King Fahd University of Petroleum and Minerals
Department of Mathematics & Statistics
SYLLABUS

Course #: Math 681

Title: Topics in Mathematical Programming

Selected Topic: Multicriteria Optimization

Instructor: Dr. Q.H. Ansari

Course Description: Review of orders, cones and convex sets; contingent cones; Convex and differentiable maps; Optimal element of a set; Multicriteria optimization problem and its solution; Weighted sum approach; The ε-constraint method; Set optimization and its solution; Continent derivatives and contingent epidervatives and their properties; Concept of subdifferential of a set-valued map; Optimality condition for set optimization

Textbook:

1. M. Ehrgott
   Multicriteria Optimization
   Springer-Verlag, Berlin, Heidelberg, New York, 2000
   ISBN 3-540-67869-7.

*2. J. Jahn
   Vector Optimization, Theory, Applications, and Extensions
   Springer-Verlag, Berlin, Heidelberg, New York, 2004
   ISBN 3-540-20615-9.

Week	**Section/Chapter**	**Topics**
1-2	1.4	Orders and Cones
	1.1*	Convex Sets
	3.5*	Contingent Cones
	2.1*	Convex Maps
	2.2*	Differentiable Maps
3	Chapter 4*	Optimality Notions
4-6	1.5	Classification of Multicriteria Optimization Problem
	2.1	Pareto Optimal Solutions and Efficient Points
	2.2	Weakly and Strictly Pareto Optimal Solutions
	2.3	Proper Pareto Optimality and Proper Efficiency
7-9	11.2.1*	Weighted Sum Approach
	3.1	Scalarizations and Efficiency
	3.2	Scalarizations and Weak Efficiency
	3.3	Scalarizations and Proper Efficiency
	4.2	The ε-constraint Method
10-11	Chapter 14*	Basic Concepts and Results of Set Optimization
	15.1*	Contingent Derivatives and Contingent Epideratives
	15.2*	Properties of Contingent Epiderivatives
12-13	16.1	Concept of Subdifferential
	16.2*	Properties of the Subdifferential
	16.3*	Weak Subgradients
14	17.1*	Optimality Conditions with Contingent Epiderivatives
15	17.2*	Optimality Conditions with Subgradients
	17.3*	Optimality Conditions with Weak Subgradients