Mathematical methods for business and economics

Master in Internationalization of companies

UNIVERSIDAD NEBRIJA

General Information

Subject: Mathematical Methods for Business and Economics

Degree: Master's Degree in Business Internationalization

Type: Elective

Language: Spanish and English

Mode: Onsite and Distance Learning

Credits: 6

Year: 1st

Semester: 2nd

Professors/Teaching Staff: Omar de la Cruz

1 . COMPETENCIES AND LEARNING OUTCOMES

1.1. Competencies

Basics Competencies

CB6: Possess and understand knowledge that provides a foundation or opportunity to be original in the development and/or application of ideas, often in a research context.

CB7: Apply the knowledge they have acquired and their problem-solving abilities in new or little-known environments within broader (or multidisciplinary) contexts related to their area of study.

CB8: Integrate knowledge and handle the complexity of making judgments based on information that, although incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.

CB9: Communicate their conclusions and the underlying knowledge and reasons to both specialized and non-specialized audiences in a clear and unambiguous way.

CB10: Possess learning skills that enable them to continue their studies in a largely self-directed or autonomous manner.

General Competencies

CG3: Developing analytical skills for managing businesses in dynamic and complex environments such as those belonging to an international setting.

CG4: Interpreting macroeconomic data, country information, sector information, and relevant business data in order to systematize the decision-making processes in business.

CG5: Acquire the knowledge and learning necessary to continue developing more specialized studies in the field of research or doctoral studies.

CG6: Integrate into multidisciplinary teams in high-pressure situations with a decisive and proactive attitude.

Specific Competencies

CE2: Choose and apply the appropriate procedure to achieve a business objective.

CE4: Develop analytical skills that allow understanding the nature of problems in the organization and therefore the application of suitable tools.

CO2: Interpreting cost-benefit analysis in a specific business context.

1.2 Resultados de aprendizaje

Upon completion of this subject, the student should be able to:

Identify the main factors to consider when making decisions.

Evaluate the different alternatives available to a company.

Make decisions using cost-benefit analysis criteria.

2. CONTENT

2.1. Requirements

None.

2.2. Detailled Content

Contents

- TOOLS FOR DECISION-MAKING.
  - Static and dynamic optimization.
  - Linear, non-linear and dynamic programming.
  - Heuristic techniques.
  - Data mining.
- MULTICRITERY DECISIONS.
  - Multi-objective and multicriteria optimization models.
  - Programming by goals and by objective.
  - Evolutionary algorithms or evolutionary computation.
- DECISIONS UNDER CERTAINTY.
  - Deterministic models.
  - Sensitivity analysis.
  - Minimum rate of adjusted performance.
- DECISIONS UNDER UNCERTAINTY AND RISK.
  - Probabilistic models.
  - Expected value.
  - Analysis of the variance / standard deviation.
  - Probability of loss and gain.
- COST-BENEFIT ANALYSIS.
  - Breakeven.
  - Return period.
  - Net present value.
- - Internal rate of return.

2.3. Directed Activities

During the academic year, students will need to complete a certain number of directed activities, either individually or in groups.

The purpose of these Directed Activities is to familiarize students with the applied nature of the concepts discussed in the classroom, so they can appreciate the use of theory in analyzing real-life situations. Each teacher will propose throughout the course the Directed Activities that best suit the course, always with a minimum of two.

2.4 Educational Activities

In-Person Attendence

Educational Activity	Hours	Percentage of In-Person Attendance for the Educational Activity
AF1 Lecture	45	100%
AF4 Tutorials	10	80%
AF6 Practical Classes. Seminars and Workshops	20	100%
AF7 Internships	10	100%
AF9 Individual Study and Independent Work	29	0%
A10 Individual or Group Assignments for Students	10	0%
A13 Activities Through Virtual Resources	20	0%
A14 Assessment	6	100%
TOTAL	**150**	

Distance Learning Mode

Educational Activity	Hours	Percentage of In-Person Attendance for the Educational Activity
AF2 Lectures	60	0%
AF4 Tutorials	10	0%
AF9 Individual Study and Independent Work	19	0%
A12 Individual Student Assignments	20	0%
A13 Activities Through Virtual Resources	20	0%
A14 Assessment	6	100%
A15 Study, Understanding, and Assessment of the Subject	15	0%
TOTAL	**150**	

