Course Type	Course Code	Name of Course	L	T	P	Credit
DC	CSC503	**Algorithmic Graph Theory**	3	0	0	9

Course Objective
Development of concepts of algorithms related to graphs
Learning Outcomes
• Students are expected to be able to handle the combinatorial and graph problems with greater ease. • Students will learn how to formulate and analyze problems under the framework of graph theory

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Graphs and algorithmic complexity, graph representation, graph traversals;	3	The students will learn the basics of graphs, their representation in data structures and traversals
2	Spanning trees, branching, connectivity, circuits, cut-sets;	4	The students will pick up concepts of trees and related applications
3	Planar graphs: genus, crossing numbers, thickness, characterization of planarity, planarity testing	5	The students will learn about the important aspects of planar graphs
4	Networks and flows: Menger's theorem, maximizing flow in graph networks, minimum cost flow	6	The graph cut techniques have wide applications - the students will learn salient aspects of that
5	Matching: maximum cardinality matching, maximum weight matching, perfect matching;	6	Matching is another very important part of graph algorithms and the students will learn them
6	Euler tours and Hamiltonian cycles: counting Eulerian tours, finding all Hamiltonian cycles using matricial products, 2-factors	6	The students will learn about Euler and Hamiltonian graphs
7	Graph coloring: dominating set, edge coloring, vertex coloring, chromatic polynomial, face coloring, 4-color theorem, 5-color theorem;	5	Students will learn how to solve problems under the framework of graph coloring
8	Graph problems and intractability: Cook's theorem, vertex covering, independent sets and cliques	5	Students will learn about vertext and edge independent sets, covering sets

Text Books:

1. Algorithmic Graph Theory by Alan Gibbons, Cambrige University Press

Reference Books:

1. Algorithmic Graph Theory and Perfect Graphs by Martin Charles Golumbic, North Holland
2. Graph Theoretic Algorithms, Therese Biedl, U of Waterloo 3. Advanced Topics in Graph Algorithms, Ron Shamir, Tel Aviv U.