

Branch Name:	Mechanical Engineering
Semester/Year:	Semester VII / Forth Year
Subject Title:	Operations Research
Subject Code:	1ET1010702
Pre-requisite:	Zeal to learn the subject

Course Objectives:

1. To give students an elementary idea about applications of Operations Research concepts.
2. To develop analytical abilities for evaluating the working of Operations Research.
3. To understand the benefits and limitations of Operations Research techniques.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Mark s)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	01	00	04	70	30	00	20	120

Subject Contents				
Sr. No	Topic	Total Hours	Weightage (%)	
1	Operations Research: Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of Operations Research.	03	06	
2	Linear Programming Problem: Introduction, Requirement of LP, Basic Assumptions, Formulation of LP, General Statement of LP, Solution techniques of LP: Graphical Methods, Analytical Methods: Simplex, Big M and Two Phase, Primal and Dual Problems	08	18	
3	Transportation and Assignment: Transportation Problems definition, Linear form, Solution methods: North west corner method, least cost method, Vogel's approximation method. Degeneracy in transportation, Modified Distribution method, Unbalanced problems and profit maximization problems, Transshipment Problems, Assignment Problems and Travelling sales man Problem.	08	18	
4	Project Management: Introduction to PERT and CPM, Critical Path calculation, Float calculation and its importance, Cost reduction by Crashing of activity.	07	16	
5	Game Theory: Introduction, Characteristics of Game Theory, Two Person Zero sum games, Pure strategy. Dominance theory, Mixed strategies (2x2, mx2, 2xn), Algebraic and graphical methods.	04	12	
6	Replacement theory: Introduction, Replacement of capital equipment which depreciated with time, replacement by alternative equipment, Group and individual replacement policy.	04	10	

7	Queuing Theory: Basis of Queuing theory, Elements of queuing theory, Kendall's Notation, Operating characteristics of a queuing system, Classification of Queuing models, Preliminary examples of M/M/1:∞/FCFA	04	10
8	Inventory Control: Inventory classification, Different cost associated to Inventory, Economic order quantity, Inventory models with deterministic demands, ABC analysis.	04	10

Course Outcomes:

After learning the course student will be able to

1. Describe characteristics and scope of Operations Research.
2. Define and formulate mathematical models.
3. Solve different problems related to Network Analysis.
4. Select optimal problems solving techniques for a given problem using LP.
5. Formulate and solve transportation, travelling sales man and transshipment problems.
6. Demonstrate and solve simple models of Game theory.
7. Choose / devise appropriate queuing model for practical application.

List of Reference Books:

1. Hamdy Taha, "Operations Research: An Introduction", Pearson
2. A M Natarajan, P Balasubramani, A Tamilarasi "Operations Research", Pearson Education Inc.
3. J K Sharma, "Operations Research", S Chand.
4. P Mariappan, "Operations Research", Pearson.
5. H N wagner, "Operations Research", Prentice hall.
6. Ronald Rardin, "Optimization in Operations Research", Pearson Education Inc.
7. R. Paneerselvam, "Operations Research", Prentice Hall of India Pvt. Ltd.
8. N D Vohra, "Quantitative Techniques in Management", Tata McGraw-Hill.

List of Tutorial:

1. Exercise on formulation of linear programming problems.
2. Exercise on Graphical and Simplex solution of LP problems
3. Exercise and case problems on Dual and Primal LP Problems, Big M and Two phase LP Problems
4. Exercise and case problems on Transportation and Transshipment Problems.
5. Exercise and case problems on Assignment and Travelling sales man Problems
6. Exercise and case problems on CPM/ PERT
7. Exercise and case problems on Game theory
8. Exercise on Replacement theory
9. Exercise and case problems on Queuing theory
10. Exercise on Inventory model

E-Resources:

1. <https://nptel.ac.in/courses/112106134/>
2. <https://ocw.mit.edu/courses/sloan-school-of-management/15-053-optimization-methods-in-management-science-spring-2013/tutorials/>