Teaching Methodologies

In-person and Distance Learning:

MD1	Expository Method / Lecture
MD2	Problem-Solving and Exercises
MD3	Cases Studies
MD5	Project-Based Learning
MD10	Cooperative learning

3. Evaluation system

3.1. Grading system

The grading system (R.D. 1125/2003, of September 5) will be as follows:
0 - 4.9 Fail (F)
5.0 - 6.9 Pass (P)
7.0 - 8.9 Good (G)
9.0 - 10 Outstanding (O)

The "honors" designation may be awarded to students who have obtained a grade equal to or higher than 9.0. Its number cannot exceed five percent of the students enrolled in the subject in the corresponding academic year, unless the number of enrolled students is less than 20, in which case only one "honors" designation may be granted.

3.2. Evaluation criteria

Face-to-face modality
Regular session

Evaluation system	Minimum weighting	Maximum weighting
SE1. Class attendance and participation	25%	25%
SE2. Presentation of assignments and projects (individual practices and teamwork)	25%	25%
SE4. Final individual in-person exam	50%	50%

Extraordinary session

Evaluation system	Minimum weighting	Maximum weighting
SE2. Presentation of assignments and projects (individual practices and teamwork)	25%	25%
SE4. Final individual in-person exam	75%	75%

Distance modality
Regular session

Evaluation system	Minimum weighting	Maximum weighting
SE1. Class attendance and participation	20%	20%
SE2. Presentation of assignments and projects (individual practices and teamwork)	20%	20%
SE4. Final individual in-person exam	60%	60%

Extraordinary session

Evaluation system	Minimum weighting	Maximum weighting

SE2. Presentation of assignments and projects (individual practices and teamwork)	25%	25%
SE4. Final individual in-person exam	75%	75%

The passing of any subject is subject to passing the corresponding final individual in-person exams.

3.3. Restrictions

Minimum grade
To calculate the average with the previous weightings, it is necessary to obtain at least a grade of 5 in the final exam.

Writing Standards:
Special attention will be paid to written assignments, practices, and projects, as well as exams, regarding both presentation and content, ensuring grammatical and spelling aspects are accurate. Failure to meet acceptable standards may result in points being deducted from the assignment.

3.4. Warning about plagiarism

The Antonio de Nebrija University will not tolerate plagiarism or copying under any circumstances. Plagiarism will be considered as the reproduction of paragraphs from sources other than the student's own work (Internet, books, articles, classmates' work, etc.), without citing the original source. The use of citations cannot be indiscriminate. Plagiarism is a serious offense.
If such practices are detected, it will be considered a serious offense and the sanction provided in the Student Regulations may be applied.

4. References

1. August, M., & Walks, A. (2018). Gentrification, suburban decline, and the financialization of multi-family rental housing: *The case of Toronto. Geoforum*, 89. 124-136.
2. Brill, F., & Durrant, D. (2021). The emergence of a Build to Ren model: The role of narratives and discourses. Environment and Planning A: *Economy and Space*. 53(5). 1140-1157.
3. Cumming, F., & Dettling, L. (2024). Monetary policy and birth rates: the effect of mortgage rate pass-through on fertility. *Review of Economic Studies*, *91*(1), 229-258.
4. Cox, D. (2022). The Childhood Loneliness of Generation Z. *Survey center on American Life.*
5. Eurostat (2023). Fertility statistics. *Online Publications*, March 2023.
6. Feichtinger, G., & Wrzaczek, S. (2024). The optimal momentum of population growth and decline. Theoretical Population Biology, 155, 51-66.
7. Hoekstra, J., & Vakili-Zad, C. (2011). High vacancy rates and rising house prices: The Spanish paradox. *Tijdschrift voor Economische En Social Geografie*. 102(1). 55-71.
8. Kelly, J. (2023). Gen-Z Faces Financial Challenges, Stress, Anxiety And An Uncertain Future. *Forbes.*