Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India

(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
CE33	Discrete Structure and Graph Theory	3	2	--	3	1	--	4
		Examination Scheme						
		Theory Marks						
		ISE		MSE		ESE		
		10		30		100(60% Weightage)		

Pre-requisite Course Codes	(Basic Mathematics)	
At the end of successful completion the course, students will be able to		
Course Outcomes	CO1	Cultivate clear thinking and problem solving ability
	CO2	Use various mathematical notations, apply various proof techniques to solve real world problems
	CO3	Learn and apply core ideas of Set Theory, Logic, Relations Functions, Recurrence Relations
	CO4	Use Graphs, Trees and their various types with their traversing techniques to solve practical examples.
	CO5	Understand the applications and make use of Algebraic Structures and Lattice to solve the problems.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	1.1	Set Theory – 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	1,2,3	2
	1.2	Logic – Propositional Logic, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Methods of Proof, Mathematical Induction	1,2,3	3
	1.3	Relations and Diagraphs – Product Sets and Partitions, Paths in relations and Diagraphs, Properties of Relations, Closure of Relation, Equivalence Relations, Operations on Relations, Warshall's Algorithm	1,2,3	4
	1.4	Partially Ordered Sets, Extremal Elements of Partially Ordered Sets, Hasse Diagram	1,2,3	2
2	2.1	Functions- Composition of Functions, Invertible Functions, Recursive Functions,	3	2
	2.2	Hashing, Pigeon hole Principle, Extended PHP	2,3	2

	2.3	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	3	4
3	3.1	Graph Theory Concepts and terminologies- Graphs as Model	2,4,5	2
	3.2	Matrices, Isomorphism, Bipartite Graphs, Directed Graphs	2,4,5	2
	3.3	Properties of trees, Minimal Spanning trees, Shortest Paths	2, 4	3
4	4.1	Graph: Connectivity, Coloring, Cycles – Transport Networks, Max Flows, Matching Problems, Maximum Bipartite Matching	2,4,5	3
	4.2	Euler Paths- Circuits, Hamiltonian Paths- Circuits	2,4,5	2
	4.3	Coloring Graphs, Chromatic Polynomial, Planer Graphs	2,4,5	3
5	**5.1**	Algebraic Structures - Semigroup, Monoids, Groups, Rings, Integral Domain Rings	1,2,3	3
	5.2	Isomorphism, Homomorphism, Auto morphism, Coding Theory	1,2,3	3
	5.3	Lattice, Sub lattice, Isomorphic Lattices, Properties of Lattice, Special Types of Lattices	1,2,3	2
			Total	42

References:
[1] Kenneth H. Rosen, "Discrete Mathematics and its applications", Tata McGraw Hill, 7th Edition / latest edition, ISBN 0-07-293033-0 HB.

[2] Bernard Kolman, Robert C. Busby, "Discrete Mathematical Structures", Pearson, Latest Edition

[3] C. L. Liu, D. P. Mohapatra, "Elements of Discrete Mathematics", Tata McGrawHill.

[4] Douglas West, "Graph Theory", Pearson, 2nd Edition

[5] Narsingh Deo, "Graph Theory with applications to Engineering and Computer Science ", Prentice Hall India

[6] Reinhard Diestel, "Graph Theory", Springer-Verlag-New York, 5 th Edition, ISBN 978-3-662-53621-6   eISBN 978-3-96134-005-7