GOVERNMENT OF GUJARAT

LUKHDHIRJI ENGINEERING COLLEGE, MORBI

Mechanical Engineering Department

Course Teaching-Learning-Evaluation Strategy

Subject: Operation Research (3151910) Academic Year: 2023-24 (Odd)

Class: 5th Semester Faculties: M B Vaghela (MBV), I B Shah (IBS)

Course Outcomes (Cos)

CO Nos.	CO statement	Weightage (Marks %)
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, transhipment, 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

Teaching and Examination Scheme:

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

Distribution of marks weightage for cognitive level

Bloom's Taxonomy for Cognitive Domain	Remember	Understand	Application	Analysis	Evaluate	Create
Marks% weightage	10	10	30	30	20	--

Course Content with lecture plan:

Sr. No.	Chapter	Course outcome(s)	Lecture(s) required	Faculty
1.	**Operations Research:** Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research. **Linear Programming Problem:** 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 Programing. Dynamic Programming: Steps involved in dynamic programming, characteristics and explanation of dynamic programming, formulation of Deterministic and probabilistic dynamic programming.	CO1, CO2	12	MBV
2.	**Transportation and Assignment:** 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. Transhipment Problems. Assignment Problems and Travelling sales man Problem.	CO3	9	MBV
3.	**Queuing Theory:** 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	CO3	11	MBV
4.	**Replacement theory:** Introduction, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group and individual replacement policy.	CO4	04	MBV
5.	**Game Theory:** Introduction, Characteristics of Game Theory, Two Person, Zero sum games, Pure strategy. Dominance theory, Mixed strategies (2x2, M x2), Algebraic and graphical methods.	CO4	04	IBS

6.	**Decision Theory:** Introduction, Decision under certainty, Decision under risk, Decision under uncertainty: Laplace criterion, MaxiMin criterion, MiniMax criterion, savage MiniMax regret criterion, Hurwicz criterion, Decision tree.	CO4	04	IBS
7.	**Project Management:** Introduction to PERT and CPM, Critical Path calculation, float calculation and its importance. Cost reduction by Crashing of activity.	CO5	08	IBS

Reference Books:

1. Operations Research: An Introduction by HamdyTaha, Pearson Education Inc
2. Operations Research: Principles and Practice by Pradeep PrabhakarPai, 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 Evaluation Plan

	Direct Assessment				
	Internal Evaluation			External(Uni.) Evaluation	
	Mid Sem Exam (continue evaluation) (Theory)	Assignment/ Quiz	Lab. Work	Practical / Viva (IF)	Uni. Exam (Theory)
Max. Marks	20	10	NA		70
Weightage	30%			70%	
CO1	2				
CO2	8	1			
CO3	5	3			
CO4	5	2			
CO5	0	4			

Course articulation matrix correlation

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1	PO1	PO1	PSO	PSO
CO1	3	2												
CO2		3	2											
CO3		3	2											
CO4		2	3											
CO5		2	2											

Justification(s) of correlation between Co and Pos/PSOs

Mapping	Justification(s)
3151910-1 WITH PO1, PO2,	CO1 mapped with PO1 & PO2 because through CO1 students shows ability to apply basic engineering knowledge and fundamentals and formulate model.
3151910-2 WITH PO2, PO3,	CO2 mapped with PO2 and PO3 because students using principle of mathematics for analysis and developing model as well as solution for product mix.
3151910-3 WITH PO2, PO3,	CO2 mapped with PO2 and PO3 because students using principle of mathematics for analysis and developing model as well as solution for transportation assignment and queuing problem.
3151910-4 WITH PO2, PO3,	CO4 mapped with PO2 and PO3 because students will apply quantitative techniques for replacement, game kind of problem for business decision making
3151910-5 WITH PO2, PO3,	CO5 mapped with PO2, PO3 because students demonstrate decision making ability on project management problems

Tagging of Cos with POs, PSOs, Cognitive Level, Knowledge Categories and the number of sessions (R-Remember, U-Understand, Ap- Apply, An-Analyse, E-Evaluate and C-Create)

CO No.	Statement	POs	PSOs	Cognitive Level	Knowledge Categories
CO1	Develop models for optimizing the management and production systems from the verbal description of the real system.	1,2		U	
CO2	Make use of LPP techniques for optimization of Production mix problem in industry.	2,3		A	
CO3	Evaluate transportation, transhipment, assignment and travelling salesman and Queuing problem.	2,3		E	
CO4	Apply quantitative techniques in machine replacement, game theory, business decision making under conditions of certainty, risk and uncertainty	2,3		A	
CO5	Demonstrate Project management Problem.	**2,3**		A	