King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
SYLLABUS
(Term 061)

Course#: MATH 582
Title: Nonlinear Programming

Textbook: Nonlinear Programming: Theory and Algorithms, 3rd Edition by Mokhtar S. Bazaraa, Hanif D. Sherali, C.M. Shetty,ISBN: 0-471-48600-0, May 2006.

Instructor: Dr. Suliman S. Al-Homidan

Course Description: An advanced introduction to theory of nonlinear programming with emphasis on convex programs. First and second order optimality conditions, constraint qualifications, Lagrangian convexity and duality. Penalty function methods. Theory and algorithms of main computational methods of nonlinear programming. Representative applications of nonlinear programming in Economics, Operations Research and Mathematics.

Week	Date	Sec	Title
1	Sep. 9-14	2.1 2.2 2.3	Convex Hulls Closure and Interior of a Set Weierstrass' Theorem
2	Sep. 16-20	2.4 2.5 2.6	Separation and Support of Sets Convex Cones and Polarity Polyhedral Sets
3	Sep. 25*-27	3.1 3.2	Definitions and Basic Properties Subgradients of Convex Functions
4	Sep. 30-Oct. 4	3.3 3.4	Differentiable Convex Functions Minima and Maxima of Convex Functions
5	October 7-11	3.5	Generalizations of Convex Functions
			Id al-Fitr Vacation: October 12, 2006 – October 8, 2006
6	Oct. 28-Nov. 1	4.1 4.2	Unconstrained Problem Problems with Inequality Constraints
7	Nov. 4-8	4.3	Problems with Inequality and Equality Constraints
8	Nov. 11-15	4.4	Second-order Necessary and Sufficient Optimality Conditions for Constrained Problems
9	Nov. 18-22	6.1 6.2	The Lagrantian Dual Problem Duality Theorems and Saddle Point Optimality Conditions
10	Nov. 25-29	6.3 6.4	Properties of the Dual Function Formulating and Solving the Dual Problem
11	Dec. 2-6	6.5	Getting the Primal Solution
12	Dec. 9-13	8.6	The Steepest Descent Method; Newton's Method
13	Dec. 16-20	8.7	Modification of Newton's Method
			Id al-Adha Vacation: December 21, 2006 – January 5, 2007
14	Jan. 6-10	8.8	Quasi-Newton and Conjugate Gradient Methods.
15	Jan. 13-17	9.1 9.2	The Concept of Penalty Functions; Geometric Interpretation of Penalty Functions; Exterior Penalty Function Methods.

Saturday 23 September is a national holiday.

Evaluation:

- First Major Exam: 20%
- Second Major Exam: 20%
- Project 20%
- Final Exam: 40%