DISCRETE MATHEMATICAL STRUCTURES

III Semester: CSE / IT / CSIT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AITC01	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		
Prerequisites: There are no prerequisites to take this course.								

I. COURSE OVERVIEW:

The purpose of this course is to provide a clear understanding of the concepts that underlying 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. COURSE 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:

After successful completion of the course, students should be able to:

CO 1	**Make use of** mathematical definitions and its notations for reformulating statements in formal logic and validating normal forms.	Apply
CO 2	**Demonstrate** operations on discrete mathematical structures like sets,functions, lattices for representing the relations among them.	Understand
CO 3	**Illustrate** rings, integral domains, and field structures with binary operations defined on them.	Understand
CO 4	**Apply** addition rule and substitution rule for solving the problems ofcombinatorics.	Apply
CO 5	**Develop** solutions for recurrence relations and generating functions to obtain terms of equation.	Apply
CO 6	**Identify** appropriate algorithms of graphs and trees for findingshortest path.	Apply

IV. SYLLABUS:

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 (09)

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 (09)

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 (08)

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", Tata McGraw 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", Pearson Education, India, 5th Edition, 2011.
4. D. S. Malik, M. K. Sen, "Discrete Mathematical Structures: Theory and Applications", Thomson Course Technology, India, 1st Edition, 2004.

VII. WEB REFERENCES:

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