Numerical Methods for Data Science

Academic Year: (2019 / 2020) **Review date: 19-04-2019**

Department assigned to the subject: Statistics Department

Coordinating teacher: NIÑO MORA, JOSE

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

OBJECTIVES

The course sets out to develop the following competences:

1) Capacity to formulate data-based analytics models for optimal decision making (operations research) in diverse applications;
2) capacity to analyze such models based on an understanding of their properties;
3) capacity to obtain numerical solutions for such models through computer software;
4) capacity to interpret the numerical solutions obtained in terms of optimal decisions.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Linear optimization models.
1.1. Introduction: decision optimization, analytics and operations research; formulations; graphical and software-based solution.
1.2. Duality; economic interpretation; optimality conditions; sensitivity analysis; robustness.
1.3. Applications.

2. Discrete optimization models.
2.1. Formulations; graphical solution; linear relaxations; optimality gap.
2.2. The branch and bound method; valid inequalities; applications.

3. Dynamic optimization models.
3.1. Formulations; finite-horizon models; optimality equations; numerical solution; applications.
3.2. Infinite-horizon models; optimality equations; numerical solution; applications.

LEARNING ACTIVITIES AND METHODOLOGY

Theoretical-practical classes with web-based supporting material. Computational sessions with numerical software. The teaching methodology will have an eminently practical approach, being based on the formulation and solution of decision optimization models from diverse application areas. Weekly individual tutorials will be scheduled.

ASSESSMENT SYSTEM

The evaluation will be based on problem sets to be solved individually by students in the continuous evaluation process, with a total weight of 100% of the final grade. Students who have not followed the continuous evaluation process will be allowed to take a final exam with a value of 60% of the course.

The evaluation in the extraordinary exam will be based on the same rules that apply to bachelor's degrees.

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals...):	100

BASIC BIBLIOGRAPHY

- F.S. Hillier, G.J. Lieberman Introduction to Operations Research, McGraw-Hill.
- H.A. Taha Operations Research: An Introduction, Prentice Hall.