

MATH-473 Operations Research

Credit Hours: 3-0

Prerequisite: None

Course Objectives: The objective is to provide a fundamental account of the basic results and techniques of linear programming (LP) and its related topics in operations research. There is an equal emphasis on all aspects of understanding, algorithms and applications. The course serves, together with topic on network models, as essential concept and background for more advanced studies in operations research. The main focus of the course is on Linear Programming Models, Duality Problems and Sensitivity analysis, Transportation Models and Network Flow Models.

Core Contents: Linear Programming, Duality and Sensitivity Analysis, Transportation Models, Network Flow Problems

Detailed Course Contents: Linear Programming: Linear programming, formulations and graphical solution, Simplex method, M-Technique and two-phase technique, Special cases in Simplex method

Duality and Sensitivity Analysis: The dual problem, primal-dual relationships, Dual simplex method, Sensitivity and postoptimal analysis

Transportation Models: Transportation problem formulations, North-West corner Method, Least-Cost and Vogel's approximations methods, The method of multipliers, The assignment model Network Flow Problems: Minimal spanning tree algorithm, Shortest route-problem, Maximalflow models

Course Outcomes:

- To understand the basic techniques in operations research and formulations of the problems
- To understand the fundamental concept and approach of linear programming appropriate to the further study of operations research;
- To demonstrate knowledge and understanding of the underlying techniques of the Simplex Method and its extensions such as the revised Simplex and dual Simplex algorithms;
- To understand and apply the theory of LP duality such as in the theory and computations of Network Optimization

Text Book: Hamdy A. Taha, Operations Research - An Introduction, Prentice Hall; 9th edition, 2010.

Reference Books

1. Paul A. Jensen, Jonathan F. Bard, Operations Research Models and Methods, JohnWiley and Sons Publishing Company, 2003.
2. Glenn H. Hurlbert, Linear Optimization, Springer, 2010.

Weekly Breakdown		
Week	Section	Topics
1	1.1, 1.2	Operation Research Models, Solving the OR Models
2	2.1	Two-Variable LP Model
3	2.2	Graphical LP Solutions and Selected LP Applications
4	3.1, 3.2	LP Models in equation form, Transition from Graphical to Algebraic Solution
5	3.3, 3.4	The Simplex Method, Artificial Starting Solution
6	3.5	Special Cases in Simplex Method
7	3.6	Sensitivity Analysis
8	4.1, 4.2	Definition of Dual Problem, Primal-Dual Relationship
9	Mid Semester Exam	
10	4.4	Dual Simplex Algorithm
11	4.5	Post-Optimal Analysis
12	5.1, 5.2	Definition of the Transportation Model, Nontraditional Transportation Models
13	5.3, 5.4	The Transportation Algorithm, The Assignment Model
14	6.2	Minimal Spanning Tree Algorithm
15	6.3	Shortest-Route Problem
16	6.4	Maximal Flow Models
17		Revision
18	End Semester Exam	