Operational Research

Academic Year: (2020 / 2021) **Review date: 29/06/2020 12:46:16**

Department assigned to the subject:

Coordinating teacher: PRIETO FERNANDEZ, FRANCISCO JAVIER

Type: Electives ECTS Credits : 6.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

It is recommended that students have taken courses in Linear Algebra, Calculus of Probabilities, Business Administration, and Computer Programming.

OBJECTIVES

The course sets out to develop the following competencies: 1) Capacity to formulate deterministic and stochastic models of operations research for optimal decision making in a wide variety of applications; in particular, linear optimization, integer and combinatorial optimization, dynamic optimization and queueing theory models; 2) capacity to analyze such models, based on an understanding of their properties; 3) capacity to solve such models by computer software, finding their optimal solutions; and 4) capacity to interpret the numerical solutions obtained in terms of decisions for the originating problem.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Linear optimization.
1.1. Formulations; graphical solution; sensitivity analysis; robustness.
1.2. Duality; economic interpretation; applications.
1.3. Network flow problems.

2. Integer and combinatorial optimization.
2.1. Formulations; graphical solution; linear relaxations.
2.2. Branch and bound method; valid inequalities; applications.
2.3 Combinatorial optimization problems: shortest distance, max flow, travelling salesman

3. Dynamic and stochastic optimization.
3.1. Formulations; finite-horizon models; optimality equations; recursive solution.
3.2. Infinite-horizon models; solution via linear optimization; applications.

4. Queueing theory
4.1. Simple queueing models: M/M/1, G/M/1 and /M/G/1 models, networks of M/M/1 queues.

LEARNING ACTIVITIES AND METHODOLOGY

Learning of theoretical concepts will be complemented with practical learning of the formulation and solution of operations research models. For such a purpose, optimization software will be used. Weekly individual tutorials will be scheduled.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

The course grade will be based on several problem sets to be solved individually by students and a final exam. The evaluation in the extraordinary exam will be based on the same rules that apply to bachelor's degrees.
- % end-of-term-examination 50%

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BASIC BIBLIOGRAPHY

- F.S. Hillier and G.J. Lieberman Introduction to Operations Research, McGraw-Hill.

- H.A. Taha Operations Research, Prentice Hall.

ADDITIONAL BIBLIOGRAPHY

- D.P. Bertsekas Dynamic Programming and Optimal Control, vol. I, II, Athena Scientific.

- L.A. Wolsey Integer Programming, Wiley.

- R.J. Vanderbei Linear Programming - Foundations and Extensions, Springer.