

## **MB204: Operations Research**

### **Course Objectives:**

1. To impart knowledge in concepts and tools of Operations Research
2. To understand mathematical models used in Operations Research
3. To apply these techniques constructively to make effective business decisions

### **Unit-I: Introduction to OR:**

Introduction to OR- Origin, Nature, Definitions, Managerial Applications and Limitations of OR. Linear and Non- Linear, Integer, Goal [Multi- Objective] and Dynamic Programming Problems (Emphasis is on Conceptual Frame Work-no Numerical Problems). Linear Programming: Mathematical Model, Formulation of LPP, Assumptions Underlying LPP, Solution by the Graph and Exceptional Cases.

### **Unit-II: Linear Programming Problem:**

LPP – Simplex Method- Solution to LP Problems, Maximization and Minimization Cases, Optimality conditions, Degeneracy. Dual – Formulation, Relationship between Primal, Dual, Solution of Dual.

### **Unit-III: Transportation Problem and Assignment Problem:**

Transportation Problem (TP) - Mathematical Model, IBFS using Northwest Corner Rule, Row and Column Minimum Methods, Matrix Minimum (Low Cost Entry) Method and Vogel's Approximation Method, Unbalanced TP, Degeneracy, Optimality Test and Managerial Applications. Assignment Problem (AP): Mathematical Model, Unbalanced AP, Restricted AP, Method of Obtaining Solution- Hungarian Method.

### **Unit-IV: Network Fundamentals:**

Network Fundamentals- Scheduling the Activities -Fulkerson's Rule -CPM- Earliest and Latest Times - Determination of Earlier Starting Time and Earliest Finishing Time in the Forward Pass – Latest Starting Time and Latest Finishing Time in Backward Pass, Determination of Critical Path, Crashing, Time Cost Trade Off, PERT- Beta Distribution, Probabilistic Models, Calculation of CP.

### **Unit-V: Applications of OR:**

Queuing Theory, Concepts of Queue/Waiting Line, General Structure of a Queuing System, Operating Characteristics of Queues, Deterministic Queuing Models, Probabilistic Queuing Model, Cost Analysis. Single Channel Queuing Model, Poisson Arrival and Exponential Service Times with Infinite Population. Game Theory, Concepts, Saddle Point, Dominance, Zero-Sum Game, Two, Three and More Persons Games, Analytical Method of Solving Two Person Zero Sum Games, Graphical Solutions for  $(m \times 2)$  and  $(2 \times n)$  Games.

**Suggested Books:**

1. Hillier, Frederick S. & Lieberman, "Introduction to Operations Research Concepts and Cases", 2010, 8<sup>th</sup> Ed. TMH
2. N.D. Vohra, "Quantitative Techniques in Management", 2010, 4thEd.TMH.
3. J.K. Sharma, "Operations Research Theory and Applications 2009,4th Ed. McMillan.
4. Kasana, HS & Kumar, KD, "Introductory Operations Research theory and Applications", 2008, Springer.
5. Chakravarty, P, "Quantitative Methods for Management and Economics", 2009, 1st Ed. HPH.

**Course Outcomes :**

- Solve Linear Programming Problems
- Solve Transportation and Assignment Problems
- Understand the usage of game theory and Simulation for Solving Business Problems