Math 480
(Linear & Nonlinear Programming)
Syllabus

Instructor **Dr. Mohammed Alshahrani** **Phone** **03-860-7748**

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Office Hours **UTR 04:20-06:00PM (ALSO BY APPOINTMENT)**

Text: Linear and Nonlinear Programming by E.G. Luenberger, 2nd Edition (1994)

Catalogue Description:

Formulation of linear programs. Basic properties of linear programs. The Simplex method. Duality theory. Necessary and sufficient conditions for unconstrained problems. Minimization of convex functions. A method to solve unconstrained problems. Equality and inequality constrained optimization. The Lagrange multipliers. The Kuhn –Tucker conditions. A method to solve constrained problems.

Goals:

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 a Nonlinear Program (NLP).

Resources:

This course will be supplemented by the following websites

- My personal website: http://faculty.kfupm.edu.sa/MATH/mshahrani/
- BlackBoard: (Version 9.1 on https://blackboard.kfupm.edu.sa/)
  Syllabus, Lecture Notes, Homework Problem Sets, Grades, Attendance, etc.

Evaluation:

		POINTS
Homework	Seven Homework (best 6)	100
Project	Modeling	60
Midterm	March 12, 2014 (07:00-09:00PM)	100
Final	May 18, 2014 (07:00-09:00PM)	140
		Total:400

Grading Scale

Grade	Range
A+	357-400
A	337-356
B+	317-336
B	297-316
C+	277-296
C	257-276
D+	237-256
D	220-236
F	0-219

Course Schedule:

Week	Date (DD/MM/2014)	Section	Topic
1	26/01 – 30/01	2.1	INTRODUCTION
		2.2	EXAMPLES OF LINEAR PROGRAMMING PROBLEMS
2	02/02 – 06/02	2.3	BASIC SOLUTIONS
		2.4	THE FUNDAMENTAL THEOREM OF LINEAR PROGRAMMING
3	09/02 – 13/02	2.5	RELATIONS TO CONVEXITY
		3.1	PIVOTS
4	16/02 – 20/02	3.2	ADJACENT EXTREME POINTS
		3.3	DETERMINING A MINIMUM FEASIBLE SOLUTION
5	23/02 – 27/02	3.4	COMPUTATIONAL PROCEDURE—SIMPLEX METHOD
		3.5	ARTIFICIAL VARIABLES
		3.7	MATRIX FORM OF THE SIMPLEX METHOD
6	02/03 – 06/03	3.8	THE REVISED SIMPLEX METHOD
		3.9	DECOMPOSITION
7	09/03 – 13/03	4.1	DUAL LINEAR PROGRAMS
		4.2	THE DUALITY THEOREM
		4.3	RELATIONS TO THE SIMPLEX PROCEDURE
8	16/03 – 20/03	4.4	SENSITIVITY AND COMPLEMENTARY SLACKNESS
		4.5	THE DUAL SIMPLEX METHOD
9	30/03 – 03/04	7.1	FIRST-ORDER NECESSARY CONDITIONS
		7.2	EXAMPLES OF UNCONSTRAINED PROBLEMS
		7.3	SECOND-ORDER CONDITIONS
10	06/04 – 10/04	7.4	CONVEX AND CONCAVE FUNCTIONS
		7.5	MINIMIZATION AND MAXIMIZATION OF CONVEX FUNCTIONS
11	13/04 – 17/04	8.6	THE METHOD OF STEEPEST DESCENT
		8.8	NEWTON'S METHOD
		9.1	CONJUGATE DIRECTIONS
12	20/04 – 24/04	9.2	DESCENT PROPERTIES OF THE CONJUGATE DIRECTION METHOD
		9.3	THE CONJUGATE GRADIENT METHOD
13	27/04 – 01/05	11.1	CONSTRAINTS
		11.2	TANGENT PLANE
		11.3	FIRST-ORDER NECESSARY CONDITIONS (EQUALITY CONSTRAINTS)

Week	Date (DD/MM/2014)	Section	Topic
		11.4	EXAMPLES
14	04/05 – 08/05	11.5	SECOND-ORDER CONDITIONS
		11.6	EIGENVALUES IN TANGENT SUBSPACE
		11.8	INEQUALITY CONSTRAINTS
15	11/05 – 15/05	11.1	ADVANTAGE OF PRIMAL METHODS
		11.2	FEASIBLE DIRECTION METHODS
		11.4	THE GRADIENT PROJECTION METHOD

KFUPM | MATH 232 | 2013-2014 CALENDAR

JANUARY						
S	M	T	W	Th	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

26 Classes Start

FEBRUARY						
S	M	T	W	Th	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	

MARCH						
S	M	T	W	Th	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

12 **Midterm Exam (07:00PM – 09:00PM)**
23-27 Midterm Break

APRIL						
S	M	T	W	Th	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MAY						
S	M	T	W	Th	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	**15**	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

15 Last Day of Classes
18 **Final Exam (07:00PM – 09:00PM)**