KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Department of Mathematics and Statistics
SYLLABUS: (151) (Semester I, 2001-2002)

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Title: Linear and Nonlinear Programming Course # Math 480
Prerequisite: Math 280, ICS 101 or ICS 102
Textbook : Linear and Nonlinear Programming by E.G. Luenberger 3nd edition (1994)

Objectives

The course deals with the basic idea of mathematical programming (linear and nonlinear). We shall see how simple mathematics plays a significant role in the development of these ideas. The students will be asked to work out the computational implementation of a numerical algorithm for solving Linear and Nonlinear Programming problems and do presentations.

Current Catalogue Description

Formulations of Linear programs. Basic properties of linear programs. The simplex method duality. Necessary and sufficient conditions for unconstrained problems. Minimization of convex functions. A method of solving unconstrained problems. Equality and inequality constrained optimization. The language multipliers. The Kuhn-Tucker conditions. A method of solving constrained problems.

Week #	Sections	Topics
1	2.1-2.2	Introduction, Examples of Linear Programming Problems
2	2.3-2.4	Basic Solutions, The fundamental theorem of Linear programming
3	2.5-3.1	Relations to Convexity, Pivots
4	3.2, 3.5	Adjacent Extreme Points, Determining a minimum feasible solution, Computational Procedure ~ Simplex Method, Artificial Variables
5	3.7-3.8	Matrix form of the simplex method, The revised simplex method
6	4.1-4.2	Dual Linear Programs, The Duality Theorem
7	4.3-4.5	Relations to the Simplex Procedure, Sensitivity and Complementary Slackness. The dual simplex method
8	6.1-6.2	Transportation problem, Finding a basic feasible solution
9	7.1-7.4	First order necessary conditions. Examples of Unconstrained problems, Second order conditions, Convex and Concave Functions
10	7.5-7.6	Minimization and Maximization of Convex Functions, Zero order conditions
11	8.6, 8.8, 10.1	The method of Steepest descent, Newton's method, Modified Newton's method
12	11.1-11.3	Constraints , Tangent Plane, First order necessary conditions
13	11.5-11.6, 11.8	Second Order Conditions, Eigenvalues in Tangent Subspace, Inequality constraints
14	11.9,13.1	Zero-order conditions and Lagrange multipliers, Penalty methods, Properties of Penalty Functions
15	15.1-15.2, 15.4-15.5	The standard problem, Strategies, Basic promal-dual method, Modified Newton's method
		Review

Grading Policy: First Major 15 points, Second Major 15 points, Homework 5 points, Project 15 points, Final 40 points