



Programación
Matemática/
Mathematical
Programming

Grado en Economía y
Negocios
Internacionales



UNIVERSIDAD
NEBRIJA

SYLLABUS

Course: Matematical Programming

Degree: Grado en Economía y Negocios Internacionales

Type: Mandatory

Languages: This course will be taught in English

Modality: In-Person and Online

Credits: 6

Year: 3rd

Semester: Fall Semester

Professors and contact information:

1. COMPETENCIES AND LEARNING OUTCOMES

1.1. Competencies

Basic Competencies

CB1, CB2, CB3, CB4, and CB5

General Competencies

CG8 and CG9

Specific Competencies

CE9, CE16, and CE18

1.2. Learning outcomes

The student, upon completing this course, should be able to:

- Organize information
- Use quantitative techniques for the analysis of data and economic variables

2. CONTENTS

2.1. Prerequisites

None.

2.2. Description

This course emphasizes techniques for the solution and analysis of deterministic linear models. The main types of models that will be addressed are linear programming, network flow, and integer linear programming. However, the course will also address more complex models, such as those incorporating nonlinear constraints or uncertainty.

2.3. Covered Topics

1. Introduction to Static Optimization.
2. Classical unconstrained programming. Necessary and sufficient conditions for optimality. Graphical representation.
3. Constrained nonlinear programming. Lagrange multipliers. Kuhn-Tucker conditions. Quadratic programming.
4. Linear programming and network flow. Mathematical formulation. Transformations. Classifications. The simplex method. Duality theory. Economic interpretation and sensitivity analysis.
5. Models with nonlinear constraints, models with uncertainty.

2.4. Individual / Group Assignments

Periodic completion of problem sets, both individually and in groups, related to each of the most relevant aspects of the content.

2.5. Learning Activities

In-Person Learning	Hours	Attendance %
AF1 Lecture / Theoretical Foundations	45	100%
AF2 Case Studies	9	100%
AF3 Tutorial	9	100%
AF4 Individual / Group Assignments	18	0%
AF5 Online Assignments	6	50%
AF6 Extracurricular Materials	6	0%
AF7 Self Study	57	0%

Online Learning	Hours	Attendance %
AF8 Online Lecture	12	50%
AF9 Online Case Studies	12	0%
AF5 Online Assignments	48	0%
AF6 Extracurricular Materials	18	0%
AF7 Self Study	24	0%
AF10 Online Tutorial	12	100%
AF11 Individual / Group Assignments	24	50%

Methodologies:

In-Person: MD1, MD2, MD3, MD4

Online: MD1, MD2, MD3, MD4

3. GRADING RUBRICS

3.1. Grades

Grades are calculated as follows:

- 0 - 4.9 Fail (SS)
- 5.0 - 6.9 Pass (AP)
- 7.0 - 8.9 Notable (NT)
- 9.0 - 10 Outstanding (SB)

The mention of "Matrícula de Honor" may be awarded to students who have obtained a grade equal to or greater than 9.0.

3.2. Evaluation criteria

Ordinary Session

Modality: In-Person

Evaluation Criteria	Percentage
S1 Attendance and Participation	10%
S2 Individual / Group Assignments	30%
S3 Midterm Exam (On-Site)	10%
S4 Final Exam (On-Site)	50%

Modality: Online

Evaluation Criteria	Percentage
S10 Participation (Forums and Supervised Activities)	10%
S2 Individual / Group Assignments	30%
S4 Final Exam (On-Site)	60%

Extraordinary Session

Modality: In-Person

Evaluation Criteria	Percentage
S2 Individual / Group Assignments	30%
S4 Final Exam (On-Site)	70%

Modality: Online

Evaluation Criteria	Percentage
S2 Individual / Group Assignments	30%
S4 Final Exam (On-Site)	70%

3.3. Restrictions

Minimum Grade

To be able to qualify for inclusion of the above evaluation criteria percentages in the calculation of the final grade, it is necessary to obtain at least a grade of 5.0 in the final test.

Attendance

Student who have missed more than 25% class meetings (unexcused) may be denied the right to take the final exam in the ordinary session.

Writing Standards

Special attention will be given to written assignments, as well as to exams, regarding both presentation and content in terms of grammatical and spelling aspects. Failure to meet the minimum acceptable standards may result in point deduction.

3.4. Plagiarism Warning

Nebrija University will not tolerate plagiarism under any circumstances. Reproducing content from sources other than a student's own work (the internet, books, articles, and peers' work, among others) without proper citation will be considered plagiarism.

If these practices are detected, they will be considered a serious offense, and the sanctions provided for in the Student Regulations may be applied.

4. BIBLIOGRAPHY

Required Reading:

- Balakrishnan N., Render B., Stair R. M. (2011). *Managerial Decision Making with Spreadsheets*. (3rd ed.). Pearson.
- Guenin, B., Könemann, J., Tunçel L. (2014). *A Gentle Introduction to Optimization*, Cambridge University Press

Recommended Reading

- Boyd, S., & Vandenberghe, L. (2004). *Convex Optimization*. Cambridge University Press
- Luenberger, D. G. (1984). *Linear and Nonlinear Programming* (2nd ed.). Addison-Wesley.
- Nocedal, J., & Wright, S. J. (2006). *Numerical Optimization* (2nd ed.). Springer Science & Business Media.