Department of Mechanical Engineering

OPERATIONS RESEARCH

Course Code	19HS1702	Year	IV	Semester	I
Course Category	Humanities	Branch	ME	Course Type	Theory
Credits	3	L – T – P	3 – 0 – 0	Prerequisites	Nil
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes		Levels
Upon successful completion of the course, the student will be able to		
CO1	Formulate practical situations by using linear programming and solving problems such as transportation, allocation and sequencing of jobs.	L2
CO2	Assess the utilization of facility by applying waiting line theory and solve sequencing problems	L2
CO3	Establish decisions about replacement of items that deteriorate with time and solve game theory problems	L2
CO4	Solve practical problems by using inventory control and simulate real time problems	L2

	Contribution of Course Outcomes towards achievement of Program Outcomes Strength of correlations (3: High, 2: Moderate, 1: Low)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2					1		2		3	2
CO2	3	3		2					1		2		3	2
CO3	3	3		2					1		2		3	2
CO4	3	3		2					1		2		3	2

Syllabus		
Unit No.	Contents	Mapped CO s
I	**INTRODUCTION TO OPERATIONS RESEARCH**: History, definition, operations research models, phases of implementing operations research in practice, applications. **LINEAR PROGRAMMING**: Introduction, formulation, graphical solution, simplex method, artificial variable techniques – Big M and two-phase methods, duality principle.	CO1
II	**TRANSPORTATION MODEL**: Formulation, initial feasible solution, optimal solution – MODI method, unbalanced transportation problems, degeneracy in transportation problems. **ASSIGNMENT MODEL**: Formulation, optimal solution, Hungarian method, travelling salesman problem.	CO1
III	**QUEUING MODELS**: Introduction, Kendall's notation, classification of queuing models, single server and multi-server models, Poisson arrival, exponential service, infinite population **SEQUENCING MODELS**: Introduction, assumptions, processing n-jobs through two machines, n-jobs through three machines, and graphic	CO2

	solution for processing 2 jobs through n machines with different order of sequence.	
IV	**GAME THEORY**: Introduction, game with pure strategies, game with mixed strategies, dominance principle, graphical method for 2xn and mx2 games. **REPLACEMENT MODELS**: Introduction, replacement of items that deteriorate with time - value of money unchanging and changing, simple probabilistic model for replacement of items that fail completely.	CO3
V	**INVENTORY**: Introduction, inventory costs, Economic Order Quantity (EOQ)Demand rate Uniform and replenishment rate infinite, demand rate non uniform replenishment rate infinite, Demand rate uniform, replenishment rate infinite (shortages allowed)models with and without shortages, inventory model with single price break. **SIMULATION**: Definition, Types of simulation models, phases of simulation, applications of simulation	CO4

Learning Recourse(s)
Text Book(s)
1. Operations Research, by S.D.Sharma, Kedarnath & Ramnath publications (15th edition),2013. 2. Introduction to Operations Research, by Taha, Pearson Education,New Delhi, (8th edition), 2008.
Reference Book(s)
1. A.M .Natarajan, P. Balasubramani Operations Research, "ATamilarasi, Pearson Education", New   Delhi, 2009. 2. R.Pannerselvam, "Operations Research", 2009, PHI Publications, Noida Wagner, "Operations Research", 2007, PHI Publications, Noida 3. J.K.Sharma, "Operation Research", 2009, MacMilan publishers, ndia Ltd. New Delhi.
e-Resources & other digital material
1. http://nptel.ac.in/courses/112106134/ 2. http://nptel.ac.in/courses/112106131/