

Department of Mathematics | School of Science
Mathematical Optimization | Short Syllabus

Course name and code: Mathematical Programming (0301371).

Credit hours: 3 hrs. **Prerequisite:** Linear Algebra I (0301241).

Instructor Name	Prof. Baha Alzalg
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Course Description: Formulation of linear problems, the simplex method, the geometry of the simplex method, duality in linear programming, the dual simplex method, sensitivity analysis, introduction to graphs, network flows.

Tests and evaluations: The final grade is calculated as follows:

Exams		
Midterm Exam (30 %)	Second Exam (20 %)	Final Exam (50 %)

Contents and schedule: The following is a rough plan. As the course progresses, I may include new topics and/or delete some of the ones listed here.

Topics	Section(s)	Week(s)
a) Linear programming formulation and examples.	10.1	1
b) The graphical method for 2D problems.	10.2	2
c) Matrices, subspaces, and bases (review).	3.3	3
d) Convexity and polyhedral.	3.4	3
e) Geometry of linear programming.	10.3, 10.5	4, 5
f) The simplex method for linear programming.	10.6	6-9
g) Duality in linear programming.	10.4	10, 11
h) Introduction to graphs.	4.1, 4.2, 4.4, 4.5	12, 13
i) Breadth-first search for shortest paths.	9.1, 9.2, 9.3	14
j) Depth-first search for minimum spanning trees.	9.4, 9.5	15
k) Sensitivity analysis.		16

Textbook: *Combinatorial and Algorithmic Mathematics: From Foundation to Optimization*, by Baha Alzalg. Kindle Direct Publishing. ISBN: 9798353826934.

Reference: *Introduction to Linear Optimization*, by D. Bertsimas and J. Tsitsiklis. Athena Scientific Series in Optimization and Neural Computation, ISBN: 9781886529199.