1. INTRODUCTION
   (a) Graphs and their Applications
   (b) Outline of the Course
   (c) Review
      i. Algorithms
      ii. Complexity Analysis
      iii. Problem Solving Guidelines

2. DEFINITIONS & NOTATION
   (a) Labeled and Unlabeled Graphs
   (b) Invariants of a Graph
   (c) Order, Size, Degree,
   (d) Computer representation of graphs/digraphs
      i. Adjacency and incidence matrices
      ii. Adjacency and incidence lists
      iii. Introduction to GMPX, PG, and Nauty
   (e) Graphical Sequence
      i. A characterization of graphical sequences
   (f) Walks, Trails, Paths, Cycles
   (g) Subgraphs of a Graph
   (h) Induced Subgraphs
   (i) Spanning Subgraphs

3. SPECIAL GRAPHS
   (a) Connected and Disconnected Graphs/Digraphs
   (b) Trees and Forests
   (c) Complete Graphs & Tournaments
   (d) Bipartite Graphs
      i. A characterization of bipartite graphs
   (e) Hamiltonian Graphs
   (f) Eulerian Graphs/Digraphs
      i. A characterization of Eulerian graphs
   (g) Iterative Graphs
   (h) Random Graphs
   (i) Other Special Graphs

4. TREES
   (a) Some Properties of Trees
   (b) Spanning Trees of a Graph
   (c) Optimal Spanning Trees
   (d) Different Optimality Criterias
   (e) Finding Optimal Spanning Trees
   (f) Some Applications

5. DIRECTED TREES
   (a) Some Properties of Directed Trees

6. COUNTING TREES
   (a) Counting Spanning Trees of a Labeled Graph

7. SEARCHING TECHNIQUES
   (a) Depth-First Search
      i. Properties of DFS
   (b) Breadth-First Search
      i. Properties of BFS
   (c) Some Applications

8. SHORTEST-PATHS PROBLEMS
   (a) Problem Description
   (b) Single-Source Single-Destination Problem
   (c) Single-Source Multiple-Destination Problem
   (d) Multiple Source-Destination Problem
   (e) Some Applications

9. MAXIMUM FLOW
   (a) Problem Description
   (b) Evolution of Maximum-Flow Algorithms
   (c) Ford-Fulkerson Results
   (d) Edmond-Karp Algorithm
   (e) MPM Algorithm
   (f) Other MFAs

10. APPLICATIONS OF MAXIMUM-FLOW
    (a) Finding Arc-Disjoint paths
    (b) Finding edge-disjoint Paths
    (c) Finding vertex-disjoint paths

11. GRAPH CONNECTIVITIES
    (a) Problem Description
    (b) Evolution of Connectivity Algorithms
    (c) Computing $\lambda$ of a Graph
    (d) Computing $\kappa$ of a Graph
    (e) Computing $\lambda$ of a Digraph

12. CONNECTIVITY GENERALIZATIONS
    (a) Problem Description
    (b) Conditional Connectivities
    (c) Restricted Connectivities
    (d) Some Applications

13. MATCHINGS
    (a) Problem Description
    (b) Matching Algorithms
    (c) Some Application