postulates, Pigeon hole principles and its application.

UNIT – 4 **12 Hours**

RECURRENCE RELATION:Generating Functions, Function of Sequences, Calculating Coefficient ofgenerating function, Recurrence relations, Recurrence relation by substitution and Generating functions, Characteristics, roots solution of Non-homogeneous recurrence relation.

UNIT – 5 **12 Hours**

GRAPH THEORY:Introduction, Graphs, Isomorphism and Sub graphs, Multi graphs and Eulercircuits, Hamiltonian graphs, Chromatic Numbers, Euler graph, Hamiltonian path, Trees, Tree traversals, Spanning trees, Minimal Spanning Trees**.**

Text Books:

1. Trembly J.P. and Manohar, "Discrete Mathematical Structures with applications to computer science", 6th edition, Tata Mc-Graw Hill, 2006.
2. Ralph and P.Grimaldi, "Discrete and Combinational Mathematics- an Applied Introduction", 5th edition, Pearson Education, 2014.

Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata Mc-Graw Hill, 2012.
2. Thomas Koshy, "Discrete Mathematics with Applications", 1st edition, Elsevier, 2003.
3. BernandKolman, Roberty C. Busby and Sharn Cutter Ross, "Discrete Mathematical Structures", 2nd edition, Pearson Education/Prentice Hall India, 2013.
4. Garry Haggard, "Discrete Mathematics for Computer science", 1st edition, Thomson, 2007.
5. J.L. Mott, A. Kandel and T.P. Baker, "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd edition, Prentice Hall India, 2009.
6. Grass Man and Trembley, " Logic and Discrete Mathematics", 2nd edition, Pearson Education/Prentice Hall India, 2013.