COURSE CODE	OPERATIONS RESEARCH	L	T	P	C
1152ME119		3	0	0	3

1. Preamble

To impart knowledge and techniques for optimization in engineering and business problems.

2. Prerequisite

Engineering Mathematics II 1150MA103

3. Links to other courses

Project Work

4. Course Educational Objectives

Students undergoing this course are expected to:

- The students can be able to solve the Engineering and Business problems by using optimization techniques.
- Develop the skills of the students in the areas of Linear Programming, Transportation, Assignment, Scheduling, Network Models, Inventory control Replacement model and Queuing theory.
- Serve as a prerequisite for the Project work and specialized studies in the research.

5. Course Outcomes

Upon the successful completion of this course, the learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Develop linear programming model and solve for optimisation.	K3
CO2	Solve the challenging real world problems using transportation, assignment and scheduling approaches.	K3
CO3	Understand the applications of networking models and solving the problems.	K3
CO4	Solve problems in inventory and replacements using available models.	K3
CO5	Apply the techniques of queuing theory for real-world applications.	K3

(K3-Apply)

6. Correlation of Cos with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	M	L	L	L	L						L	M	L
CO2	H	M	L	L	L	L						L	M	L
CO3	H	M	L	L	L	L						L	M	L
CO4	H	M	L	L	L	L			L		L	L	M	L
CO5	H	M	L	L	L	L						L	M	L

H-High; M-Medium: L-Low

7. Course Content

UNIT I LINEAR PROGRAMMING **L- 9**

Formulation of linear programming problems – Graphical method of solution– solving LPP using simplex algorithm – Degeneracy- Duality theory- Big-M method and artificial variables. Integer programming, dual simplex method

UNIT II TRANSPORTATION AND ASSIGNMENT PROBLEM **L- 9**

Mathematical model, balanced and unbalanced Transportation and assignment problem, MODI method – northwest corner method- least cost method – Vogel's approximation methods – travelling salesman problem – assignment problem – types- Hungarian method – flow of scheduling – Johnson's algorithm – N Jobs two machines, N jobs three machines – 2 jobs N machines problems.

UNIT III NETWORK MODELS **L- 9**

Shortest route problem – Maximal flow problem – Minimal spanning tree problem – Project networks- CPM, PERT – project costing and control. Softwares related to LP, CPM and PERT

UNIT IV INVENTORY CONTROL AND REPLACEMENT **L-9**

Types of inventory- Inventory cost – EOQ – Deterministic inventory problems – EOQ with price breaks– EOQ with storage limitations – probabilistic inventory problems , single period without setup cost, with setup cost – replacement policy – considering money value remains constant – money value changes with time – individual – group replacement policy

UNIT V QUEUEING THEORY **L- 9**

Queueing system – Characteristics – symbols – Single server queuing models – Multiserver queueing models- Simulation – Monte Carlo technique.

TOTAL: 45 Periods

8. Text Books

1. Handy, A. Taha, "Operations Research", 9th Edition, Prentice Hall of India, New Delhi, 2013
2. R.Panneerselvam, "Operations Research", PHI, Fourth Print, 2008.
3. N. D Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 2010.
4. J.K Sharma " Operations research" theory and applications, Mac Millan, 2009

9. References

1. Hillier, F.S. and Liebermann, G.J., "Introduction to Operations Research", 8th Edition, McGraw Hill, 2010.
2. Philip and Ravindran, "Operationl Research", John Wiley, 2010.
3. Tulsian and Pasdey V., "Quantitative Techniques", Pearson – Asia 2010.