Semester: IV						
DISCRETE MATHEMATICAL STRUCTURES AND COMBINATORICS **Category: Professional Core Course** **(Common to CS, IS, CD, AI & CY)** **(Theory)**						
Course Code	**:**	**CS241AT**		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	**3:0:0**		**SEE**	**:**	**100 Marks**
Total Hours	**:**	**45L**		**SEE Duration**	**:**	**3 Hours**

Unit-I	**09 Hrs**
Fundamental Principles of Counting and Combinatorics: The Rule of Sum and Product, Permutations, Combinations, Principle of Inclusion and Exclusion, Derangements, The Binomial Theorem, Combinations with repetition. **Recursive Definitions, Recurrence Relations:** Recursive definition, First order linear recurrence relation- Formulation problems and examples, Second order linear recurrence relations with constant coefficients- Homogeneous and Non homogeneous, Generating functions.	
Unit – II	**09 Hrs**
Fundamentals of Logic: Basic Connectives and Truth Tables, Tautologies, Logical Equivalence: The laws of logic, Logical Implications, Rules of inference. Open Statement, Quantifiers, Definition and the use of Quantifiers, Definitions, and the proofs of theorems.	
Unit –III	**09 Hrs**
Relations: Properties of relations, Composition of Relations, Partial Orders, Hasse Diagrams, Equivalence Relations, and Partitions. **Functions:** Functions-plain, One-to-one, onto functions, Stirling numbers of the second kind, Function composition and Inverse function, Growth of function.	
Unit –IV	**09 Hrs**
Groups theory: Definition, Examples and Elementary properties, Abelian groups, Homomorphism isomorphism, cyclicgroups, cosets and Lagrange's theorem. **Coding Theory:** Elementary coding theory, the hamming metric, the parity-Check and Generator Matrices.	
Unit –V	**09 Hrs**
Introduction to Graph Theory: Graphs and their basic properties - degree, path, cycle, complement, subgraphs, isomorphism, Computer representations of graphs. Eulerian and Hamiltonian graphs, Graphcoloring, Planar graphs. **Trees:** Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Spanning trees.	