Mathematics IV - Discrete Mathematics (Only for IT) 4 Credits [3-1-0]

Module I: **Propositional Logic and Counting** ***(8 Lectures)***

Logic: Propositional equivalence, predicates and quantifiers, methods of proofs, proof strategy, mathematical induction, strong induction

Counting: The basics of counting, the pigeonhole principle, principle of inclusion and exclusion and its applications

Module II: **Relations and Recurrence relations** ***(8 Lectures)***

Relations: Relations and their properties, *n*-array relations and their applications, representingrelations, closure of relations, equivalence of relations, partial orderings.

recurrence relations, solving homogeneous and non-homogeneous recurrence relations, generating functions.

Module III: **Graph theory** ***(8 Lectures)***

Graph theory: Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, planar graphs, graph coloring,

Module IV: **Algebraic Structure and Group theory** ***(8 Lectures)***

Group theory: Algebraic Structure, groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, group homomorphism, isomorphism, automorphism, normal subgroups.

Module V: **Lattices and Boolean Algebra** ***(8 Lectures)***

Lattice theory: Lattices and algebraic systems, principles of duality, basic properties of algebraic systems defined by lattices, distributive and complimented lattices, Boolean lattices and Booleanalgebras, uniqueness of finite Boolean expressions

Text Books:

1) *K.H. Rosen: Discrete Mathematics and its application, 5th edition, Tata McGraw Hill.*
2) *C.L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics, Tata McGraw-Hill Publishing*

Course Outcomes:

Upon completion of the subject the students will be able to:

CO1	Recognise recursive definitions and structural induction
CO2	Demonstrate equivalence of relations, recurrence relations and generating functions
CO3	Describe Euler and Hamilton paths, Planar graphs, Graph colouring with applications
CO4	Recognise Group structure, homomorphism, isomorphism and automorphism
CO5	Analyse Lattice theory and Boolean algebras