KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Department of Mathematical
SYLLABUS (101) (Semester II, 2002-2003)
(Dr. Suliman Al-Homidan)

Course #	Math 480
Title	Linear and Nonlinear Programming
Prerequisite	Math 280, ICS 101 or ICS 102
Textbook	Linear and Nonlinear Programming by E.G. Luenberger, 2nd edition (1994).

Objectives

The course deals with the basic ideas 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

Formulation 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 inequahit)' constrained optimization. The Lagrange multipliers. The Kuhn-Tucker conditions. A method of solving constrained problems.

Week #	Sections	Topics
1	2.1-2.3	Introduction, Examples of Linear Programming Problems, Basic Solutions
2	2.4-2.5	The Fundamental Theorem of Linear Programming, Relations to Convexity
3	3.1-3.5	Pivots, Adjacent Extreme Points, Determining a Minimum Feasible Solution, Computational Procedure–Simplex Method, Artificial Variables
4	3.7-3.8	Matrix Form of the Simplex Method, The Revised Simplex Method
5	4.1-4.2	Dual Linear Programs, The Duality Theorem
6	4.3-4.5	Relations to the Simplex Procedure, Sensitivity and Complementary Slackness, The Dual Simplex Method
7	5.1-5.4	Transportation Problem
8	6.1-6.4	First Order Necessary Conditions, Examples of Unconstarined Problems, Second-Order Conditions, Convex and Concave Functions,
9	6.5, 7.8	Minimization and Maximization of Convex Functions, Newton's Method
10	9.1-9.4	Modified Newton's Method, Construction of the Inverse, Davidon-Fletcher-Powell Method, The Broyden Family
11	10.1-10.3	Constraints, Tangent Plane, First-Order Necessary Conditions
12		
13	10.5-10.6, 10.8	Second-Order Conditions, Eigenvalues in Tangent Subspace, Inequality Constraints
14	12.1-12.3	Penalty Methods, Barrier Methods, Properties of Penalty and Barrier Functions
15	14.1-14.2,14.4	Quadratic Programming, Direct Methods, Modified Newton's Methods

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

References:

1. An Introduction to Optimization, E. Chong and S. Zak (1996)
2. A First Course in Optimization Theory, R. Sundaram (1996)
3. Maxima and Minima with Applications, W. Kaplan (1999)
4. الأسس الرياضية للبرمجة الخطية، الحميدان، حامد وحميدة (2002)