

MA2130: BASIC GRAPH THEORY

Course Content:

Fundamentals: Graphs, subgraphs, isomorphism, representation of graphs, degrees and graphic sequences, walks, trails, Paths, Cycles, connectivity, bipartite graphs
Trees: Characterisations of trees, minimum -spanning -trees, number of trees, Cayley's formula
Connectivity: cut-sets, characterization of blocks.
Search algorithms: DS, BFS, shortest path algorithms, identification of cut-vertices and cut-edges.
Eulerian and Hamilton graph; Characterizations, Necessary / sufficient conditions, Fleury's algorithm.
Coverings, independent sets: Basic relations, Matchings in bipartite graphs, Tutte's perfect matching theorem and consequences.
Colorings, Edge-colorings of bipartite graphs, Gupta Vizing's theorem (without Proof), greedy algorithm for vertex-colorings, Brook's theorem, clique-number and vertex chromatic number.
Planar graphs: Euler's formula $V-E+F=2$ and its consequences, Kuratowski's Characterization (without proof), DMP planarity algorithm.
Directed graphs: Basics, various connectivities and tournaments.

Text Books:

1. **J.A. Bondy and U.S.R. Murthy**; Graph theory with applications, Macmillan (1976)

Reference Books:

1. **D.B. West**; Introduction to graph theory, P.H.I. (1999).

Prerequisite:

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