Universidad Zaragoza

Academic Year/course: 2023/24

29508 - Optimization Theory

Syllabus Information

Academic year: 2023/24
Subject: 29508 - Optimization Theory
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 625 - Bachelor's Degree in Industrial Processes' Data Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject type: Basic Education
Module:

1. General information

The subject includes several quantitative techniques aimed at decision making in the field of logistics and production . The development of these techniques is presented to the student with the greatest possible simplification of the mathematical apparatus, emphasizing the applied aspects and the use of computer tools.

Modeling real problems and solving them using optimization theory introduces the student to decision making . The objective is for the student to be able to identify, analyze, formulate and solve real decision problems related to the organization and management of production systems.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the 2030 Agenda of the United Nations (2030 Agenda (https://www.un.org/sustainabledevelopment/es/):

- GOAL 8. Decent Work and Economic Growth
- GOAL 12. Responsible Production and Consumption

2. Learning results

- To learn the basics necessary to solve mathematical problems that may arise in Linear Algebra;

  Graph theory; Differential and Integral Calculus, Numerical Methods and optimization.
- To know the reflexive use of symbolic and numerical calculation tools
- To know the optimization techniques associated with linear and nonlinear problems.
- Possess scientific-mathematical thinking skills that allow them to ask and answer certain mathematical questions.
- Have the ability to handle mathematical language; in particular, symbolic and formal language.

3. Syllabus

- Introduction to optimization: Analysis and definition of the problem, formulation, solution and validation of the model.
- Linear programming: Simplex algorithm. Sensitivity analysis.
- Entire Programming: Binary, integer and mixed integer programming.
- Non-linear programming: Karush-Kuhn-Tucker (CKKT) conditions. Numerical methods: SQP algorithm.
- Multi-criteria decision: Efficient alternative or optimal pareto. Efficient assembly. Payment matrix. Method of the weightings. Method of constraints. Programming commitment. Programming by goals.
- Dynamic programming: Bellman's optimality principle. Optimization by phases or sequences. assignment problems. Continuous dynamic programming.

4. Academic activities

The subject is structured with 4 hours of face-to-face classes during the 15 weeks of the term. All hours are taught in the computer classroom. Theoretical concepts are taught and reinforced with practical work through the use of statistical analysis programs.

5. Assessment system

Continuous assessment system

Written tests: There will be two written tests along the term. They will deal with theoretical and/or practical aspects of the subject . Its weight in the grade is 80%.

Participatory controls: Throughout the term the student will carry out 4 participatory controls valued at 5% of the final grade, which will consist of practical exercises.

In the written tests and participatory controls will be evaluated:

- understanding of the mathematical concepts used to solve problems
- the use of efficient strategies and procedures in its resolution
- clear and detailed explanations
- the absence of mathematical errors in development and solutions
- correct use of terminology and notation
- clear, orderly and organized exposition

Global assessment.

Students who have not passed the subejct with the continuous assessment system, must take a a written test of obligatory character equivalent to the written tests and the participatory controls described in the point, whose weight in the final grade will be 100%.