Optimization Techniques

Academic Year: (2023 / 2024) **Review date: 25-04-2023**

Department assigned to the subject: Statistics Department

Coordinating teacher: NIÑO MORA, JOSE

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students are expected to have completed courses with contents in linear algebra, multivariable differential calculus, statistics, operations research, business administration and computer programming.

OBJECTIVES

1. Formulating optimization models for decision-making in diverse application areas.
2. Analyzing and solving optimization problems of dynamic and nonlinear types, through the formulation and solution of their optimality conditions.
3. Using software tools for formulating and solving optimization models.
4. Interpreting the numerical solutions of optimization models in decision-making terms.

1. Capacity for analysis and synthesis.
2. Problem solving and mathematical modeling.
3. Oral and written communication.

DESCRIPTION OF CONTENTS: PROGRAMME

-Topic 1. Deterministic dynamic optimization.
1.1. Motivation, formulations and examples.
1.2. Computation of optimal policies; optimality equations; recursive solution; computer-based solution.
1.3. Applications and examples.

-Topic 2. Unconstrained nonlinear optimization (ONL).
2.1. Motivation and examples; local and global optima; convexity; optimality conditions; algebraic solution.
2.2. Algebraic solution; computer-based solution.
2.3. Applications and examples.

-Topic 3. Equality-constrained NLO.
3.1. Motivation and examples; Lagrange multipliers; optimality conditions.
3.2. Algebraic solution; computer-based solution.
3.3. Applications and examples.

-Topic 4. Inequality-constrained NLO.
4.1. Motivation and examples; Karush-Kuhn-Tucker multipliers; optimality conditions.
4.2. Algebraic solution; computer-based solution.
4.3. Applications and examples.

-Topic 5. Numerical solution of unconstrained NLO problems.
5.1. Newton's method; computer implementation.
5.2. Speed of convergence; possible divergence; sensitive dependence.

LEARNING ACTIVITIES AND METHODOLOGY

Theory (3 ECTS). Theory classes with supporting material in Aula Global.
Practice (3 ECTS). Model formulation and problem-solving classes. Computing classes.

The teaching methodology will have a practical approach, being based on the formulation and solution of problems drawn from diverse application areas, both in the practical classes and in the theory classes, as motivation and illustration of the theory.

There will be a weekly individual tutoring session.

ASSESSMENT SYSTEM

The course grade will be based on in-class exercises, with a weight of 100% of the final grade.

Students who have not followed the continuous evaluation will be allowed to take a final exam with a value of 60% of the course grade

Students who do not pass the course in the regular semester will have an extraordinary exam. If the student followed the continuous evaluation process, this exam will have the same weight that the regular exam. If the student did not follow the continuous evaluation process, the weight of the final exam will be 100% of the total grade. In any case, the final grade will be based on the more favorable weighing scheme.

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

BASIC BIBLIOGRAPHY

- F.S. Hillier and G.J. Lieberman Introduction to Operations Research, McGraw-Hill, 2010
- H.A. Taha Operations Research: An Introduction , Prentice Hall, 2011

ADDITIONAL BIBLIOGRAPHY

- K. Lange Optimization, Springer, 2004