Information about the subject

Degree: Bachelor of Science Degree in Business Administration and Management

Faculty: Faculty of Legal, Economic and Social Sciences

Code: 301105 **Name:** Mathematics for Economics and the Business

Credits: 6,00 **ECTS Year:** 1 **Semester:** 1

Module: Quantitative Methods

Subject Matter: Mathematics **Type:** Basic Formation

Field of knowledge: Ingeniería y Arquitectura

Department: Economics, Business Management, and Marketing

Type of learning: Classroom-based learning / Online

Languages in which it is taught: English, Spanish

Lecturer/-s:

301A	María Aranzazu Juan Blanco **(Responsible Lecturer)**	ma.juan@ucv.es
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Module organization

Quantitative Methods

Subject Matter	ECTS	Subject	ECTS	Year/semester
Information Systems	12,00	IT Management I	6,00	1/2
		IT Management II	6,00	2/1
Mathematics	6,00	Mathematics for Economics and the Business	6,00	1/1
Statistical and Econometric Methods	12,00	Econometrics	6,00	4/1
		Statistical Inference	6,00	3/2
Statistics	6,00	Descriptive Statistics	6,00	2/1

Recommended knowledge

Knowledge of mathematical content at secondary school level.

Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

R1 Given an already formalized problem (to formalize if verbalized), being able to choose and apply the standard techniques learned to solve it (eg in a mathematical context, - using the Gauss method for solving a large system of linear equations, - to know how to calculate some primitive function to solve an integral or to know how to derive a function with a complicated expression, - in an economic context, to approach and to solve mathematical models which include economic concepts such as discrete models from diagonalization of matrices).

R2 Being able to decide whether the solution obtained is reasonable according to the context in which the problem is formulated. That is, be able to post a critical assessment of it.

R3 Being able to decide whether or not you can obtain a solution "closed" (ie, expressed algebraically or analytically) of a given problem, so that in the second case, the student also can approximate the solutions by using suitable computer tools and office suites which must also handle with ease (involving choice of source) for it.

R4 To present solutions to problems or situations by using its experience in similar : economic models containing concepts; new cognitive schemas and ways of interpreting reality.

R5 To express opinions clearly and precisely and to know how to ask control and monitoring questions in the context of solving formal problems (mathematical) or applied (economy).

Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB1	That students have demonstrated knowledge and understanding in an area of study that is at the core of general secondary education, and is often at a level that, while supported by advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study.	x			
CB2	That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.	x			
CB3	That students have the ability to gather and interpret relevant data (usually within their area of study) to make judgments that include reflection on relevant social, scientific or ethical issues.	x			
CB4	That students can convey information, ideas, problems and solutions to both specialized and non-specialized audiences.	x			
CB5	That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.	x			

GENERAL		Weighting			
		1	2	3	4
CG0	Speaking well in public.	x			
CG1	Capacity of analysis and synthesis.				x
CG3	Capacity to apply knowledge into practice.		x		
CG5	Oral and written communication.	x			
CG6	Use of ICTs			x	

CG8	Orientation to problem-solving.				x
CG11	Creativity and ability to generate new ideas.		x		
CG13	Ability to learn and research skills.			x	
CG18	Ability to obtain, from the data, valuable information for decision making.		x		

SPECIFIC		Weighting			
		1	2	3	4
CE14	To understand the potential impact of aspects related to the macro- and microeconomic environment and its institutions on business organizations (e.g. the monetary and financial system, domestic markets)	x			
CE15	Ability to obtain, from the data, valuable information for decision making.			x	
CE17	Application of professional criteria to the analysis of business problems.	x			
CE18	Ability to integrate in any functional area of a company and develop different tasks related to its management.		x		

Assessment system for the acquisition of competencies and grading system

In-class teaching

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R4, R5	15,00%	Objective Tests
R1, R2, R3, R4, R5	25,00%	Conduct of Theory-Practice
R1, R2, R3, R4, R5	10,00%	Class attendance and participation
R1, R2, R4, R5	50,00%	Final Exam

Observations

Comments

The assessment system will be structured as follows:

·Throughout the course, objective in-person tests will be given on the content covered. The average of the marks for these tests will account for 15% of the final mark.

