



C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: - Mechanical Engineering
SEMESTER: - VII
CODE: - 4TE07ORE1
NAME – Operation Research

Teaching & Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE07ORE1	Operation Research	3	0	2	5	4	30	1.5	70	3	---	20	30	150

Objectives:-

1. To provide knowledge and training using optimization techniques under limited resources for the engineering and business problems.
2. Create awareness about preparation of project plan.

Prerequisites: - Engineering Mathematics, Theory of probability, Statistics.

Course outline:-

Sr. No.	Course Contents	Hours
1	Basics of operation research: Definition, characteristics, phases, scope and limitations of OR.	03
2	Linear programming: Formulation, graphical method, Simplex method, Degeneracy, Big-M method, Two phase method, duality, sensitivity analysis.	08
3	Transportation model: 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..	07
4	Assignment model: Hungarian method for solution, non square matrix, restriction on assignments, Maximization problem, travelling salesman problem.	05
5	Replacement models : 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 fail suddenly, group replacement policy,	05

	mortality and staffing problems.	
6	Queuing models : Terms used in queuing theory, Kendall's notation, classification of queuing models- model 1 (M/M/1) : (∞ /FCFS) single server unlimited queue, model 2, (M/M/1) : (∞ /SIRO), model 3 birth-death process-generalisation of model (M/M/1) : (∞ /FCFS), model 4 (M/M/1) : (N/FCFS) single server finite queue, model 5 (M/M/C) : (∞ /FCFS) multi channel queuing model.	06
7	Inventory models: Objectives of inventory management, inventory classification, inventory costs, EOQ, inventory models with deterministic and probabilistic demand, ABC analysis.	05
8	Network analysis: 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.	06

Learning Outcomes: Students will be able to...

1. Illustrate the need to optimally utilize the resources in various types of industries.
2. Apply and analyze mathematical optimization functions to various applications.
3. Demonstrate cost effective strategies in various applications in industry.

Text Books:

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

References Books:

1. Operation Research by **A.P. Verma** , S.K. Kataria and Sons, New Delhi.
2. Operation Research by **Rathindra P. Sen** ,PHI Learning, New Delhi.
3. Operation Research by **C.Mohan & Kusum Deep**, New Age, New Delhi.
4. Operation Research by **Askhedkar & Kulkarni**, Dhanpatrai & Sons
5. Operation Research by **V. K . Kapoor**, Sultan Chand & Sons, New Delhi.
6. Operation Research by **D.S. Cheema** , Laxmi publication, New Delhi
7. Operation Research by **S.D.Sharma** , Kedarnath publications New Delhi.
8. PERT & CPM by **L.S. Shrinath**, East-West Publishers.