B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

19AME63 – OPERATIONS RESEARCH

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Course Objectives: The objectives of the course are to make the students learn about
To impart the basic concepts of modeling, models and statements of the operations research.

- Formulate and solve linear programming problem/situations.
- Model strategic behaviour in different economic situations.
- To solve transportation problems to minimize cost.
- Apply Queuing theory to solve problems of traffic congestion, counters in banks, railway bookings etc.
- Explain scheduling and sequencing of production runs and develop proper replacement policies.
- Learn how to manage and control inventory accuracy.

UNIT – I: Introduction to Operations Research **10 Hrs**

Introduction to Operations Research (OR): OR definition - Classification of Models, modeling – Methods of solving OR Models, limitations and applications of OR models

Linear Programming(LP): Problem Formulation, Graphical Method, Simplex Method, Big-M Method, Two–Phase Simplex Method, Special Cases of LP- Degeneracy, Infeasibility and Multiple Optimal Solutions; Concept of dual theorem

Learning Outcomes:

At the end of this unit, the student will be able to

- Formulate practical problems given in words into a mathematical model. **L6**
- Quantify OR models to solve optimization problems. **L5**
- Formulate linear programming problems and appreciate their limitations. **L6**

UNIT – II: Transportation and Assignment Problems **10 Hrs**

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution – North West Corner Rule, Least Cost Method, Vogel's Approximation Method; Optimality Method – Modified Distribution (MODI) Method; Special Cases – Unbalanced Transportation Problem, Degenerate Problem. Assignment Problem – Formulation, Hungarian Method for Solving Assignment Problems, Traveling Salesman problem.

Learning Outcomes:

At the end of this unit, the student will be able to

- Model linear programming problems like the transportation. **L3**
- Solve the problems of transportation from origins to destinations with minimum time and cost. **L6**

UNIT – III: Game theory & Job Sequencing **10Hrs**

Game theory: Optimal solution of two person zero sum games, the max min and min max principle. Games without saddle points, mixed strategies. Reduction by principles of dominance, arithmetic, algebraic method and graphical method.

Job Sequencing: Introduction to Job shop Scheduling and flow shop scheduling, Solution of Job Sequencing Problem, Processing of n Jobs through two machines, Processing of n Jobs through m machines, graphical method.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify strategic situations and represent them as games. **L3**
- Solve simple games using various techniques. **L6**
- Solve problems of production scheduling and develop inventory policies. **L6**

UNIT – IV: Queuing Theory & Inventory Control **8 Hrs**

Queuing Theory: Introduction – Terminology, Arrival Pattern, Service Channel, Population, Departure Pattern, Queue Discipline, Birth & Death Process, Single Channel Models with Poisson Arrivals, Exponential Service Times with infinite and finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with infinite queue length.

Inventory Control: Introduction, Deterministic models – EOQ model with and without shortages, Production model, Buffer stock and discount inventory models with single price breaks. Selective inventory control.

Learning Outcomes:

At the end of this unit, the student will be able to

- Model a dynamic system as a queuing model to compute performance measures. **L3**
- Apply optimality conditions for single- and multiple-variable constrained and unconstrained nonlinear optimization problems. **L3**
- Describe the functions and costs of an inventory system. **L2**
- Determine EOQ, reorder point and safety stock for inventory systems **L2**

UNIT – V: Replacement and Maintenance Analysis **8 Hrs**

Replacement and Maintenance Analysis: Introduction – Types of Maintenance, Make or buy decision. Types of Replacement Problems, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.

Dynamic Programming (DP): Introduction –Bellman's Principle of Optimality – Applications of Dynamic Programming – Shortest Path Problem – Capital Budgeting Problem – Solution of Linear Programming Problem by DP.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solve problems using dynamic programming. **L3**
- Apply the concept of replacement model. **L3**

Text Books:

1. Sharma S.D., Operations Research: Theory, Methods and Applications, 15th Edition, Kedar Nath Ram Nath, 2010
2. Taha H.A., Operations Research, 9th Edition, Prentice Hall of India, New Delhi, 2010.

Reference Books:

1. Hiller F.S., and Liberman G.J., Introduction to Operations Research, 7th Edition, Tata McGraw Hill, 2010.
2. Sharma J.K., Operations Research: Theory and Applications, 4th Edition, Laxmi Publications, 2009.
3. Prem kumar Gupta and Hira, Operations Research, 3rd Edition, S Chand Company Ltd., New Delhi, 2003.
4. Pannerselvam R., Operations Research, 2nd Edition, Pentice Hall of India, New Delhi, 2006.
5. Sundaresan.V, and Ganapathy Subramanian.K.S, Resource Management Techniques: Operations Research, A.R Publications, 2015.

Course Outcomes:

At the end of this Course the student will be able to

- Develop mathematical models for practical problems. **L3**
- Apply linear programming to transportation problems. **L3**
- Solve games using various techniques. **L3**
- Solve production scheduling and develop inventory policies. **L6**
- Apply optimality conditions for constrained and unconstrained nonlinear problems **L3**