MCA202 GRAPH THEORY AND APPLICATIONS

	L	T	P	Cr
	3	0	0	3.0

Course objective: This course is designed to explore computing and to show students the art of computer programming. Students will learn some of the design principles for writing good programs.

Introduction: Graphs, Sub-graphs, Regular graph, Adjacency and incidence matrices, Finite and infinite graph, Incidence and degree, Isolated vertex, Pendent vertex and null graph, Turan's theorem.

Paths and Circuits: Isomorphism, Walk, Cycle, Paths and circuits, Simple and proper circuit, Connected and disconnected graph, Euler graphs, Operations on graphs, Hamiltonian paths and circuits, Bipartite graph, Berge theorem, Hall's theorem, Edge connectivity, Blocks, Menger's theorem.

Trees and Fundamental Circuits: Trees, Properties of tree, Pendant vertices in a tree, Distance and centers in a tree, Spanning tree, Cayley's Formula, Minimal spanning tree, Prim and Kruskal's algorithm, Matrix Tree theorem, Dijkstra's Shortest Path Algorithm, Floyd-Warshall algorithm, Huffman's Coding Algorithm, Depth-first and breath first algorithm.

Cuts sets and cut-vertices: Cut sets, Properties of cutset, all cut sets in a graph, 1-isomorphism, 2-isomorphism.

Planar graph and dual graphs: Planar graphs, Homoeomorphic graph, Kuratowski's Two Graphs, Different representation of a planar graph, Tutte's f-factor theorem, Detection of planarity, Geometric dual, Combinatorial dual.

Coloring, Covering and Partitioning: Chromatic number, Chromatic Partitioning, Chromatic Polynomial, Covering, Four colour conjecture, Five-colour theorem, Dirac Theorem, Brooks theorem, Vizing theorem.

Directed Graphs: Directed graph, Diagraph and binary relations, Directed Paths, Euler diagraphs, Acyclic digraphs, Topological sorting, Warshall's algorithm, Bellman-Ford algorithm, Ramsey theorems.

Application of Graphs: Study of Konigsberg bridge problem, Travelling-salesman problem, Utilities problem, Electrical network problem, Seating problem, Use of graph in sequential switching networks, Graphs in coding theory, Graphs in computer programming, Flow graph notation, Test case generation using graphs, Job sequencing problem, Graph coloring in scheduling of examinations.

Recommended Books:
1. DeoNarsingh, Graph Theory with applications to Engineering and Computer Science, Prentice-Hall of India (2007).
2. Parmenter Michael M., Goodaire Edgar G., Discrete Mathematics with Graph Theory, Prentice-Hall of India (2007).
3. Rosen, Kenneth H. Discrete Mathematics and its Applications, Tata Mcgraw-Hill (2003).
4. Bondy, J.A. Murty U.S.R., Graph theory and Applications, North Holland Publications (1995).