Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**IV Year B.E. (Mechanical Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
7MERC1 **OPERATIONS RESEARCH**	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
	3	**1**	**0**	**3**	**1**	**-**	**4**
Duration of Theory Paper: **3 Hours**							

Course Objectives:

1. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming.
2. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Transportation, Assignment, Queuing etc.
3. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Strategies formulation with the help of game theory and simulation etc.

Pre requisite(s): Industrial Engineering & Management and Materials Management.

COURSE CONTENTS

UNIT- I

INTRODUCTION: History and development Operations Research, Scientific Methods, Characteristics, Scope, Models in Operations Research. Linear Programming: Formulation, graphical methods, simplex method, Big-M- method

UNIT- II

TRANSPORTATION & ASSIGNMENT MODELS: Definition, Mathematical Representation, Formulation and Solution, Alternate optimal solution Transportation Model: Definition, Formulation and solution, Alternate optimal solution, Stepping stone method, Modified distribution (MODI) or u-v method. Traveling salesman problem, and minimal path problem.

UNIT- III

WAITING LINE MODELS: Introduction, classification, state in queue, probability distribution of arrival and service times. Single server model (M/M/I). Multiple server model (MMS). Birth & death process.

Dynamic Programming: Introduction, Distribution characteristic, Dynamic programming approach, Optimal subdivision problem.

UNIT- IV

GAME THEORY & SIMULATION: Theory of Game, Competitive game, Two persons, zero sum games, maximin and minimax Principles. Saddle point. Method of Dominance, graphical and algebraic method of solution by transforming into linear programming problem. Bidding problem. Building a simulation model, Monte-Carlo simulation and application.

UNIT- V

NETWORK ANALYSIS: Network diagram, Time estimation, Basic steps in PERT and CPM, PERT computation, CPM computation, critical path, Float, Cost analysis, Crashing of activities in the network

Course Outcomes:

CO1. Students will be able to apply linear programming models in different practical situations.
CO2. Students will be able to optimize the resources different conditions.
CO3. Students will be able to know the various situation for queuing in service and industrial situations.
CO4. Students will be able to know the various strategies required in business decisions using game theory.
CO5. Students will be able to know the project implementation and control techniques using network analysis.

BOOKS RECOMMENDED:

[1]. Taha, *Operations Research*, Tata Mc.Graw Hill.

[2]. Wagner, *Operations Research*, PHI. New Delhi, 2003.

[3]. Ravindram & Philips, *Operations Research*, Tata Mc.Graw Hill.

[4]. Gupta & Hira, *Operations Research*, S. Chand. 1e, 2008

[5]. Chitle & Negi, *Operations Research*, Jain Brothers.

[6]. Vohra N.D, Kataria S.K, *Quantitative Techniques for Management*. Tata Mc.Graw Hill, 2004.

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1. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like linear programming.
2. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Transportation, Assignment, Queuing etc.
3. To develop the skills of decision making in dynamic business situations through quantitative analysis using different mathematical models like Strategies formulation with the help of game theory and simulation etc.

Course Outcome:

Students earned credits will develop ability to

CO. No.	CO	PO
CO1	Students will be able to apply linear programming models in different practical situations.	PO1, PO2, PO3, PO4
CO2	Students will be able to optimize the resources different conditions.	PO2, PO3, PO9
CO3	Students will be able to know the various situation for queuing in service and industrial situations.	PO1, PO3, PO11
CO4	Students will be able to know the various strategies required in business decisions using game theory.	PO1, PO3, PO11, PO12
CO5	Students will be able to know the project implementation and control techniques using network analysis.	PO1, PO2, PO11, PO12

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3	3	3								
CO2		3	3						2			
CO3	3		3								2	
CO4	3		3								2	2
CO5	3		3								2	2

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)
1→ relevant and small significance 2 → medium or moderate and 3 →strong