

IV Year B.Tech. Mechanical Engg. I-Semester

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## ME421 OPERATIONS RESEARCH

### **Course Description & Objectives:**

*Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively; knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry; skills in the use of Operations Research approaches and computer tools in solving real problems in industry; Mathematical models for analysis of real problems in Operations Research. Identify and develop operational research models from the verbal description of the real system.*

### **Course Outcomes:**

1. *Recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry.*
2. *Formulate a managerial decision problem into a mathematical model;*
3. *Understand Operations Research models and apply them to real-life problems;*
4. *Use computer tools to solve a mathematical model for a practical problem.*
5. *Cognitive skills (thinking and analysis)*
6. *Be able to build and solve Transportation Models and Assignment Models.*
7. *Be able to understand the characteristics of different types of decision.*

### **UNIT - I Definition:**

Definition - Characteristics and phases, Applications of OR.

**Allocation Models** : Linear Programming Problem Formulation - Graphical solution - Simplex method - Artificial variables technique (i.e. Big M method only) - Duality principle, simple problems on dual formulation only.

### **UNIT - II Transportation Model:**

Formulation, IBFS, Optimality test by MODI method, unbalanced transportation problem.

**Assignment Model** - Formulation - Optimal solution by Hungarian method – Unbalanced Assignment problem- Restricted case.

**UNIT - III Sequencing:**

Introduction - Optimal solution for processing 'n' jobs through two machines and 'n' jobs through three machines.

**Replacement Model:** Introduction - Replacement of resources that deteriorate with time - when money value is counted and not counted.

**UNIT - IV Theory of Games:**

Introduction-classification of games- 2 person zero sum games- Assumptions -solution of games with saddle points - Rectangular games without saddle points, dominance principle - 2 X 2 games by Algebraic method, Matrix method to 3 x 3 games – m X 2 & 2 X n games by graphical method.

**Waitingline Models:** Introduction – Kendall's Lee notation- single channel with infinite population, Multichannel with infinite population.

**UNIT - V Inventory Models:**

Introduction - single item - Deterministic models - Purchase inventory models with one price break when shortages are not allowed.

**Simulation :** Definition - types of simulation models - inventory and queuing problems.

**TEXT BOOKS :**

1. Taha, "Introduction to Operations Research.", 8<sup>th</sup> ed., PHI Publications, 2008.
2. S.D. Sharma, "Operations Research", 8<sup>th</sup> ed., Kedarnath Publishers, 2007.

**REFERENCE BOOKS :**

1. Hiller & Libermann, "Introduction to Operations Research", 8<sup>th</sup> ed., Tata Mc Graw Hill, 2010.
2. D.S. Hira and R.K. Gupta, "Operations Research", 5<sup>th</sup> ed., S.Chand & Co., 2008.
3. P.K.Gupta and Manmohan, "Problems in Operations Research", 8<sup>th</sup> ed., S.Chand & Co., 2003.
4. Manohar Mahajan, "Operation Research", 1<sup>st</sup> ed., Dhanpat Rai & Co., 2008.