COURSE TITLE	**OPERATION RESEARCH**
COURSE CODE	**01ME0604**
COURSE CREDITS	**4**

Objective:

1 Understanding Operation research and to apply problem solving techniques to organization activities such as transportation, assignment, queuing, Project management and Inventory control.

2 UnderstandingOperation researchand to apply problem solving techniques to organization activities such as transportation, assignment, queuing,Project managementand Inventory control.

3 Understanding Operation research and to apply problem solving techniques to organization activities such as transportation, assignment, queuing, Project management and
Inventory control.

4 To impart the skill to take managerial decision in mechanical system

Course Outcomes: After completion of this course, student will be able to:

1 Apply fundamental operations research principles to formulate real-world problems as linear programming models and solve them using standard methods.

2 Use appropriate techniques to model and solve transportation and job assignment problems.

3 Assess different replacement policies and recommend the best option for machines or components in industries.

4 Use CPM and PERT techniques to analyse, plan, and manage projects effectively.

5 Apply techniques to solve queuing and inventory management problems.

6 Solve Queuing and Inventory problems related to practical applications.

Pre-requisite of course: Nil

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	1	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction** Introduction to operation research, History of Operation Research, Methodology and characteristics, Different phases, Limitations & Applications of Operation research.	

Contents : Unit	Topics	Contact Hours
2	**Linear Programming Problems** Introduction to linear programming, Basic assumptions of Linear Programming, General Mathematical form, Formulation of Linear Programming, Graphical solution technique for Linear Programming, Limitations of Linear Programming	
3	**Analytical Methods for LPP** Concept of slack and surplus variables, Solution of LP using Simplex method, Two phase method, Big M method, Primal and Dual problems	
4	**Transportation Problem** Introduction to Transportation Problems, Mathematical Model for Transportation Problem, Unbalanced Problems, Methods for initial basic feasible solution: Northwest corner method, Least cost method, Vogel's approximation method, Degeneracy in transportation, Optimal solution using Modified Distribution method, Special cases - Unbalanced problems and profit maximization problems. Transshipment Problems	
5	**Assignment Problem** Introduction to Assignment Problems, Mathematical formulation of the problem, Hungarian method to solve Assignment problem, Travelling salesman Problem	
6	**Queuing Theory** Basics of queuing theory, Operating Characteristics of queuing, Components of queuing system, Kendall's Notation, Classification of Queuing Models, Preliminary examples of M/M/1 : ∞ / FCFS	
7	**Replacement Theory** Introduction to Replacement Models, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group replacement policy, Individual replacement policy	
8	**Project Management** Introduction to Introduction to Project Management, Network diagram components and Rules of Network Construction, Fulkerson's Rules, critical Path calculation, float calculation and its importance, PERT method, Cost reduction by Crashing of activity	
9	**Inventory Control** Introduction to Inventory Control, Inventory Classification, Types of Inventories, Different cost associated to Inventory, Economic order quantity, Inventory model with deterministic demand (Constant rate of demand, No shortage allowed & instantaneous replenishment), ABC analysis	
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Exercise on formulation of linear programing problems** Exercise on formulation of linear programing problems	
2	**Exercise on Graphical solution of linear programing problems** Exercise on Graphical solution of linear programing problems	
3	**Exercise and case problems on Transportation problems** Exercise and case problems on Transportation problems	
4	**Exercise and case problems on Assignment Problems** Exercise and case problems on Assignment Problems	
5	**Exercise and case problems on Simplex, Big M and Two phase LP Problems** Exercise and case problems on Simplex, Big M and Two phase LP Problems	
6	**Exercise and case problems on Dual and Primal LP Problems** Exercise and case problems on Dual and Primal LP Problems	
7	**Exercise and case problems on Queuing theory** Exercise and case problems on Queuing theory	
8	**Exercise on Inventory model** Exercise on Inventory model	
9	**Exercise on Replacement theory** Exercise on Replacement theory	
10	**Exercise and case problems on PERT/CPM** Exercise and case problems on PERT/CPM	
11	**Case study on implementation of lpp in industry** Case study on implementation of lpp in industry	2
12	**Case study on network diagram of real industrial project** Case study on network diagram of real industrial project	2
Total Hours		**4**

Textbook :

1 Operations Research: An Introduction, Hamdy Taha, Pearson, 2019

2 Operations Research , D.S. Hira and Premkumar Gupta, S chand, 2015

References:

1 Operations Research, Operations Research, H N wagner, Prentice hall, 1980

2 Operations Research, Operations Research, R. Paneerselvam, Prentice Hall of India Pvt. Ltd, 2016

3 Quantitative Techniques in Management, Quantitative Techniques in Management, N D Vohra, Tata McGraw-Hill, 2000

4 OPERATIONS RESEARCH: PRINCIPLES AND PRACTICE, OPERATIONS RESEARCH: PRINCIPLES AND PRACTICE, Pradeep Prabhakar Pai , Oxford University Press India; Illustrated edition, 2012

5 Operations Research, Operations Research, G Srinivasan, Phi Learning Pvt. Ltd, 2014

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
10.00	20.00	25.00	25.00	15.00	5.00

Instructional Method:

1 Lecture
2 Brainstorming
3 Presentation

Supplementary Resources:

1 ttp://nptel.ac.in/
2 http://ocw.mit.edu/