

**JYOTI NIVAS COLLEGE AUTONOMOUS  
SYLLABUS FOR 2018 BATCH AND THEREAFTER**

**Programme: B.C.A**

**Semester: III**

**GRAPH THEORY AND OPERATIONS RESEARCH**

**Course Code: 18BCAIIIIT3**

**No. of Hours: 60**

**COURSE OBJECTIVES:**

- To inquire and understand wide range of concepts in mathematics.
- To understand basic properties of Graphs as discrete structures and able to solve in real life problems.
- To understand the method of problem solving in decision making using operations research.
- To impart knowledge in concepts and tools of Operations Research
- To understand mathematical models used in maximization and minimization techniques.
- To apply the O.R techniques to make effective decisions in business.

**LEARNING OUTCOMES:**

- Clear understanding of the concepts of different graph, their properties and the observations made by their matrix representation of graphs.
- Able to solve shortest path problems graph algorithms.
- Able to model a real life problem into a Linear Programming Problem
- To solve specialized Linear Programming problems like the transportation and assignment problems.

**UNIT I**

**30 HRS**

**Graph theory**

**1. Introduction:** What is a Graph? , Application of Graphs, finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex and Null Graph.

**2.Paths and Circuits :** Isomorphism, subgraphs, A Puzzle with multicolored cubes, Walks, Paths and Circuits, Connected Graphs, Disconnected Graphs, and components, Euler Graphs, Operation on Graphs, Hamiltonian Paths and Circuits, the Traveling Salesman Problem.

**3. Trees and fundamental circuits :** Trees, Some Properties of Trees, Pendant Vertices in a Tree, Distance and Centers in a Tree, Rooted and Binary Trees, Spanning Trees, Fundamental Circuits, Finding all spanning trees of a graph, Spanning Trees in a Weighted Graph.

**4. Cut-Set and Cut-Vertices:** Cut-sets, Connectivity and Separability.

**5.Matrix Representation of Graphs:**Incidence Matrix, Circuit Matrix, Path matrix, Adjacency Matrix.

**6.Coloring,:** Chromatic Number, chromatic Partitioning, chromatic Polynomial.

**7. Graph Theoretic Algorithms:** Directed circuits, Shortest- Path Algorithm- shortest path from Specified Vertex to another specified vertex- Shortest path between all pairs of Vertices.

## UNIT – II

30 HRS

**Linear programming** – Introduction , Formulation of a LPP, Graphical and Simplex methods of solving a LPP, Concept of duality– obtaining a dual problem for the given primal.

**Transportation problem** – Introduction, finding an Initial basic feasible solution using North West corner Rule, Row Minima method and column minima method, Vogel’s approximation method, Obtaining an optimum solution by MODI method.

Assignment problems – Introduction, Formulation, Hungarian method, Travelling salesman problem.

### REFERENCES:

1. Narsingh Deo. Graph theory with Applications to Engineering and Computer Science, 1974.
2. L.S. Srinath. Linear Programming. ( East –West) , New Delhi .First Edition.
3. Hillier and Leiberman. Operations Research. Tata McGraw Hill . VIII Edition, 2005.
4. S.D.Sharma. Operations Research. Kedar Nath RamNath&Co .VII Edition, 1985.
5. J.K.Sharma. Operations Research ,Theory and Application. Macmillan India Ltd. ThirdEdition.