



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

DISCRETE MATHEMATICAL STRUCTURES								
III Semester: CSE (DS)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACDD01	Core	L 3	T -	P -	C 3	CIA 40	SEE 60	Total 100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			

Prerequisite: Basics of Mathematics.

I. COURSE OVERVIEW:

The purpose of this course is to provide a clear understanding of the concepts that underlie fundamentals with emphasis on their applications to computer science. It highlights mathematical definitions and proofs as well as applicable methods. The contents include formal logic notation, proof methods; induction, well-ordering; sets, relations; growth of functions; permutations and combinations, counting principles, recurrence equations, trees and more general graphs.

II. COURSES OBJECTIVES:

The 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.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO1 Make use of mathematical definitions and its notations for reformulating statements in formal logic and validating normal forms.
- CO2 Demonstrate operations on discrete mathematical structures like sets, functions, lattices for representing the relations among them.
- CO3 Illustrate rings, integral domains, and field structures with binary operations defined on them.
- CO4 Apply addition rule and substitution rule for solving the problems of combinatorics.
- CO5 Develop solutions for recurrence relations and generating functions to obtain terms of equation.
- CO6 Identify appropriate algorithms of graphs and trees for finding shortest path.

IV. COURSE CONTENT:

MODULE – I: MATHEMATICAL LOGIC AND PREDICATES (10)

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 (09)

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, sub lattices, some special lattices.

MODULE – III: ALGEBRAIC STRUCTURES AND COMBINATORICS (10)

Algebraic structures: Algebraic systems, examples and general properties, semi groups and monoids, groups, sub groups, 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 RELATION (10)

Recurrence relation: Generating functions, function of sequences calculating coefficient of generating function, recurrence relations, solving recurrence relation by substitution and generating functions, Characteristics roots solution of homogeneous recurrence relation.

MODULE – V: GRAPHS AND TREES (09)

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.

V. TEXT BOOKS:

1. J. P. Tremblay, R. Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, TataMcGraw Hill, India, 1st edition, 1997.
2. JoeL. Mott, Abraham Kandel, Theodore P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, Prentice Hall of India Learning Private Limited, New Delhi, India, 2nd edition, 2010.

VI. REFERENCE BOOKS:

1. Kenneth H. Rosen, “Discrete Mathematics and Its Applications”, Tata Mcgraw-Hill, New Delhi, India, 6th edition, 2012.
2. C. L. Liu, D. P. Mohapatra, “Elements of Discrete Mathematics”, Tata Mcgraw-Hill, India, 3rd edition, 2008.
3. Ralph P. Grimaldi, B. V. Ramana, “Discrete and Combinatorial Mathematics - An Applied Introduction”, PearsonEducation, India, 5th edition, 2011.
4. D. S. Malik, M. K. Sen, “Discrete Mathematical Structures: Theory and Applications”, Thomson CourseTechnology, India, 1st edition, 2004.

VII. ELECTRONICS RESOURCES:

1. <http://www.web.stanford.edu/class/cs103x>
2. http://www.cs.odu.edu/~cs381/cs381content/web_course.html
3. <http://www.cse.iitd.ernet.in/~bagchi/courses/discrete-book>
4. <http://www.saylor.org/course/cs202/>
5. <http://www.nptel.ac.in/courses/106106094/>
6. http://www.tutorialspoint.com/discrete_mathematics
7. <http://www.dmtcs.org/dmtcs-ojs/index.php/dmtcs>

VIII. MATERIALS ONLINE (Include full stack)

1. Course template
2. Tutorial question bank
3. Definition and terminology
4. Tech-talk topics
5. Assignments
6. Model question paper - I
7. Model question paper - II
8. Lecture notes
9. Early learning readiness videos (ELRV)
10. Power point presentations