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Date:

CSX4146: Operations Research

L-T-P-Cr: 3-0-0-3

Pre-requisites: Nil.

Objective: The course aims at teaching the students basic aspect of operations research methodology. Various topics of operations research have been introduced to the students which will help them in decision making in organization. At the end of the course it is expected that students will be able to demonstrate a working knowledge of various Operations Research tools in decision making.

Course Outcomes:

At the end of the course, a student should:

Sl. No	Course Outcome	Mapping to POs
1	Understand concepts of Optimization and Linear Programming techniques	PO1, PO2
2	Apply graphical solutions and simplex methods to solve optimization problems	PO1, PO3, PO5
3	To understand and use transportation and assignment models	PO1, PO2, PO3, PO5
4	Understand the concepts of Game theory and queuing theory	PO1, PO2, PO3, PO4
5	To apply network analysis techniques to solve optimization problems	PO1, PO2, PO4

Unit I: Introduction to Theory of Optimization & Linear Programming

Features of O.R, Modeling in Operations Research, Classification of Models, General Solution Methods for O.R Models, Scientific Method in O.R, Methodology of O.R., Applications, Opportunities and Shortcomings of O.R.

Applications of operation research in economics, Finance and decision making, Formulation of Mathematical Model of Linear Programming Problem

Unit II: Graphical Solution and Simplex Method

Graphical Solution: Solution of Linear Programming Problem by Graphical Method, Special Cases:

(i) Alternate Optima (ii) Unbounded Solution (iii) Infeasible Solution

Simplex Method: Introduction to Simplex Method- Maximization and Minimization, Duality, primal to dual conversion only.

Unit III: Transportation Models & Assignment Models

Balanced and Unbalanced Models of Transportation, Initial Basic Feasible Solutions (i). North-West Corner Method, (ii). Row Minima Method, (iii). Column Minima Method, (iv). Matrix Minima Method, (v). Vogel's Approximation Method, Modi Method, Degeneracy.

Balanced and Unbalanced Assignment Models, Hungarian Method, Maximization and Minimization.

Unit IV: Game Theory & Queuing Theory

Game Theory: Two-Person Zero sum Games, Some Basic Terms, The Maximin-Minimax Principle, Games without Saddle Points (Mixed Strategies), Graphical solution of $2 \times n$ and $m \times 2$ Games, algebraic method.

Queuing Theory: Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Pure Birth and Death Models; Poisson Queue Models: M/M/1 : ∞ /FIFO and M/M/1: N/ FIFO.

Unit V: Network Analysis

Shortest Path: Dijkstra Algorithm; Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded).

Text/Reference Books:

1. Kanti Swarup, Gupta, P.K. and Manmohan, Operations Research, Sultan Chand: New Delhi, 12th thoroughly revised Ed.
2. Hamdy A. Taha, Operations Research; Pearson, 8th Ed.
3. Fredrick S. Hiller, Gerald J. Liberman, Introduction to Operations Research, McGraw- Hill, 9th Ed.
4. J.K. Sharma, Operations Research Theory & Application, Macmillan, 3rd Ed.