21CS121 DISCRETE MATHEMATICAL STRUCTURES

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P
45	-	-
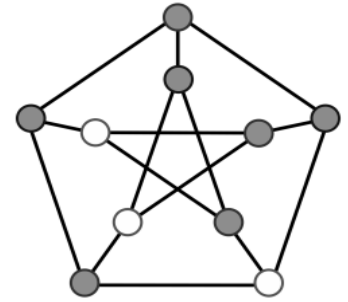
COURSE DESCRIPTION AND OBJECTIVES:

This course is aimed to improve the logical thinking and problem solving skills. This course enhances the students ability to reason and to present the argument. Throughout the course, students will be expected to demonstrate analytical and combinatorial methods such as propositional logic, set theory, relations, functions, recurrence relations and graph theory etc.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Apply propositional logic, predicate logic and Boolean functions to express the mathematical properties.
2	Analyze the basic mathematical objects such as sets and relations to verify the mathematical properties.
3	Identify the solutions for various problems using recurrence relations and analyze various algebraic structures like Group, Ring and Field.
4	Design and Develop solutions for various combinatorial and Graph based problems.

SKILLS:

- ✓ *Design of logical gates using propositions.*

- ✓ *Prove the basic mathematical theorems through direct or indirect proofs.*

- ✓ *Solving various types of problems on sets & relations.*

- ✓ *Understand some basic Properties of trees, graphs and related discrete structures.*

- ✓ *Solving a problem in recursive manner and estimation of time complexity.*

UNIT– I

L- 9

PROPOSITIONAL LOGIC: Propositional logic - applications of propositional logic, propositional equivalences; Predicates and quantifiers - nested quantifiers; Rules of inference - introduction to proofs, proof methods and strategy.

UNIT – II   **L- 9**

SETS, RELATIONS, FUNCTIONS: Sets, Operations on sets, set identities, **Relations:** and their properties, Representing relations, Closures of relations, Equivalence relations, Partial ordering, Functions, Different types of orderings. **Functions:** Different types of functions, their composition and inverses

UNIT – III   **L- 9**

GROUP THEORY: Algebraic structures with binary operations, Semi group, Monoid Group, Co-sets, Lagrange's theorem, Normal sub groups, Homomorphic sub groups, Quotient groups, rings, Integral Domain, Fields.

UNIT – IV   **L- 9**

COUNTING: The basics of counting, Principles of inclusion and exclusion, Pigeon hole principle, solving linear recurrence relations, Generating functions.

UNIT - V   **L- 9**

GRAPH THEORY: Graph terminology, special types of graphs, representing graphs, graph isomorphism, Euler and Hamilton paths and circuits, planar graphs, graph coloring, shortest path problems.

TEXT BOOK:

1.   Kenneth H. Rosen, "Discrete Mathematics and Its Applications with Combinatorics and Graph Theory", 7th edition, MGH, 2012.

REFERENCE BOOKS:

1.   Thomas Koshy, "Discrete Mathematics with Applications", 1st edition, Elsevier, 2003.

2.   Tremblay J. P. and Manohar R., "Discrete Mathematical Structures", MGH, 1997.

3.   Bernand Kolman, 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.