Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NMCD540	Algorithmic Graph Theory	3	0	0	3

Course Objective

The objective of the course is to introduce special classes of graphs with emphasis on their structural characterizations and to give idea "P vs NP" for graph problems in these graph classes.

Learning Outcomes

Upon successful completion of this course, students will:
- have a broad understanding of how structural characterization will help in designing efficient algorithms for NP-hard optimization problems.
- have an understanding of restricted graph classes such as interval, chordal graphs, bipartite graphs and their subclasses.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Introduction to graph problems:**Definition of different graph parameters such vertex cover, edge cover, longest path, maximum clique, maximum independent set, maximum matching, graph coloring, and the optimization problems associated with those. A survey on computational complexity of solving above problems for arbitrary graphs.	09	Students will learn the basic definitions on graphs and several graph problems and also know the survey on the computational complexity of these problems.
2	**Introduction to intersection graphs:** Definition and structural properties, Examples.	07	This unit will help in knowing the concept of intersection graphs.
3	**Interval Graphs, Chordal Graphs, Perfect Graphs:** Definition and Characterization. On solving different graph problems on these classes along with NP-hard problems on these graph classes.	09	Students will learn how good characterizations help in solving the graph problems efficiently for several families of intersection graphs.
4	**Subclasses of Bipartite Graphs:** Definition and characterization of some important subclasses of bipartite graphs and solving optimization problems on these classes.	09	Students will learn how good characterizations help in solving the graph problems efficiently for several families of bipartite graphs.
5	**Other classes of graphs:** Split graphs, cographs, threshold graphs etc.	08	Students will learn a few other graph classes.
	Total	42	

Text Books:
1. M. C. Golumbic, Algorithmic graph theory and perfect graphs, Elsevier, 2004
2. A. Brandstadt, V. B. Le and J. P. Spinrad, Graph Classes: A survey, SIAM Monograph, 1987

Reference Books:
1. J. P. Spinrad, Efficient Graph Representations, Field Institute Monograph, AMS, 2003
2. D. B. West, Introduction to Graph Theory, 2nd Edition, Phi Learning, 2009