Program	B. Tech CSE (AI)				
Year	II	Semester		III	
Course Name	Discrete Mathematics				
Code	NCS4301				
Course Type	PCC	L	T	P	Credit
Pre-Requisite	Basics knowledge of functions and set theory	3	0	0	3
Course Objectives	**1.** To introduce Discrete Mathematical Structures (DMS) used in theoretical computer science. **2.** Investigate functions as relations and their properties **3.** Investigate use of Groups, Rings, Fields & Lattice **4.** Investigate proportional logic and relations for problem solving				
Course Outcomes					
CO1	Explore application of Set Theory, Relations, Functions & Natural Numbers				
CO2	To apply the basic principles Algebraic Structures				
CO3	To analyse the simple mathematical proofs by logic and relations				
CO4	To introduce Generating function and Combinatorics				

Module	Course Contents	Contact Hrs.	Mapped CO
1	**Set Theory, Relations, Functions & Natural Numbers** Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs, Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Natural Numbers: Introduction, Mathematical Induction, Induction with Nonzero Base cases, Proof Methods, Proof by contradiction.	30 Hours	CO1
2	**Groups, Rings, Fields & Lattice** Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Definition and elementary properties of Rings and Fields, Integers Modulo n; Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices, Bounded, Complemented, Modular, Complete lattice	30 Hours	CO2
3	**Proposition Logic** Propositional Logic: Proposition, well-formed formula, Truth tables, Tautology, Satisfiability; Contradiction; Algebra of proposition; Theory of Inference; Predicate Logic: First order predicate-well- formed formula of predicate, quantifiers, Inference theory of predicate logic. **Recurrence Relation & Combinatorics** Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatorics: Introduction; Counting Techniques: Pigeonhole Principle	30 Hours	CO3, CO4

Suggested Readings

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", McGraw- Hill

2. R.P. Grimaldi, "Discrete and Combinatorial Mathematics", Addison Wesley.

3. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science," McGraw-Hill.

Online Resources

1. https://archive.nptel.ac.in/courses/106/108/106108227/
2. https://archive.nptel.ac.in/courses/106/105/106105192/