

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL ENGINEERING

### B. E. SEMESTER: VII

Subject Name: **Operation Research**

Subject Code: **171901**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
4	2	0	6	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	<b>BASICS OF OPERATION RESEARCH:</b> Definition, characteristics, phases, scope and limitations of OR.	2
2.	<b>LINEAR PROGRAMMING:</b> Formulation, graphical method, Simplex method, Degeneracy, Big-M method, Two phase method, duality, sensitivity analysis.	7
3.	<b>TRANSPORTATION MODEL:</b> North-West Corner rule, Least-cost method, Vogel's approximation method, Degeneracy in transportation problem, stepping stone method, modified distribution method, unbalanced supply and demand, profit maximization problem, prohibited transportation routes, transshipment problems.	5
4.	<b>ASSIGNMENT MODEL:</b> Hungarian method for solution, non square matrix, restriction on assignments, Maximization problem, travelling salesman problem.	4
5.	<b>GAMES THEORY :</b> Terms used in game theory, Two person zero sum games, pure strategy, matrix reduction by dominance, mixed strategies( $2 \times 2$ , $2 \times n$ , $m \times 2$ , $3 \times 3$ games), algebraic, arithmetic and graphical method.	4
6.	<b>REPLACEMENT MODELS :</b> Replacement of items whose maintenance and repair costs increase with time- ignoring changes in the value of money during the period and considering value of money changes with time, replacement of items that	4

	fail suddenly, group replacement policy, mortality and staffing problems.	
<b>7.</b>	<b>QUEUEING MODELS :</b>  Terms used in queueing theory, Kendall's notation, classification of queueing models- model 1 (M/M/1) : ( $\infty$ /FCFS) single server unlimited queue, model 2, (M/M/1) : ( $\infty$ /SIRO), model 3 birth-death process-generalisation of model (M/M/1) : ( $\infty$ /FCFS), model 4 (M/M/1) : (N/FCFS) single server finite queue, model 5 (M/M/C) : ( $\infty$ /FCFS) multi channel queueing model.	<b>5</b>
<b>8.</b>	<b>INVENTORY MODELS:</b>  Objectives of inventory management, inventory classification, inventory costs, EOQ, inventory models with deterministic and probabilistic demand, ABC analysis.	<b>4</b>
<b>9.</b>	<b>NETWORK ANALYSIS:</b>  Terms used in network analysis, Network or arrow diagram, Fulkerson's rule, Programme evaluation and review technique (PERT), Critical path method (CPM), Crashing of network.	<b>4</b>
<b>10.</b>	<b>SIMULATION:</b>  Introduction, Monte Carlo Simulation, Generation of random numbers.	<b>3</b>
<b>11.</b>	<b>DYNAMIC PROGRAMMING:</b>  Introduction, Bellman's principle of Optimality, solution of problems with finite number of stages, solution of LPP by dynamic programming.	<b>3</b>

### **Term Work:**

The term work shall be based on the topics mentioned above.

### **Practical / Oral:**

The candidate shall be examined on the basis of term-work.

### **Text Books:**

1. Operation Research – P.K. Gupta & D.S. Hira, S.Chand & Company Ltd, New Delhi
2. Quantitative Techniques in Management – N.D. Vohra , Tata McGraw Hill, New Delhi
3. Operation research – P. Rama Murthy, New Age, New Delhi.
4. Operation Research – Hamdy A. Taha, Pearson Education.

## **Reference Books:**

1. Operation Research- A.P. Verma , S.K. Kataria and Sons, New Delhi.
2. Operation Research- Rathindra P. Sen PHI Learning, New Delhi.
3. Operation Research- S. Kalavathy, Vikas publishing house, Noida.
4. Operation Research – C.Mohan & Kusum Deep, New Age, New Delhi.
5. Operation Research – Askhedkar & Kulkarni, Dhanpatrai & Sons
6. Operation Research – V. K . Kapoor, Sultan Chand & Sons, New Delhi.
7. Operation Research – D.S. Cheema , Laxmi publication, New Delhi
8. Operation Research – S.D.Sharma , Kedarnath publications New delhi