

**RAJIV GANDHI PROUDYOGIKI VISHWA VIDYALAYA, BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**Artificial Intelligence and Data Science, V-Semester**

**AD 504 (C) Operations Research**

**COURSE OUTCOMES: After Completing the course student should be able to:**

CO1: Develop the concepts and able to formulate and solve Linear Programming Problems.

CO2: Design an optimal solution for transportation & Assignment Problem

CO3: Identify & analyze the scheduling of activities using PERT and CPM techniques.

CO4: Understand Job sequencing problems and the use of Dynamic programming in OR.

CO5: Develop a solution for queuing models.

**COURSE CONTENTS:**

**UNIT-I**

Origin & Development of OR, Different Phases of OR study, Methodology of OR, Scope and Limitations of OR, OR in decision making. Linear Programming: Introduction – Mathematical formulation of a problem – Graphical solutions, standard forms the simplex method for maximization and minimization problems, Interpretation of Duality, Dual simplex Method.

**UNIT-II:**

Transportation problem (TP) and its formulation. Finding basic feasible solution and optimal solution for transportation problem.

Assignment problem and its formulation, Hungarian method for solving Assignment problem, travelling salesmen problem.

**UNIT-III**

Project Scheduling: PERT and CPM with known activity times. Critical Path Analysis, Various types of floats. Probability considerations in PERT. Updating of PERT charts. Project crashing. Formulation of CPM as a linear programming problem. Resource levelling and resource scheduling.

**UNIT-IV**

Sequencing problem: Introduction to sequencing problem. Flow shop problem: Processing  $n$  jobs through 2, 3 and  $m$  machines. General  $n/m$  job-shop problem.

Introduction to Dynamic Programming. Dynamic Programming Approach for solving Linear Programming Problem. Applications of Dynamic programming.

## **UNIT-V**

Queuing: Introduction to queuing theory, Queuing systems and their characteristics, Pure-birth and Pure-death models, Kendall & Lee's notation of Queuing, empirical queuing models – Numerical on M/M/1 and M/M/C Queuing models.

### **TEXT BOOKS:**

1. Operations Research, P K Gupta and D S Hira, S. Chand and Company LTD. Publications, New Delhi – 2007
2. Operations Research, An Introduction, Seventh Edition, Hamdy A. Taha, PHI Private Limited, 2006.

### **REFERENCE BOOKS:**

1. Operations Research, Theory and Applications, Sixth Edition, J K Sharma, Trinity Press, Laxmi Publications Pvt. Ltd. 2016.
2. Operations Research, Paneerselvan, PHI
3. Operations Research, A M Natarajan, P Balasubramani, Pearson Education, 2005
4. Introduction to Operations Research, Hillier and Lieberman, 8th Ed., McGraw Hill