EASTERN MEDITERRANEAN UNIVERSITY
Faculty of Engineering
Department of Industrial Engineering
IENG512 – Advanced Linear Programming
COURSE OUTLINE

COURSE CODE	IENG512	**COURSE LEVEL**	MS and PhD Degree
COURSE TITLE	Advanced Linear Programming	**COURSE TYPE**	Approved Elective
CREDIT VALUE	(3,0) 3	**ECTS Credit Value**	3
PRE-REQUISITE(S)	IENG313-IENG314	**CO-REQUISITE(S)**	NONE
LECTURER	Oğuzhan KIRILMAZ	**SEMESTER / ACADEMIC YEAR**	Fall 2022-2023
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CATALOG DESCRIPTION

Affine & Convex Combinations; Convexity of Half Spaces and Hyperplanes; Convexity of the Set of Feasible Solutions of an LP; Separating Hyperplane; The Revised Simplex Method; The Karush-Kuhn-Tucker Optimality Conditions; Farkas' Lemma via the Simplex Method; Duality and Sensitivity Analysis; Primal-Dual Relationships; The Dual Simplex Method; Parametric Analysis; Bounded Variables Algorithm; The Decomposition Algorithm; The Maximal Flow Problem; Cuts in a Network; Shortest Route; Minimum Cost-Flow Problem; Transportation Problem; Transshipment Problem, Assignment problem, Karmarkar Interior-Point Algorithm

COURSE AIMS & OBJECTIVES

To provide insight in the theory of linear optimization and in the design of advanced practical methods for solving linear optimization problems.

Part 1: Geometry OF Linear Programming and Simplex Method, Special Simplex Implementations and Optimality Conditions, Duality and Sensitivity Analysis, Bounded Variables Algorithm, Decomposition Principle.

Part 2: Network Flow Theory, Transportation, Transshipment Problems, Assignment Problem, Karmarkar's Method

GENERAL LEARNING OUTCOMES (COMPETENCES)

After this course, the successful student will be able to:

1. Comprehend the geometry and properties of linear inequality systems and how they are related to the Simplex Method
2. Know revised simplex method, Farkas' Lemma and the Karush-Kuhn-Tucker optimality conditions
3. Formulate dual problem, apply dual-simplex method and primal-dual algorithm
4. Discuss the effect of variations in the the cost coefficients, the right-hand-side coefficients, and the constraint coefficients,
5. Apply bounded variables algorithm
6. Apply the strategy of the decomposition procedure over the set of general constraints and over the set of special constraints.
7. Model and prove the theorems about and Maximal-Flow problem and the Shortest-Route problem
8. Model and solve Transportation Problem; Transshipment Problem, Assignment problem
9. Understand the underlying concept behind Karmarkar's Algorithm

TEXTBOOK/S

1. Linear programming 2: Theory and Extensions / George B. Dantzig & Mukund N. Thapa
2. Linear programming and network flows / Mokhtar S. Bazaraa, John J. Jarvis, Hanif D. Sherali
3. Operations Research An Introduction, by Hamdy A. Taha

ASSESSMENT METHOD

Quiz	5%
Midterm	30%
Homeworks	10%
Final	40%
Presentation	15%

ATTENDANCE

- Attendance will be taken on every lecture. Note that EMU regulations allow instructors to give a grade of NG to a student whose absenteeism is more than 30% of the lecture hours and/or who do not complete sufficient work that are included in the assessment of the course..
- Students missing an examination should provide a valid excuse within three days following the examination they missed. One make-up examination will be given.

COURSE CONTENT (The lecture topics within the semester are as in the following schedule although minor changes are possible)	
Week	**Topics**
1	Geometry of Linear Programming and Simplex Method
2	Special Simplex Implementations and Optimality Conditions I
3	Special Simplex Implementations and Optimality Conditions II
4	Duality and Sensitivity Analysis I
5	Duality and Sensitivity Analysis II
6	Bounded Variables Algorithm
7	Decomposition Principle
8-9	Midterm Exams
10	Network Flow Theory I
11	Network Flow Theory II
12	Transportation, Transshipment Problems, Assignment Problem I
13	Transportation, Transshipment Problems, Assignment Problem II
14	Karmarkar's Method
15-16	Final Exams

PLAGIARISM

This is intentionally failing to give credit to sources used in writing regardless of whether they are published or unpublished. Plagiarism (which also includes any kind of cheating in exams) is a disciplinary offence and will be dealt with accordingly.)