

DISCRETE MATHEMATICAL STRUCTURES

III Semester:CSE/IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB04	Core	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 60	

OBJECTIVES:

Students will try to Learn:

- I. The fundamental knowledge of statement notations and logical connectives which are used to convert English sentences into logical expressions.
- II. The effective use of combinatory principles for calculating probabilities and solving counting problems
- III. The characteristics of generating functions for finding the solution of linear homogeneous recurrence relations.
- IV. The effective use of graph theory in subsequent fields of study such as computer networks, and algorithms for solving real world engineering problems.

COURSE OUTCOMES:

After Successful completion of this course, students will be able to:

- CO 1 **Explain** mathematical definitions and its notations to Reformulate statements from common language to formal logic.
- CO 2 **Relate** the laws of logic to find the disjunctive normal form and conjunctive normal form of compound proposition.
- CO 3 **Demonstrate** the concept of argument validation using direct proof, proof by contradiction and mathematical induction
- CO 4 **Apply** operations on discrete mathematical structures like sets, functions, lattices to show the relation among them.
- CO 5 **Apply** reflexive, symmetric and transitive properties on partial order set to represent diagraph as Hasse diagram.
- CO 6 **Identify** the types of functions and properties to find operations like composition, recursive and inverse.
- CO 7 **Compare** rings, integral domains, and field structures with binary operations defined on them
- CO 8 **Make use of** addition rule and substitution rule to solve the problems of combinatorics.
- CO 9 **Solve** problems involving recurrence relations and generating functions to obtain particular solution
- CO 10 **Recall and relate** the methods of iteration, substitution and characteristic roots to solve homogenous and non-homogenous recurrence relations
- CO 11 **Find** the optimal Hamiltonian circuit for a graph using nearest neighbor algorithm and sorted edges algorithm
- CO 12 **Make use of** Kruskal's and prim's algorithms to form a spanning tree and to find minimum cost spanning tree.

MODULE-I	MATHEMATICAL LOGIC AND PREDICATES
Mathematical logic: Statements and notations, connectives, well-formed formulas, truth tables, tautology, equivalence implication; Normal forms: Disjunctive normal forms, conjunctive normal forms, principle disjunctive normal forms, principle conjunctive normal forms; Predicate calculus: Predicative logic, statement functions, variables and quantifiers, free and bound variables, rules of inference, consistency, proof of contradiction.	
MODULE-II	RELATIONS, FUNCTIONS AND LATTICES
Relations: Properties of binary relations, equivalence, compatibility and partial ordering relations, lattices, Hasse diagram; Functions: Inverse function, composition of functions, recursive functions; Lattices: Lattices as partially ordered sets; Definition and examples, properties of lattices, sublattices, some special lattices.	
MODULE-III	ALGEBRAIC STRUCTURES AND COMBINATORICS
Algebraic structures: Algebraic systems, examples and general properties, semigroups and monoids, groups, subgroups, homomorphism, isomorphism, rings. Combinatory: The fundamental counting principles, permutations, disarrangements, combinations, permutations and combinations with repetitions, the binomial theorem, multinomial theorem, generalized inclusion-exclusion principle.	
MODULE-IV	RECURRENCE RELATIONS
Recurrence relation: Generating functions, function of sequences calculating coefficient of generating function, recurrence relations, solving recurrence relation by substitution and generating functions, characteristic roots solution of homogeneous recurrence relation.	
MODULE-V	GRAPHS AND TREES
Graphs: Basic concepts of graphs, isomorphic graphs, Euler graphs, Hamiltonian graphs, planar graphs, graph coloring, digraphs, directed acyclic graphs, weighted digraphs, region graph, chromatic numbers; Trees: Trees, spanning trees, minimal spanning trees	
Text Books:	
<ol style="list-style-type: none"> 1. J. P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, India, 1st Edition, 1997. 2. Joe L. Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists and Mathematics", Prentice Hall of India Learning Private Limited, New Delhi, India, 2nd Edition, 2010. 	
Reference Books:	
<ol style="list-style-type: none"> 1. C. L. Liu, D. P. Mohapatra, —Elements of Discrete Mathematics, Tata McGraw-Hill, India, 3rd Edition, 2008. 2. Ralph P. Grimaldi, B. V. Ramana, —Discrete and Combinatorial Mathematics - An Applied Introduction, Pearson Education, India, 5th Edition, 2011. 	
Web References:	
<ol style="list-style-type: none"> 1. http://www.web.stanford.edu/class/cs103x 2. http://www.saylor.org/course/cs202/. 3. http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book 	