Program	BACHELOR OF TECHNOLOGY (B.Tech)	**Semester - 4**
Type of Course	Basic Science Course	
Prerequisite		
Rationale	-	
Effective From A.Y.	2025-26	

Teaching Scheme (Contact Hours)				Examination Scheme				
Lecture	**Tutorial**	**Lab**	**Credit**	**Theory Marks**		**Practical Marks**		**Total Marks**
				SEE TH	**IAT**	**SEE P**	**CCE**	
3	1	-	4	70	30	-	50	150

SEE - Semester End Examination, *IAT* - Internal Assessment Test, *CCE* - Continues & Comprehensive Evaluation

Course Content			

T - Teaching Hours | **W** - Weightage

Sr.	Topics	T	W
1	**Fundamentals of Logic:**	7	15
	Basic Connectives and Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication –Rules of Inference. The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.		
2	**Fundamental Principles of Counting:**	7	15
	The Rules of Sum and Product, Permutations, Combinations –The Binomial Theorem, Combinations with Repetition. **Functions:** Introduction & definition, Co-domain, range, image, value of a function; Examples, surjective, injective, bijective; examples; Composition of functions, examples; Inverse function, Identity map, condition of a function to be invertible, examples; Inverse of composite functions, Properties of Composition of functions;		
3	**Relations:**	10	20
	Relations: Definition, Binary Relation, Representation, Domain, Range, Universal Relation, Void Relation, Union, Intersection, and Complement Operations on Relations, Properties of Binary Relations in a Set: Reflexive, Symmetric, Transitive, Anti-symmetric Relations, Relation Matrix and Graph of a Relation; Partition and Covering of a Set, Equivalence Relation, Equivalence Classes, Compatibility Relation, Maximum Compatibility Block, Composite Relation, Converse of a Relation, Transitive Closure of a Relation R in Set X, Partial Ordering: Definition, Examples, Simple or Linear Ordering, Totally Ordered Set (Chain), Frequently Used Partially Ordered Relations, Representation of Partially Ordered Sets, Hasse Diagrams, Lattice. **Recurrence Relation:** Introduction, Recursion, Recurrence Relation, Solving, Recurrence Relation		
4	**Algebraic Structures:**	8	20
	Algebraic structures with one binary operation- Semigroup, Monoid, Group, Subgroup, normal subgroup, group Permutations, Coset, homomorphic subgroups, Lagrange's theorem, Congruence relation and quotient structures. Algebraic structures (Definitions and simple examples only) with two binary operation- Ring, Integral domain and field.		
5	**Graph Theory:**	7	15
	Introduction, definition, examples; Nodes, edges, adjacent nodes, directed and undirected edge, Directed graph, undirected graph, examples; Initiating and terminating nodes, Loop (sling), Distinct edges, Parallel edges, Multi-graph, simple graph, weighted graphs, examples, Isolated nodes, Null graph; Isomorphic graphs, examples; Degree, In degree, out-degree, total degree of a node, examples; Subgraphs, Path, length of path, examples; Simple path (edge simple), elementary path (node simple), examples; Cycle (circuit), elementary cycle, examples; Matrix representation of graph, Adjacency matrix, Boolean (or bit) matrix, examples; Determine number of paths of length *n* through Adjacency matrix, examples; Path (Reachability) matrix of a graph, examples; Warshall's algorithm to produce Path matrix.		
6	**Trees:**	6	15

Course Content

T - Teaching Hours | W - Weightage

Sr.	Topics	T	W
	Definition, branch nodes, leaf (terminal) nodes, root, examples; Different representations of a tree, examples; Binary tree, m-ary tree, Full (or complete) binary tree, examples; Converting any m-ary tree to a binary tree, examples; Representation of a binary tree, Tree traversal: Pre-order, in-order, post-order traversal, examples.		
	Total	45	100

Suggested Distribution Of Theory Marks Using Bloom's Taxonomy

Level	Remembrance	Understanding	Application	Analyze	Evaluate	Create
Weightage	10	15	75	0	0	0

NOTE : This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes

At the end of this course, students will be able to:

CO1	Apply the concepts of logical reasoning and mathematical proof techniques in proving theoremsand statements.
CO2	Employ counting principles to determine probabilities, domain and range of a function, identify one-to-one functions, perform the composition of functions
CO3	Use the concept of relations and recurrence relations.
CO4	Utilize the fundamental principles of Algebraic structures
CO5	Interpret different traversal methods for graphs.
CO6	Execute different traversal methods for trees.

CO PO Mapping

CO	CO - 1	CO - 2	CO - 3	CO - 4	CO - 5	CO - 6
PO - 1	1	1	1	1	1	1
PO - 2	1	1	1	1	1	1
PO - 3	1	1	1	1	1	1
PO - 4	1	1	1	1	1	1
PO - 5	1	1	1	1	1	1
PO - 6	1	1	1	1	1	1
PO - 7	1	1	1	1	1	1
PO - 8	1	1	1	1	1	1
PO - 9	1	1	1	1	1	1
PO - 10	1	1	1	1	1	1
PO - 11	1	1	1	1	1	1