



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Bachelor of Engineering (Part Time)**

**Subject Code: 2950909**

**Semester – V**

**Subject Name: Operation Research**

**Type of course: Humanities and Social Science**

**Prerequisite: Nil**

### **Rationale:**

Operations Research now a day widely used in the area of decision making for the real life problems. Managers and decision makers get idea for optimizing and approximating industrial problems. They not only strive to devise appropriate measures for problem solving but also apply scientific techniques to monitor the organizations ongoing activities such as Production mix, Transportation, Assignment, Queuing, Game theory, Replacement and Project Management problem.

### **Teaching and Examination Scheme:**

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

### **Content:**

Sr. No.	Content	Total Hrs
1	<p><b>Operations Research:</b> Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research.</p> <p><b>Linear Programming Problem:</b> Introduction, Requirement of LP, Basic Assumptions, Formulation of LP, General Statement of LP, Solution techniques of LP: Graphical Methods, Analytical Methods: Simplex, Big M and Two Phase, Special Case of LP Problem, Graphical Sensitivity Analysis. Introduction of Primal and Dual Problems, Economic Interpretation. Introduction of Goal and Integer Programming. Dynamic Programming: Steps involved in dynamic programming, characteristics and explanation of dynamic programming, formulation of Deterministic and probabilistic dynamic programming.</p>	12
2	<p><b>Transportation and Assignment:</b> Transportation Problems definition, Linear form, Solution methods: North west corner method, least cost method, Vogel's approximation method. Degeneracy in transportation, Modified Distribution method, Unbalanced problems and profit maximization problems. Transshipment Problems. Assignment Problems and Travelling sales man Problem.</p>	09
3	<p><b>Queuing Theory:</b> Basis of Queuing theory, elements of queuing theory, Kendall's Notation, Operating characteristics of a queuing system, Classification of Queuing models, Preliminary examples of M/M/1:∞/∞/FCFS.</p>	04



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4	<b>Replacement theory:</b> Introduction, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group and individual replacement policy.	04
5	<b>Game Theory:</b> Introduction, Characteristics of Game Theory, Two Person, Zero sum games, Pure strategy. Dominance theory, Mixed strategies (2 x 2, M x 2), Algebraic and graphical methods.	04
6	<b>Decision Theory:</b> Introduction, Decision under certainty, Decision under risk, Decision under uncertainty: Laplace criterion, MaxiMin criterion, MiniMax criterion, savage MiniMax regret criterion, Hurwicz criterion, Decision tree.	04
7	<b>Project Management:</b> Introduction to PERT and CPM, Critical Path calculation, float calculation and its importance. Cost reduction by Crashing of activity.	08
	<b>Total Hours</b>	<b>45</b>

### Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	10	30	30	20	--

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference Books:

1. Operations Research: An Introduction by Hamdy Taha, Pearson Education Inc
2. Operations Research: Principles and Practice by Pradeep Prabhakar Pai, Oxford Higher Education, Oxford University press
3. Operations Research: Principles and Practice by Ravindran Phillips and Solberg by Wiley India Edition,
4. Operations Research by P Mariappan, Pearson
5. Operations Research by A M Natarajan, P Balasubramani, A Tamilarasi, Pearson Education Inc
6. Operations Research by H N Wagner, Prentice hall.
7. Optimization in Operations Research by Ronald Rardin, Pearson Education Inc.
8. Operations Research by R. Paneerselvam, Prentice Hall of India Pvt. Ltd.
9. Quantitative Techniques in Management by N D Vohra, Tata McGraw-Hill

**Course Outcomes: After learning the course the students will be able to:**



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Sr. No.	CO statement	Marks % weightage
CO-1	Develop models for optimizing the management and production systems from the verbal description of the real system.	10
CO-2	Make use of LPP techniques for optimization of Production mix problem in industry.	20
CO-3	Evaluate transportation, transshipment, assignment and travelling salesman and Queuing problem.	30
CO-4	Apply quantitative techniques in machine replacement, game theory, business decision making under conditions of certainty, risk and uncertainty.	20
CO-5	Demonstrate Project management Problem.	20

### Term Work:

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

### List of Experiments:

Nil

### Major Equipment:

Nil

### List of Open Source Software/learning website:

1. Industrial Problems of Linear Programming
2. Industrial Problems on Transportation
3. Industrial Problems on Assignment
4. Industrial Problems on Queuing
5. Industrial Problems on PERT and CPM