SUBJECT TEACHING GUIDE

G100 - Optimisation I

Double Degree in Physics and Mathematics
Degree in Mathematics

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Double Degree in Physics and Mathematics Degree in Mathematics			Type and Year	Compulsory. Year 4 Compulsory. Year 3
Faculty	Faculty of Sciences				
Discipline	Subject Area: Computational Mathematics Module: Compulsory Subjects				
Course unit title and code	G100 - Optimisation I				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web	https://personales.unican.es/polac/opt/Leeme_alumnos_optcr.pdf				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICAS, ESTADISTICA Y COMPUTACION
Name of lecturer	MARIA CECILIA POLA MENDEZ
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Other lecturers	DIANA STAN

3.1 LEARNING OUTCOMES
- To get basic skills in modeling of various applied optimization problems
- To get basic skills in solving optimization problems by computer.
- To implement optimization algorithms.
- To use available optimization software.
- To interpret and use numerical results.

4. OBJECTIVES
To give training in modeling and solving practical problems; in particular linear programs (LP) and quadratic programs (QP)
To understand the basic theory behind LP and QP and to implement the corresponding algorithms.
To know optimization software and to learn how to use it properly.
To interpret results appropriately.
To understand important applications of LP and QP to real life problems

6. COURSE ORGANIZATION	
CONTENTS	
1	TEMA: INTRODUCTION 1.1 Basic Theoretical Concepts of Optimization 1.2 Mathematical Formulation and Classification of Optimization Problems 1.3 Applications 1.4 Existence and Uniqueness of Solutions 1.5 Optimality Conditions. Lagrange Multipliers. 1,6 Duality
2	TEMA 2: LINEAR PROGRAMMING 2.1 Formulations. Existence of Solution. Optimality Conditions 2.2 Applications. A Transportation Problem. A Diet Problem 2.3 The Simplex Method. Convergence. Implementation.Phase I.
3	TEMA 3: QUADRATIC PROGRAMMING 3.1 Existence of Solutions. Uniqueness of Solutions. Optimality Conditions. 3.2 Active Set Methods. Convergence. Implementation. 3.3 Generalized quadratic programming problems.
4	The final exam consists of three parts. Part I (without computer) gives a maximum of 2.5 points. Part II (solving problems with optimization software) with a maximum of 2.5 points and finally Part III (replacing the written examination and the project proposed during the lecture period) with a maximum of 5 points.
5	6 hours per week

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
A written examination at the end of the first lecture.	Written exam	No	Yes	25,00
The project must be carried out during the corresponding LP or QP lectures.The students work to a deadline and they will pass a short (theoretical and/or practical) exam. Moreover the professor could talk with the student so that he shows his knowledge	Work	No	Yes	25,00
The final exam consists of two parts. Part I (written examination without computer) gives a maximum of 2.5 points. Part II (solving problems with optimization software) with a maximum of 2.5 points.	Laboratory evaluation	Yes	Yes	50,00
TOTAL				100,00

Observations

On the date of the regular exam, students who wish to substitute the first written test may take a make-up exam after the final exam with a maximum value of 2.5 points.
On the date of the extraordinary exam, students who wish to substitute both, the first test and the project, may take a make-up exam after the final exam with a maximum value of 5 points.

Observations for part-time students

Part-time students will follow the same testing requirements as other candidates,

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

•. J. Nocedal y S.J. Wright. Numerical Optimization. Springer. 2006.

• D.P. Bertsekas. Nonlinear Programming. Athena Scientific. 1999.

• I. Griva, S.G. Nash y A. Sofer.Linear and Nonlinear Optimization. SIAM. 2009.