

Optimization

Academic Year: (2024 / 2025)

Review date: 23-03-2024

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 important optimization algorithms.

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. Unconstrained optimization.
 - b. Equality constrained minimization.
 - c. Inequality constrained minimization.
2. Convex optimization
 - a. Convex sets and convex functions.
 - b. Linear optimization problems.
 - c. Quadratic optimization problems.
3. Duality
 - a. The Lagrange dual function.
 - b. The Lagrange dual problem.
4. Geometric problems
5. Other 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

% end-of-term-examination:	30
% of continuous assessment (assignments, laboratory, practicals...):	70
- Homework and classwork: 70%	
- Final Exam: 30%	

BASIC BIBLIOGRAPHY

- Ross Baldick Applied optimization: formulation and algorithms for engineering systems, Cambridge University Press, 2009

- 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/>