Graph theory

Course Outline

1. Basic Concept of Graph

1.1 Basic concepts of Graphs

1.2 Directed and Undirected graphs

1.3 Basic terminologies

1.4 Degree of a vertex

1.5 Isolated and pendent vertices

1.6 Handshaking Theorem

1.7 Types of graphs

1.8 Subgraphs

1.9 Graphs isomorphism

2. Connected and disconnected Graph

2.1 Connected and disconnected graphs

2.2 Path and cycle graphs

2.3 Rank and Nullity

2.4 Walk, Path and Circuits

3. Matrix Representation of Graph (**Matrix Notation of Graph**)

3.1 Adjacency Matrices

3.2 Reachability Matrices

4. Euler Diagram and Hamilton Diagram

4.1 Euler Diagram

4.2 Hamilton Diagram

5. Trees and Spanning Trees (with applications)

5.1 Undirected Trees

5.3 Directed Trees

5.2 Spanning Trees and Minimal Spanning Trees

6. Shortest Path Problems

6.1 Two Shortest Path Algorithm

6.2 The Steiner Network Problem

Modern Algebra

1. Binary Operations and Their Properties

1.1 Binary operations

1.2 Properties of operations

1.3 Special elements in a set with one binary operation

2. Groups and Subgroups

2.1 The concept of group

2.2 The properties of groups

2.3 Subgroups

3. Algebraic systems

4. Euler's theorem & Lagrange's Theorem

5. Abelian (commutative) groups and cyclic groups

5.1 Abelian (Commutative) Groups

5.2 Cyclic Groups

5.3 Permutation group

6. Homomorphism and Isomorphism of Algebraic Systems

7. Rings and Fields

7.1 Rings

7.2 Fields

Recommended Books:

1. Graph Theory with Applications to Engineering and Computer Science by Narsingh Deo, Ist Edition.
2. Graphs and Matrices by Ravindra B. Bapat, 2nd Edition.
3. Modern Algebra: An Introduction by John R. Durbin, 6th Edition.