Kadi Sarva Vishwavidyalaya, Gandhinagar

MASTERS OF COMPUTER APPLICATION (MCA)
Semester – I (First Year)
Subject: MCA-104 – Foundations in Mathematics (FM)

SUB Total CREDIT	Teaching scheme (per week)		Examination scheme				
			MID	CEC	External		Total Marks
	Th.	Pr.	Th.	Th.	Th.	Pr.	
3	3	--	25	25	50	0	100

Course Description:

The purpose of this course is to introduce the mathematical elements of computer science including propositional logic, predicate logic, sets, functions and relations, combinatorics, matrices, graphs, trees, and Boolean logic. In this course, emphasis is on providing a concept for the application of the mathematics in computer science.

Objectives:

1. To introduce a number of Discrete Mathematical Structures (DMS) found to be serving as tools even today in the development of theoretical computer science.
2. To present the foundations of many basic computer related concepts and provide a coherent development to the students for the courses like Fundamentals of Computer Organization, RDBMS, Data Structures, Analysis of Algorithms, Cryptography, Artificial Intelligence and others.
3. To develop mathematical reasoning and analytical thinking that is the base of computer science.

Prerequisites: Knowledge of basic concepts on Sets, Different operations on sets, Number systems, Functions.

Course Contents:* The proofs of the theorems must be excluded and only statements and their applications should be discussed.

UNIT – I Mathematical Logic: [20%]

Statements, Connectives, Negation, Conjunction, Disjunction, Conditional, Biconditional, Well-formed-formula, Tautology, Contradiction, Logical equivalence, Introduction to Predicate Calculus, Quantifiers, Free and Bound Variables, Domain of discourse, Argument, Validity of argument

UNIT – II Permutations and Combinations: [20%]

Basic principles of counting: the multiplication principle, the addition principle, Factorial notation, Binomial theorem, Pascal's triangle, Permutations, Permutations with repetitions, Circular permutations, Combinations of n different objects, Combinations with repetitions

UNIT – III Relations and Lattices: [20%]

Relations, Properties of relation: Reflexive, Symmetric, Transitive, Irreflexive, Antisymmetric, Representation of relation, Equivalence relation, Lattices as poset, Properties of lattices, Lattices as algebraic systems, Sub-lattices, Complete lattices, Bounds of lattices, Distributive lattice, complemented lattices

UNIT – IV Algebraic Structures & Graph theory: [20%]

Algebraic Structures: Definitions and examples of Semigroups, Monoids and Groups, Abelian group, Permutation groups, Cyclic groups, Subgroups

Introduction to Graph theory, Definition of digraph, Undirected graph, Indegree, Outdegree, Subgraph ,Converse of a graph, Isomorphism, Paths, Reachability and Connectedness, Matrix representation of graph, Trees

UNIT – V Boolean Algebra and Applications of Boolean Algebra: [20%]

Introduction, Definition and Important properties of Boolean Algebra, Sub Boolean algebra, Join-irreducible, Meet-irreducible atoms, Anti atoms, Stone's representation theorem (Without Proof), Boolean expressions and their equivalence, Minterms and Maxterms, Free Boolean algebra, Values of Boolean expression, canonical forms, Boolean functions, Representation of Boolean function, Minimization of Boolean Expressions by Karnaugh maps.

Text Book(s):

1. "Discrete Mathematical Structures with Applications to Computer Science", J.P. Tremblay and R.Manohar, Tata McGraw-Hill
2. "Discrete Mathematical Structure", D. S. Malik, M. K. Sen, Cengage Learning
3. "Discrete Mathematics" Semyour Lipschutz and Mark Lipson , Tata McGraw-Hill

Other Reference Books:

1. Discrete Mathematics and its applications, Tata McGraw-Hill, 6th edition, K. H.Rosen.
2. Discrete Mathematical Structure, Pearson Education, Bernard Kolmann& others,Sixth Edition
3. Discrete Mathematics with Graph Theory, PHI, Edgar G. Goodaire, Michael M.Parmenter.
4. Logic and Discrete Mathematics, Pearson Education, J. P. Tremblay and W. K.Grassman.