GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering (Part Time)
Subject Code: 2931901
Semester – III
OPERATION RESEARCH

Type of course: Humanities and social science

Prerequisite:

Rationale: This subject is a robust tool and offers directions in making the best decisions based on available data. It may provide the executive with an analytical and quantitative basis to identify the problem area. The most frequently adopted applications in this category deal with production scheduling and cost reduction.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Topics	Teaching Hrs.
1	**General concepts:** Introduction to O.R., Definitions of O.R.	01
2	**Linear Programming:** (i) General Concepts / Definitions (ii) Assumptions in LP / Limitations in LP / Applications of LP. (iii) Formulation of LP Problems (iv)Solution Methods •Graphical method (maximization, minimization) •Simplex method (maximization, minimization) •Big M and Two Phase methods (v) Special issues in LP (Graphical & Simplex methods) •Infeasible solution •Unbounded solution •Degenerate solution •Alternate solution (vi)Duality & Sensitivity analysis •Duality in LP •Economic Interpretation of dual •Sensitivity analysis	09
3	**Transportation Problems:** Balanced / Unbalanced Problems (i) General Concepts / Definitions (ii) Formulation of TT problems (iii) Solution Methods •NorthWest Corner Rule(NWCR) •Least Cost Rule (LCR) •Vogels Approximation Method(VAM) (iv)Optimality Tests •Stepping Stone Method (SSM) •Modified Distribution method (MODI)	06

	(v) Special issues in Transportation Problems •Resolving Degeneracy •Maximization case of Transportation Problems •Alternative solution •Prohibited Routes	
4	**Assignment Problems:** Balanced / Unbalanced Problems (i) General Concepts / Definitions (ii) Solution Methods •Hungarians Algorithm: (Concept of Opportunity costs), Minimization Case, Maximization Case. (iii) Special Issues in AP •Restricted routes / choice •Reserved routes / choice •Multiple Optimal Solutions	04
5	**PERT and CPM:** (i) Introduction, Definitions, Terminology (ii) Types of Networks •CPM : Critical Path Method •PERT: Programme Evaluation Review Technique (iii) Drawing a network (iv) Network Calculations •Deterministic model: CPM •Probabilistic model: PERT Critical Path, Float / Slack, Significance of floats, Types of floats(Total Float (TF) , Free Float (FF), Independent Float (IF)) (v) Estimation of Project completion time (vi) Project Cost Analysis: Crashing, Project cost time trade-off (vii)Resource allocation and leveling.	07
6	**Sequencing Problems:** (i) Introduction, Concepts, Definitions (ii) Assumptions, Limitations, Applications of Sequencing Problems (iii) Types of Sequencing problems and solution methods •N jobs 2 m/cs case •N jobs 3 m/cs case •N jobs M m/cs case •2 jobs M m/cs case	05
7	**Decision Theory (Analysis):** (i) Introduction, Definitions, Application (ii) Uncertainty and risk in Decision making (iii) Static Decisions •Payoff Tables •Expected value of perfect information (EVPI) and its interpretation (iv) Sequential Decisions and Decision Trees	04
8	**Replacement Problems:** (i) Introduction, replacement cases and reasons for replacements (ii) Cases of Replacements •Replacements of items that deteriorate with time (Tabular method) •Replacements of items that fail completely	05
9	**Queuing Models:** (i) Introduction, Concepts, Terminology (ii) General structure of queuing system (iii) Operating Characteristics of Queuing system (iv) Poisson-exponential single server model-infinite population	04

	(v) Poisson-exponential single server model-finite population	

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Marks % weightage
Recall	10
Comprehension	15
Application	20
Analysis	25
Evaluate	25
Create	05

References:

1. N.D.Vohra, Quantitative Techniques in Management, Tata McGraw-Hill.
2. F.M.Wilkes, Elements of Operational Research, McGraw Hill.
3. Taha H. A., Operations Research: An Introduction, Pearson/Printice Hall.
4. D. S. Hira & P. K. Gupta, Operations Research, S Chand.
5. J.K.Sharma, Quantitative Techniques: Theory and Application, Macmillan India Limited.

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

Sr. No.	CO statement	Marks % weightage
CO-1	Identify and develop models for optimizing the management and production systems from the verbal description of the real system.	25
CO-2	Facilitate quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.	25
CO-3	Adopt optimization techniques to solve manufacturing and other industry related problems to minimize cost.	25
CO-4	Apply various scientific tools and models that are available in the subject to take decisions in a complex environment.	25

List of open source:

- NPTEL