COURSE DATA

DATA SUBJECT

Code: 36431
Name: Quantitative methods for management
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1406 - Degree in Data Science	Escola Tècnica Superior d'Enginyeria	3	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1406 - Degree in Data Science	Economics, Business and Management	COMPULSORY

COORDINATION

LIERN CARRION VICENTE

SUMMARY

Quantitative methods for management is a compulsory training subject taught by the Mathematics for Economics and Business and Applied Economics departments during the second semester of the third year of the Data Science Degree with a total teaching load of 6 ECTS credits.

Few scientific fields in history have made such an intensive use of data as Economics, Business Management and Finance. Economic models, which emerge as a simplified abstraction of a complex and changing reality, often mark determining actions by managing a reduced number of variables. Nowadays, out dependency on data is even more evident. For this reason, this course tries to show students both the need and the way to deal with data in management.

In this course, the concepts learned from mathematics and statistics will be applied to contexts within the scope of economy and business. From the field of linear algebra, the input-output models and static equilibrium situations that depend on some parameters will be analysed. Techniques for dynamic analysis of economic situations will be explained and the necessary tools will be used to extract trends and marginal changes in economic data. In addition, it is intended that the student learns to search, select, and value the appropriate information for economic analysis so he/she can draw conclusions through the use and construction of indicators. This is especially important because the use of indicators is becoming a

tool increasingly used in the management of organizations, allowing the institution to see if a project is successful and if the objectives are being met.

The course is divided into two blocks. The first block, '**Management Indicators**', is dedicated to the use and management of economic information, definition of index numbers and variation rates, and the use and construction of indicators. The second block, '**Methods of Mathematical Economics**', is dedicated to showing linear algebra techniques that are used in economic and business decision making, allowing to obtain trends and marginal changes in economic data. The utility of differential and integral calculation in the study of the evolution and variation of economic magnitudes is shown. In addition, dynamic analysis techniques are studied in economic situations such as inflation and unemployment, markets with price expectations, etc.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

Since students have already taken mathematics and statistics courses in the first two years of the degree, no additional background knowledge is required. Regarding prerequisites in the field of economics and business, as the students have taken the Business and Data Science course before the Quantitative Methods for Management, no other requirements will be necessary.

COMPETENCES / LEARNING OUTCOMES

1406 - Degree in Data Science

(CE12) Ability to design and start solutions based on data analysis in the field of medicine and business, taking into account the specific requirements of this type of use cases.

(CG06) Ability to access and manage information in different formats for subsequent analysis in order to obtain knowledge from data.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

DESCRIPTION OF CONTENTS

1. Indicators in management

Lesson 1. Economics and Business databases
a) Access to databases of official organizations and institutions. (INE, Eurostat, World Bank, etc.).
b) Selection and treatment of economic information.
Lesson 2. Variation rates and index numbers.
a) Variation rates.
b) Definition and classification of index numbers.
c) Base change, renewal, link, and deflation.
d) Price indices.
Lesson 3. Construction of composite indicator for management.
a) Introduction
b) Building a composite indicator
c) Tools for indicator building.

2. Methods of Mathematical Economics

Lesson 4: Linear algebra in decision making
a) Static equilibrium. Systems of linear equations. Applications to national income models, equilibrium models, input-output models.
b) Opportunity set. Solution spaces. Generating systems.
c) Kernel and Range of a linear map within economic contexts. Linear normalizations. Aggregation operators.
Lesson 5: Applications of differential and integral calculus to management.
a) Limits and trends in economics contexts.
b) Derivability. Marginal values, elasticity, national income model. Cobb-Douglas production function.
c) Integrals. Total function definition from marginal functions. Investment and capital formation.
Lesson 6: Dynamical models in economy.
a) Ordinary differential equations.
b) Economical models: unemployment-inflation model, models of market with expected prices, Domar and Solow growth models, Domar debt model.
c) Resolution of study cases with R.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	28,00
Laboratory	20,00
Classroom practices	12,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	2,50
Individual or group project	20,00
Independent study and work	21,50
Preparation of lessons	18,00
Preparation for assessment activities	18,00
Resolution of case studies	10,00
Total hours	**90,00**

TEACHING METHODOLOGY

This course is divided into theory/problem-solving lectures and computer lab sessions. Each one will use different teaching methods.

In the theory lectures, expository development of the subject will be carried out with the participation of the student in the resolution of specific questions. The predominant teaching method in these lectures will be the master class. This methodology allows a large group of students to be led in an organized way. Nevertheless, the participation of the students and the teacher-student interaction will not be limited in any way. An attempt will be made to encourage participation and discussion in the classroom, in order to offer the student a direct involvement with the content and individual evaluation questionnaires may be carried out (CG06, CE12).

In the problem-solving sessions, problem-based learning will be encouraged through exercises, problems, and study cases (CB2, CG06).

In the computer lab sessions, project-based learning will be the main objective. Several activities to be solved either individually or in groups will be carried out (CB2, CG06, CE12).

EVALUATION

The grading system will consist on: a final exam at the end of the semester, which will assess the degree of achievement of the learning outcomes, especially those focused on specific competences of the course regarding content and applications; the practical activities developed by the student during the course, and the continuous assessment of the student, based on their participation and involvement in the teaching-learning process.

- The final exam (SE1) will consist on theoretical and practical questions in order to assess whether the student has mastered the key elements of the program. This test is the 50% of the final grade (CB2, CE12).

- The evaluation of practical activities (SE2) will be carried out with the grading of the exercises, papers, reports, presentations, etc. This will represent the 30% of the final grade (CB2, CG06, CE12).

- The continuous assessment (SE3) aims to develop the competences of the students and stimulate daily work. It will be based on the monitoring of the student participation in the classroom. This will be the 20% of the final grade. By their very nature, continuous assessment activities are non-recoverable (CB2, CE12).

The final grade will be the sum of the final exam, continuous evaluation, and practical activities. To pass the course, it will be necessary to pass the synthesis test (with a minimum of 2.5 out of 5) and must pass each part (with a minimum grade of 1.25 out of 2.5 in each part).

At the second call, the practical activities (SE2), can be recovered by with a final exam based on the practical activities carried out during the course.

In any case, the evaluation system will be governed by the Regulations of Evaluation and Qualification of the University of Valencia for bachelor's and master's degrees. (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639).

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

- Esteban, J. y otros (2006). Estadística Descriptiva y nociones de probabilidad. Paraninfo, Madrid.
- F. Dorin, D. Perrotti y P. Goldszier, Los números índices y su relación con la economía, Metodologías de la CEPAL, N° 1 (LC/PUB.2018/12-P), Santiago, Comisión Económica para América Latina y el Caribe (CEPAL), 2018.
- Liern, V. (2018). Algunos usos del Álgebra Lineal en las decisiones de Economía y Empresa. 1ª ed. [ebook]. E-book gratuito en http://www.uv.es/liern.
- Canós, M. J., Ivorra, C. y Liern, V. (2002). Matemáticas para la Economía y la Empresa. Ed. Tirant lo Blanch. Valencia.
- Sydsaeter, K. y Hammond, P. J. (2002). Matemáticas Esenciales para el Análisis Económico. Ed. Prentice Hall.
- Joint Research Centre-European Commission. (2008). Handbook on constructing composite indicators: methodology and user guide. OECD publishing.
- Chiang, A. (1996). Métodos fundamentales de Economía Matemática. 3ª Edición. McGraw-Hill, Madrid.
- Ivorra, C. (2007). Matemáticas Económico-Empresariales. Laboratori de Materials, 2. Publicacions Universitat de València.