Course guide
200152 - PM - Mathematical Programming

Unit in charge: School of Mathematics and Statistics
Teaching unit: 715 - EIO - Department of Statistics and Operations Research.
Degree: BACHELOR'S DEGREE IN MATHEMATICS (Syllabus 2009). (Compulsory subject).
Academic year: 2023  ECTS Credits: 7.5  Languages: Catalan

LECTURER
Coordinating lecturer: JORDI CASTRO PÉREZ
Others: Primer quadrimestre:
JORDI CASTRO PÉREZ - M-A, M-B
MARC ESQUERRÀ COROMINAS - M-A, M-B
FRANCISCO JAVIER HEREDIA CERVERA - M-A, M-B

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CE-2. Solve problems in Mathematics, through basic calculation skills, taking in account tools availability and the constraints of time and resources.
2. CE-3. Have the knowledge of specific programming languages and software.
3. CE-4. Have the ability to use computational tools as an aid to mathematical processes.

General:
4. CB-1. Demonstrate knowledge and understanding in Mathematics that is founded upon and extends that typically associated with Bachelor's level, and that provides a basis for originality in developing and applying ideas, often within a research context.
5. CB-2. Know how to apply their mathematical knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader or multidisciplinary contexts related to Mathematics.
6. CB-3. Have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements.
7. CG-1. Show knowledge and proficiency in the use of mathematical language.
8. CG-2. Construct rigorous proofs of some classical theorems in a variety of fields of Mathematics.
9. CG-3. Have the ability to define new mathematical objects in terms of others already know and ability to use these objects in different contexts.
10. CG-4. Translate into mathematical terms problems stated in non-mathematical language, and take advantage of this translation to solve them.
12. CG-6 Detect deficiencies in their own knowledge and pass them through critical reflection and choice of the best action to extend this knowledge.

Transversal:
11. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

TEACHING METHODOLOGY

(Section not available)

LEARNING OBJECTIVES OF THE SUBJECT

(Section not available)
### STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>30.0</td>
<td>16.00</td>
</tr>
<tr>
<td>Self study</td>
<td>112.5</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>24.00</td>
</tr>
</tbody>
</table>

**Total learning time:** 187.5 h

### CONTENTS

**Introduction**

**Description:**
The Mathematical Programming. Building methodology of Mathematical Programming models. The paper of the models in the decision making process. Main types of Mathematical Programming: linears, integers, network flows, nonlinear, stochastics, etc.

**Full-or-part-time:** 23h 30m

- Theory classes: 4h 30m
- Practical classes: 3h
- Self study: 16h

**Linear Programming**

**Description:**

**Full-or-part-time:** 47h 30m

- Theory classes: 13h 30m
- Practical classes: 6h
- Laboratory classes: 3h
- Self study: 25h

**Integer Linear Programming**

**Description:**

**Full-or-part-time:** 18h 30m

- Theory classes: 6h
- Practical classes: 4h
- Self study: 8h 30m
Unconstrained Nonlinear Programming

Description:

Full-or-part-time: 28h 30m
Theory classes: 7h 30m
Practical classes: 5h
Self study : 16h

Constrained Nonlinear Programming

Description:

Full-or-part-time: 34h 30m
Theory classes: 11h 30m
Practical classes: 7h
Self study : 16h

GRADING SYSTEM

There will be a non eliminatory midterm exam (ExP), a final exam (ExF), and a mark for practical assignments (Pr).

The final mark NF of the course will be:

\[ NF = \max\{ExF, 0.8 \text{ ExF} + 0.2 \text{ Pr}, 0.6 \text{ ExF} + 0.2 \text{ ExP} + 0.2 \text{ Pr}\} \]

An extra exam will take place on July for students that failed during the regular semester.

If the student fails, the extra evaluation will only consist of a resit exam (neither Pr nor ExP/ExF will be considered).

BIBLIOGRAPHY

Basic: