

OPERATIONAL RESEARCH

Degree(s)	: Management
Type	: Compulsory course unit
Curricular year/semester	: 3rd year / 1st Semester
ECTS / hours per week	: 6 ECTS / 4.0 Hours
Workload per week	: 2 Theoretical / Practical x 2 Hours
Teacher responsible	: Professor Leonor Pinto

OBJECTIVES

- Introduce the students to the wide field of applications for (integer) linear programming and network models, as well as provide basic knowledge of the respective mathematical models.
- Apply very simple algorithms and dominate the resolution of (integer) linear programming problems with the Solver/Excel software, giving to the economic interpretation of results.

PROGRAM

1. Linear Programming (LP)

- 1.1 Introduction
- 1.2 Formulation and Graphical Solution
- 1.3 Definitions and Properties
- 1.4 Solving Problems by Solver/Excel

2. Simplex Method

- 2.1 Introduction
- 2.2 Augmented Form and Basic Feasible Solutions
- 2.3 Simplex Algorithm

3. Duality and Sensitivity Analysis

- 3.1 Introduction
- 3.2 Duality

3.3 Economic Interpretation of Duality. Shadow Prices. Primal-Dual Relations

3.4 Sensitivity Analysis

- Changes in the Right-Hand Sides of the Constraints
- Changes in the Coefficients of the Objective Function

4. Transportation and Assignment Problems

4.1 Introduction

4.2 Transportation Problem

4.3 Assignment Problem

5. Network Optimization

5.1 Introduction

5.2 Minimum Cost Flow Problem

5.3 Shortest-Path Problem

5.4 Minimum Spanning Tree Problem

- Prim Algorithm

6. Integer Linear Programming (ILP)

6.1 Introduction

6.2 Integer Linear Programming Problems

6.3 Graphical and Solver/Excel Solution

6.4 Formulations with Binary Variables

BIBLIOGRAPHY

Recommended Bibliography:

- F.S. Hillier & G.J. Lieberman, Introduction to Operations Research, 9th edition, McGraw-Hill, International Edition, New York, 2010

Optional Bibliography:

- .., Exercise sheet in english will be given, .. .
- .., Exercise sheet in english will be given, .. .
- M.C. Mourão, L. Santiago Pinto, O. Simões, J. Valente, M.V. Pato, Investigação Operacional: Exercícios e Aplicações , 1ª edição, Verlag Dashöfer, Lisboa, 2011 - (in portuguese)