MA5161 MATHEMATICAL FOUNDATIONS FOR COMPUTER APPLICATIONS

DETAILED SYLLABUS

OBJECTIVES:

The primary objective of this course is to provide mathematical background and sufficient experience on various topics of discrete mathematics like matrix algebra, logic and proofs, combinatorics, graphs, algebraic structures, formal languages and finite state automata. This course will extend student's Logical and Mathematical maturity and ability to deal with abstraction and to introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.

UNIT I MATRIX ALGEBRA

Matrices - Rank of a matrix - Solving system of equations - Eigenvalues and Eigenvectors - Cayley - Hamilton theorem - Inverse of a matrix.

UNIT II BASIC SET THEORY

Basic definitions - Venn diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion – Partitions - Permutation and combination – Relations - Properties of relations – Matrices of relations - Closure operations on relations - Functions - Injective, subjective and objective functions.

UNIT III MATHEMATICAL LOGIC

Propositions and logical operators - Truth table - Propositions generated by a set - Equivalence and implication - Basic laws - Some more connectives - Functionally complete set of connectives – Normal forms - Proofs in propositional calculus - Predicate calculus.

UNIT IV FORMAL LANGUAGES

Languages and grammars - Phrase structure grammar - Classification of grammars -Pumping lemma for regular languages - Context free languages.

UNIT V FINITE STATE AUTOMATA

Finite state automata - Deterministic finite state automata (DFA) - Non deterministic finite state automata (NFA) - Equivalence of DFA and NFA - Equivalence of NFA and Regular Languages.

REFERENCES:

1. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.

2. Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2006.

3. Hopcroft J. E and Ullman, J.D, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.

4. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 4th Edition, 2002.

5. Sengadir, T. "Discrete Mathematics and Combinatorics" Pearson Education, New Delhi, 2009.