

# **GUJARAT TECHNOLOGICAL UNIVERSITY**

## **MASTER OF COMPUTER APPLICATIONS (MCA)**

### **Semester: IV**

**Subject Name: Operations Research (OR)**

**Subject Code: 2640003**

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#### **Learning Objectives:**

1. The course is intended to provide basic understanding of 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.
2. The students will learn 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 – issues.
3. It is expected to emphasis on the algorithmic approach rather than on theoretical side. Mathematical derivations are not included for any topic identified.

**Prerequisites:** NIL

**Contents :** *(Mathematical Proofs or Derivations are not to be included)*

#### **Unit 1 : Basics of Operations Research and Linear Programming**

- (i) **Basics of Operation Research** (2 Lect.)  
Operation Research introduction, definitions, features, advantages and applications
- (ii) **Linear Programming Problem (L.P.P.)** (7 Lect.)  
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, Graphic method, Simplex method, Big – M method, Primal & Dual problem definition

#### **Unit 2 : Special Cases of L.P.P.**

- (i) **Transportation problem (T.P.)** (5 Lect.)  
Mathematical definition of a T.P., Method to find initial basic feasible solution, North-West corner rule, Least cost cell entry method, Vogel's approximation method, Test of optimality for finding an optimum solution – Modi method.
- (ii) **Assignment problem (A.P.)** (4 Lect.)  
Mathematical definition of an Assignment Problem, Method to find an optimum solution - Hungarian Method.

#### **Unit 3 :**

- (i) **Theory of Games** (4 Lect.)  
Introduction, Two – Person Zero Sum game, Pure strategies (Minimax & Maximin principles) Games with saddle point, Rules to determine saddle point.
- (i) **Theory of Queues** (4 Lect.)  
Introduction, Queuing system and problem, transient and steady states, traffic intensity, probability distributions in queuing systems, single service queuing model.

- (ii) **Simulation** (2 Lect.)  
Introduction, applications, Monte-Carlo Method, Simulation using Computers

**Unit 4 : Management of Inventory and Replacement**

- (i) **Management of Inventory** (6 Lect.)  
Introduction and terminology of the inventory management  
Single Item Inventory Control Models without Shortages  
Model –I : EOQ model with constant rate of demand  
Model – II : EOQ model with different rate of demand.
- (ii) **Management of Replacement** (4 Lect.)  
Definition, replacement of items that deteriorates, replacement of item that fails completely.

**Unit 5 : Project Management and Scheduling**

- (i) **Project Management (CPM & PERT)** (6 Lect.)  
Network concepts, components, rules for network construction, critical path method (CPM) and Project evaluation and Review Techniques (PERT)
- (ii) **Production scheduling (job sequencing)** (4 Lect.)  
Introduction, Johnson's algorithm for n jobs 2 machines, Johnson's algorithm for N jobs m machines, 2 jobs m machines using graphical method.

**Text Book:**

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

**Other Reference Books:**

1. Kanti Swarup, Gupta P.K. , Man Mohan, "Operations Research", Sultan Chand & Sons, New Delhi
2. Shah, Gor, Soni, "Operations Research", PHI
3. V. K. Kapur, "Operations Research – Problems & Solutions", Sultan Chand & Sons, New Delhi

**Chapter-wise coverage from above Text book:**

<b>Unit #</b>	<b>Name of Topic</b>	<b>Chapter</b>	<b>Subtopics</b>
Unit 1	Basics of Operation Research	Chapter – 1	1.1, 1.2, 1.3, 1.4, 1.10, 1.13
	Basics of Linear Programming	Chapter – 2	2.1, 2.2, 2.6, 2.7, 2.8
	Graphical Method of LPP	Chapter – 3	3.1, 3.2, 3.3 (3.3.1, 3.3.2 & 3.3.3 only), 3.4
	Simplex Method of LPP Big-M Method of LPP	Chapter – 4	4.1 to 4.6
	Duality in LPP	Chapter – 5	5.1, 5.2
Unit 2	Transportation Problem	Chapter – 9	9.1, 9.2, 9.3, 9.4, 9.5
	Assignment Problem	Chapter – 10	10.1 to 10.3
Unit 3	Theory of Games	Chapter – 12	12.1 to 12.3
	Theory of Queues	Chapter – 16	16.1 to 16.6
	Simulation	Chapter – 19	19.1 to 19.6
Unit 4	Inventory Management	Chapter – 14	14.1 to 14.7
	Replacement	Chapter – 17	17.1 to 17.4
Unit 5	Project Management (CPM and PERT)	Chapter – 13	13.1 to 13.6
	Job Sequencing	Chapter – 20	20.1, 20.2, 20.3, 20.5, 20.6