Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course (Category) Code	Course Name	Teaching Scheme (Hrs/week)					Credits Assigned			
		L	T	P	O	E	L	T	P	Total
(PC)	Discrete Structures and Graph Theory	3	0	0	4	7	3	0	0	3
		Examination Scheme								
		Component	ISE		MSE		ESE		Total	
		Theory	75		75		150		300	
CS201/IT201		Laboratory	--		--		--		--	

Pre-requisite Course Codes, if any.	

Course Objective: To teach students how to think logically and mathematically. It provides the mathematical foundation that is used in most areas of computer science.

Course Outcomes (CO): *At the End of the course students will be able to*

XXXXX.1	Solve problems using set theory, logic and its various proof techniques.
XXXXX.2	Apply the concepts of relations, functions, lattices and recurrence relations to solve problems
XXXXX.3	Apply the concepts of graph, trees and their various types with their traversing techniques to solve problems.
XXXXX.4	Apply the basics of coding theory and cryptography to solve real world problems.

CO-PO Correlation Matrix (3-Strong, 2-Moderate, 1-Weak Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
XXXXX.1												
XXXXX.2												
XXXXX.3												
XXXXX.4												

CO-PEO/PSO Correlation Matrix (3-Strong, 2-Moderate, 1-Weak Correlation)

	PEO1	PEO2	PEO3	PEO4	PSO1	PSO2
XXXXX.1						
XXXXX.2						
XXXXX.3						
XXXXX.4						

BLOOM'S Levels Targeted (Pl. Tick appropriate)

Remember	Understand	Apply	Analyze	Evaluate	Create

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Theory Component

Module No.	Unit No.	Topics	Ref.	Hrs.
1	**Title**	**Set Theory, Logic and Proofs**	1, 2	
	1.1	Finite and infinite set, Union, Intersection, Disjoint, and Difference of two sets. Power Set, Partition of Sets, Ordered Sets, De Morgan's Laws, Principle of Inclusion Exclusion		2
	1.2	Predicates, Propositions, Conditional Propositions, Logical Connectivity, Proposition calculus, Universal and Existential Quantifiers, First order logic, Equivalence, Normal Forms, Introduction to proofs, Mathematical Induction, Strong Induction, Well-ordering principle, Logical inference		6
2	**Title**	**Relations, Functions and Lattices**	1, 2	
	2.1	Product Sets and Partitions, Paths in relations and Diagraphs, Properties of Relations, Closure of Relation, Equivalence Relations, Operations on Relations, Warshall's Algorithm, Partially Ordered Sets, External Elements of Partially Ordered Sets, Hasse Diagram		8
	2.2	Composition of Functions, Invertible Functions, Recursive Functions, Hashing, Pigeon hole Principle, Extended PHP		3
	2.3	Lattice, Sub lattice, Isomorphic Lattices, Properties of Lattice, Special Types of Lattices		4
	2.4	Recurrence Relations – Introduction, Linear Recurrence Relations with constant coefficients, Homogeneous solutions, Particular Solutions, Total Solutions, Solution by the method of Generating functions, solving Recurrence Relations		5
3	**Title**	**Graph Theory**	1, 2	4
	3.1	Concepts and terminologies, Graphs as Model (Konigsberg Bridge Problem)		
	3.2	Matrices, Isomorphism, Bipartite Graphs, Directed Graphs		
	3.3	Minimal Spanning Trees-Prim's Algorithm and Kruskal's Algorithm		
4	**Title**	**Graph connectivity**	1, 2	6
	4.1	Cycles – Transport Networks, Max Flows, Matching Problems, Maximum Bipartite Matching, Perfect Matching		
	4.2	Euler Paths- Circuits, Hamiltonian Paths- Circuits		
	4.3	Coloring Graphs, Chromatic Polynomial, Planer Graphs		
5	**Title**	**Coding Theory**	1, 2	4
	5.1	Hamming Code, Minimum Distance		
	5.2	Number Theory, Modular Arithmetic and applications to cryptography; Diffie-Hellman Algorithm		

6	Self-Study	Algebraic Structures - Semi group, Monoids, Groups, Cyclic groups, Abelian groups, Normal Subgroups	1, 2	5*
		Total (*Not included)		42

Text Books

Sr. No	Title	Edition	Authors	Publisher	Year
1	Discrete Mathematics and it's applications	Seventh	Kenneth H. Rosen	Tata McGraw-Hill	2013
2	Discrete Mathematical Structures	Sixth	Bernad Kolman, Robert Busby, Sharon Cutler Ross, Nadeem-ur-Rehman	Pearson Education	2015

Reference Books

Sr. No	Title	Edition	Authors	Publisher	Year
1	Elements of Discrete Mathematics	Fourth	C. L. Liu	Tata McGraw-Hill	2012
2	Introduction to graph Theory	Second	Douglas B. West	Pearson Education	2015
3	Discrete Mathematical Structures with Applications to Computer Science	First	Jean-Paul, Tremblay R. Manohar	Tata McGraw-Hill	1987