MCA- C104 Mathematical Foundations for Computer Science				
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Course objective:

1. Use mathematically correct terminology and notation.
2. Apply logical reasoning to solve a variety of problems.

Course outcomes:

1. For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
2. For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
3. Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
4. Organize, manage and present data.
5. Analyze statistical data using measures of central tendency, dispersion and location
6. Develop the given problem as graph networks and solve with techniques of graph theory

Sets, Relations and Functions: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency

Probability and Statistics: Introduction to data - Types of variables; data collection principles; types of studies, examining numerical data - Graphical methods: histograms and other graphs, Numerical methods: the average, the standard deviation, etc., Examining categorical data- Tabular methods: contingency tables, Graphical methods: bar plots and other graphs, Elementary probability rules, Conditional probability, Random variables, Normal Distribution, Binomial distribution

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances

Recommended Books:

1. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill
2. Thomas Dietz, Linda Kalof, Introduction to Social Statistics, Wiley
3. P. Trembley and R. P. Manohar, Discrete Mathematical Structures with applications to Computer Science, McGraw Hill

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