ME401: OPERATIONS RESEARCH
CREDITS = 5 (L=3, T=2, P=0)

Course Objective:

To apply the various optimization techniques in industry for decision making and selecting best course of action.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				
L	T	P	C	Theory		Practical		Total Marks
				ESE	CE	ESE	CE	150
3	2	0	5	70	30	30	20	

Course Contents:

Unit No.	Topics	Teaching Hours
1	**Basics of Operations Research:** History, definition, operations research models, phases of implementing operations research in practice. **Linear Programming Problem(LPP)**: Introduction, Formulation, Graphical solution, Simplex method, Artificial variable techniques: Big-M and Two-phase methods, Special cases: degeneracy, multiple optima, unbounded solution, infeasible solution, Concept of Primal and Dual problems, Economic analysis of dual, Sensitivity analysis.	08
2	**Transportation Model:** LPP formulation of transportation problem, Initial feasible solution: North-West Corner rule, Least-cost method, Vogel's approximation method, Optimal solution: Stepping stone method, Modified Distribution (MODI) method, Special cases: unbalanced transportation problems, profit maximization, degeneracy, alternate optimal solutions, prohibited transportation routes, transshipment problems.	04
3	**Assignment Model:** LPP formulation of assignment problem, Hungarian method for solution and optimization, Special cases: alternate optimal solution, restrictions on assignment, maximization, crew layover problem, travelling salesman problem.	04

Unit No.	Topics	Teaching Hours
4	**Game Theory:** Introduction, Terms used in Game Theory, Game with pure strategies, Game with mixed strategies, Dominance theory, Algebraic method, Graphical solution of 2xn and mx2 games, Linear programming approach for game theory.	05
5	**Project Management:** Introduction to PERT and CPM, Terms used in network analysis, Network diagram, Fulkerson's rule, Concept of floats, PERT, Project cost analysis: Crashing of network, Resource smoothing and Resource leveling.	07
6	**Replacement Models:** Objective, Replacement of capital equipment which deteriorate with time (value of money unchanging and changing), Replacement of items that fail suddenly, Group replacement policy.	04
7	**Inventory Management:** Objectives of inventory management, Inventory classification, Inventory costs, EOQ, Inventory models with deterministic demand: Purchase model without and with quantity discount, Manufacturing model, Model with planned shortages, Inventory with safety stock, Inventory models with probabilistic demand, ABC analysis of inventory.	06
8	**Queuing Theory:** Terms used in queuing theory, Kendall's notation, Classification of queuing models, Preliminary analysis of single server models with infinite and finite queues.	04
	TOTAL	**42**

List of References:

1. Vohra N. D., *"Quantitative Techniques in Management",* 4th ed., Tata McGraw Hill
2. Sharma J. K., *"Operations Research: Theory and Applications",* Macmillan India Ltd.
3. Taha H. A., *"Operations Research – An Introduction"*, 9th ed., Prentice Hall India
4. Wagner H. M., "*Principles of Operations Research*", Prentice Hall India
5. Gupta P. K., Hira D.S., "*Operations Research*", S Chand Publishers

Course Outcomes (COs): At the end of this course students will be able to …

1. Formulate and obtain the optimal solution for Linear Programming problems.
2. Determine the optimal solution for Transportation problems.
3. Determine the optimal solution for Assignment problems.
4. Determine the best strategy and value of the given game model.
5. Plan, Schedule and Control the given project.
6. Decide optimal replacement period/policy for a given item/equipment/machine.
7. Manage the inventories.
8. Choose appropriate queuing model for practical application.