

## **CC-N1: GRAPH THEORY & LINEAR ALGEBRA**

### **Unit 1. Introduction**

- 1.1 What is a Graph?
- 1.2 Application of Graphs
- 1.3 Finite and Infinite Graphs
- 1.4 Incidence and Degree
- 1.5 Isolated Vertex, Pendant Vertex and Null Graph

### **Unit 2. Paths and Circuits**

- 2.1 Isomorphism
- 2.2 Subgraphs
- 2.4 Walks, Paths, and Circuits
- 2.5 Connected Graphs, Disconnected Graphs, and Components
- 2.6 Euler Graphs
- 2.7 Operations on Graphs
- 2.8 More on Euler Graphs
- 2.9 Hamiltonian Paths and Circuits
- 2.10 The Traveling Salesman Problem

### **Unit 3. Trees and Fundamental Circuits**

- 3.1 Trees
- 3.2 Some Properties of Trees
- 3.3 Pendant Vertices in a Tree
- 3.4 Distance and Centers in a Tree
- 3.5 Rooted and Binary Trees
- 3.6 On Counting Trees
- 3.7 Spanning Trees
- 3.8 Fundamental Circuits
- 3.10 Spanning Trees in a Weighted Graph

### **Unit 4. Cut-Sets and Cut-Vertices**

- 4.1 Cut-Sets

4.2 Some Properties of a Cut-Set

4.3 All Cut-Sets in a Graph

4.4 Fundamental Circuits and Cut-Sets

4.5 Connectivity and Separability

### **Unit-5: Matrices and System of Linear Equations**

5.1 Row echelon form of a matrix, reduced row echelon form of a matrix.

5.2 Definition of rank of a matrix using row echelon or row reduced echelon form.

5.3 System of linear equations- Introduction, matrix form of linear system, definition of row equivalent matrices.

5.4 Consistency of homogeneous and non-homogeneous system of linear equations using rank, condition for consistency.

5.5 Solution of System of Equations: Gauss elimination and Gauss-Jordan elimination method, examples.

### **Unit-6: Vector Spaces-I**

6.1 Definition and Examples.

6.2 Subspaces.

6.3 Linear Dependence and Independence.

6.4 Basis of Vector Space

### **Unit-7: Vector Spaces-II**

7.1 Dimension of a Vector Space.

7.2 Row, Column and Null Space of a matrix.

7.3 Rank and nullity.

### **Unit-8: Linear Transformations**

8.1 Definition and Examples, Properties, Equality.

8.2 Kernel and range of a linear Transformation

8.3 Rank-Nullity theorem.

8.4 Composite and Inverse Transformation.

8.5 Matrices and Linear Transformation.

8.6 Basic Matrix Transformations in  $R^2$  and  $R^3$

## 8.7 Linear Isomorphism.