Optimization

Academic Year: (2021 / 2022) **Review date: 28-06-2021**

Department assigned to the subject: Mathematics Department

Coordinating teacher: MOSCOSO CASTRO, MIGUEL ANGEL

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students are expected to have a solid background in Linear Algebra and Calculus.

OBJECTIVES

- To develop a theoretical basis and the skills for solving optimization problems arising in science and engineering.
- To learn some of the more popular optimization toolboxes.

Codes: CB6, CB7, CB8, CB9, CB10, CG2, CG4, CG5, CG6, CG7, CE1, CE2, CE3, CE4, CE8

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to mathematical optimization.
   a. Classification of optimization problems.
   b. Geometric resolution of simple optimization problems.
2. Linear programming.
   a. Geometry interpretation
   b. The simplex method
   c. LP Duality
3. Quadratic optimization
   a. Geometrical examples
   b. Simplex method for quadratic optimization
4. Convex optimization.
   a. Convex sets and convex functions
   b. The Lagrange dual problem
   c. Optimality conditions
   d. Sensitivity Analysis
   e. Algorithms
5. Applications

LEARNING ACTIVITIES AND METHODOLOGY

- Theoretical sessions illustrated with different applications and examples. Material for out-of-class work.
- Problem sessions to discuss different problems in science and engineering. There will be proposed projects to be solved at home.

ASSESSMENT SYSTEM

- Homework and classwork: 70%
- Final Exam: 30%

% end-of-term-examination:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

BASIC BIBLIOGRAPHY

- S. Boyd and L. Vandenberghe Convex Optimization, Cambridge University Press, 2004

ADDITIONAL BIBLIOGRAPHY

- David G. Luenberger and Yinyu Ye Linear and Nonlinear Programming, 3rd ed. Springer, 2008
- Jorge Nocedal and Stephen J. Wright Numerical Optimization, Springer-Verlag, 2006
- R. Fletcher Practical Methods of Optimization, Wiley, 1987

BASIC ELECTRONIC RESOURCES

- S. Boyd and L. Vandenberghe . Convex Optimization : https://web.stanford.edu/~boyd/cvxbook/