Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
IND 501	Linear Optimization	1	3	0	0	3	6

Prerequisites	
Admission Requirements	

Language of Instruction	English
Course Type	Compulsory
Course Level	Masters Degree
Objective	This course introduces basic theoretical principles and algorithms of linear programming, which provide a foundation for the other mathematical programming concepts and techniques. Furthermore, the course also introduces several different types of mathematical models, which can be used to model real-life applications, and the softwares GAMS and CPLEX, which can be used to solve large-scale linear programming problems. The objectives of the course are determined as follows: • Introduce how to formulate mathematical models of the real-life applications • Enable students to apply the linear optimization algorithms efficiently • Enable students to use the softwares GAMS and CPLEX for large-scale linear optimization problems • Facilitate the understanding of the theory of the other mathematical programming techniques
Content	
References	Bazaraa, M.S., Jarvis, J.J., Sherali, H.D., "Linear Programming and Network Flows", 4. Edition, Wiley, New Jersey, 2010 Bertsimas, D., Tsitsiklis, J.N., "Introduction to Linear Optimization", Athena Scientific Series in Optimization and Neural Computation, Massachusetts, 1997 Bazaraa, M.S., Sherali, H.D., "Nonlinear Programming: Theory and Algorithm", 3. Edition, Wiley, New Jersey, 2006 Wolsey, L.A., "Integer Programming", Wiley, New Jersey, 1998 GAMS Manual, downloadable from http://www.gams.com/

Theory Topics

Week	Weekly Contents
1	Modeling of optimization problems (Bazaraa, Jarvis & Sherali, Chapter 1, Bertsimas & Tsitsiklis, Chapter 1)
2	Modeling of optimization problems (Bazaraa & Sherali, Chapter 1, Wolsey, Chapter 1) and solution through GAMS and MATLAB+CPLEX
3	Basic concepts in linear algebra (Bazaraa, Jarvis & Sherali, Chapter 2)
4	Basic concepts in convex analysis (Bazaraa, Jarvis & Sherali, Chapter 2)
5	The simplex and big-M algorithms (Bazaraa, Jarvis & Sherali, Chapter 3)
6	The two-phase algorithm, degeneration, cycling, and cycling prevention rules (Bazaraa, Jarvis & Sherali, Chapter 4)
7	Farkas' lemma, Karush-Kuhn-Tucker optimality conditions (Bazaraa, Jarvis & Sherali, Chapter 5)
8	Midterm I
9	Duality and sensitivity analysis (Bazaraa, Jarvis & Sherali, Chapter 6, Bertsimas & Tsitsiklis, Chapter 4)
10	Parametric analysis, the revised simplex algorithm (Bazaraa, Jarvis & Sherali, Chapter 6, Bertsimas & Tsitsiklis, Chapter 5)
11	The dual simplex and the primal-dual algorithms (Bazaraa, Jarvis & Sherali, Chapter 6)
12	Dantzig-Wolfe decomposition (Bazaraa, Jarvis & Sherali, Chapter 7, Bertsimas & Tsitsiklis, Chapter 6)

Week	Weekly Contents
13	Programming the Dantzig-Wolfe decomposition in MATLAB+CPLEX
14	Midterm II