MA 204: DISCRETE MATHEMATICS (3-0-0 : 3)

History and overview: Reasons for studying discrete structures, Some people who influenced or contributed to the area of discrete structures.

Sets, relations, and functions: Basic operations on sets, cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses.

Propositional Logic: Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic. Introduction to first order logic and first order theory.

Partially ordered sets: Complete partial ordering, chain, lattice. complete, distributive, modular, and complemented lattices. Boolean and pseudo boolean lattices.

Algebraic Structures: Algebraic structures with one binary operation – semigroup, monoid and group. Cosets, Lagrange's theorem, normal subgroup, homomorphic subgroup. Congruence relation and quotient structures. Error correcting code. Algebric structures with two binary operations- ring, integral domain, and field. Boolean algebra and boolean ring. (Definitions and simple examples only).

Introduction to Counting: Basic counting techniques – inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functrion.

Introduction to Graph: Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees.

Text Books:

1. Trembly, Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill.
2. C. L. Liu, D. P. Mahapatra, Elements of Discrete Mathematics, Tata McGraw Hill.