

Kadi Sarva Vishwavidyalaya, Gandhinagar

MCA Semester IV

MCA 403: Optimization Techniques

Rationale:

The primary emphasis of the course is to introduce the important optimization techniques of Operations Research applied in the Industry, Economy, Business, Resource Allocation, Finance, Marketing, Simulation and Network Analysis. Optimization techniques use mathematical, computational, and scientific methods for making decisions to solve real life optimization problems.

Prerequisites:

Knowledge of Computer Oriented Numerical Methods and Statistical Methods.

Learning Outcome: Students will

- Acquire adequate knowledge with mathematical and computational modeling of real decision-making problems, including the use of modeling tools and computational tools, as well as analytic skills to evaluate the problems.
- Identify and develop operational research models from the verbal description of the real system.
- Enhance knowledge of different Operation Research Techniques of strategic decision planning for optimum utilization of constraint resources in various span of human life viz. industry, business, commerce, administration, management, service supply, maintenance, agriculture, medicines and healthcare, defense etc.
- Gain deep knowledge of purpose, importance and applications of optimization techniques of Operation Research and will be able to design and construct suitable optimization models to solve real life strategic problems and issues.
- Increase their capability to acquire sound knowledge of the algorithmic approach, real life operational issue solving approach rather than theoretical side.
- Be facilitated in such a way that they will able to use tools like MATLAB, Scilab, MS Excel, Minitab to implement and apply various optimization techniques.

Sub Total Credit	Teaching scheme		Examination scheme				Total Marks
	(per week)		MID	CEC	External		
	Th	Pr	Th	Th	Th	Pr	
3	3	-	25	25	50	-	100

Course Contents:

UNIT – I: Basics of Operations Research and Linear Programming Problem [20%]

Introduction of Operation Research, definitions, features, advantages and applications, Linear Programming Problem (L.P.P.), Mathematical definition of a L.P.P. with its components: objective function and constraints, optimal solution, slack, surplus and artificial variables, Graphical method, Simplex method (Maximization case)

UNIT – II: Linear Programming Problem and Sequencing Problem [20%]

Simplex method (Minimization case), Two Phase Method, Big – M method , Introduction of Job Sequencing, Notation, Terminology and Assumptions, Johnson’s algorithm for processing n jobs

through 2 machines, Johnson's algorithm for processing n jobs through 3 machines, Johnson's algorithm for processing n jobs through m machines, Processing 2 jobs through m machines using graphical method.

(Exclude: Dual Problem and Revised Simplex Methods)

UNIT – III: Transportation Problem [20%]

Introduction of Transportation problem (T.P.), Mathematical Models of T.P., Method to find initial basic feasible solution, North-West Corner Method(NWCM), Least Cost Cell Entry Method(LCM), Vogel's Approximation Method(VAM), Test of optimality for finding an optimum solution – MODI method, Variations in Transportation Problem (Unbalanced supply and demand)

(Exclude: Degeneracy resolution, Alternative Optimal Solution Prohibited transportation routes)

UNIT – IV: Assignment Problem (A.P.) [20%]

Introduction of Assignment Problem (A.P.), Mathematical Models of an Assignment Problem, Method to find an optimum solution - Hungarian Method, Variations of the Assignment Problem: Multiple optimal solutions, Maximization case, Unbalanced Assignment Problem, Restrictions on Assignments

UNIT – V: Project Management (PERT and CPM) [20%]

Introduction of Project Management, basic difference between PERT and CPM, Network Concepts, Components, Rules for Network Construction, Critical Path Analysis (Forward Pass, Backward Pass, Critical Path)

Text Book(s):

1. J. K. Sharma, "Operations Research – Theory and Application", 4th Edition, Macmillan Publishers India Ltd.

Other Reference Books:

1. Operations Research :
Author(s): M.V. Durga Prasad
Publication: Cengage Learning India Pvt. Ltd.
2. Operations Research – Principles and Practice :
Author(s): Pradeep Prabhakar Pai
Publication: Oxford University Press
3. Operations Research – Problems & Solutions :
Author(s): V. K. Kapur
Publication: Sultan Chand & Sons, New Delhi
4. Operations Research :
Author(s): Kanti Swarup, Gupta P.K. , Man Mohan
Publication: Sultan Chand & Sons, New Delhi
5. Operations Research :
Author(s): N.K. Tiwari, Shishi K. Shandilya
Publication: Prentice - Hall of India Pvt. Ltd.
6. Operations Research – An Introduction :
Author(s): Hamdy A. Taha
Publication: Prentice - Hall of India Pvt. Ltd.
7. Operations Research for Development :
Author(s): Jonathan Rosenhead, Arabinda Tripathy
Publication: New Age International Pvt. Ltd.