·Theoretical-practical activities will also be proposed, to be carried out individually or in pairs, and must be submitted electronically via the virtual campus. The average mark will account for another 25% of the final mark. The requirements and characteristics corresponding to the submission will be indicated in due course via the platform or in the classroom. As a guideline, submissions are expected to be made once a month from October to January (both inclusive and, in the case of January, prior to the final exam).

·Classroom attendance and participation will account for 10% of the final mark, a percentage that will only be available to students who can prove at least 80% attendance at face-to-face sessions.

·The final exam will account for the remaining 50%.

·In order to pass the course, students must obtain at least 5 out of 10 points in the final in-person exam for the course in any of the exam sessions: first, second or single assessment test. If the final exam is failed, the final weighted grade for the course may not exceed 4.9 out of 10 points.

·In the second call, in addition to maintaining these requirements, students will be offered the opportunity to improve the part corresponding to continuous assessment – exclusively in relation to theoretical-practical activities – by means of a new submission or substitute activity, with special dates being proposed for this purpose. Given that the objective tests and class participation cannot be recovered in their original format due to their intrinsic characteristics, the mark obtained in this new submission or substitute activity will represent 50% of the final mark, assuming the entire weighting assigned to continuous assessment.

·In accordance with the General Regulations for Assessment and Grading of Official Courses and

UCV Qualifications, single assessment is linked to the inability of students to attend face-to-face sessions. It is, therefore, an extraordinary and exceptional assessment system available to students who, for justified and accredited reasons, are unable to undergo the continuous assessment system and who request it from the professor responsible for the subject, who will expressly decide on the admission of the student's single assessment request and notify them of its acceptance or rejection. The evidence to be presented and/or the test(s) to be taken in the single assessment by the student will consist of the same theoretical and practical activities as those included in the continuous assessment - which will be expanded to take account of the readjustment in the assessment instruments - as well as the final exam. In this case, the final mark will be obtained by applying the following percentages: 50% theoretical-practical activities and 50% final exam. This criterion will apply to both the first and second exam sessions. As in the previous case, and for the second exam session, students will be offered the opportunity to improve their marks in the theoretical-practical activities by submitting a new assignment or completing a substitute activity, with special dates being proposed for this purpose. As in the other modalities, if students fail the final in-person exam, their final weighted mark for the course cannot exceed 4.9 out of 10.

·During the course, the lecturer will define and detail good practices in the use of artificial intelligence (AI) tools applied to the content. Students who violate these good practices, either in the continuous assessment tests or in the final examination, will receive a mark of 0 (zero points) in the corresponding test.

Online teaching

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R5	5,00%	Attendance and participation in the activities of synchronous communication
R1, R2, R3, R4, R5	25,00%	Conduct of deliverables
R1, R2, R4, R5	15,00%	Regular evaluations through online questionnaires.
R1, R2, R3, R4, R5	5,00%	Participation in discussion forums
R1, R2, R4, R5	50,00%	Final on-site assessment.

Observations

The assessment system will be structured as follows:

·Throughout the course, there will be synchronous communication activities, assessments using online questionnaires, and forum discussions on the content covered. The average of the marks for these tests will account for 25% of the final mark. Participation in the former will account for 5% of the final mark, a percentage that will only be available to students who can prove at least 80% attendance at the synchronous communication sessions.

·Theoretical-practical activities will also be proposed, to be carried out individually or in pairs and submitted electronically via the virtual campus. The average mark will account for another 25% of the final mark. The requirements and characteristics corresponding to the submission will be indicated in a timely manner through the platform or during the synchronous sessions. As a guideline, submissions are expected to be made once a month from October to January (both inclusive and, in the case of January, prior to the final exam).

·The final exam (in person) will account for the remaining 50%.

·In order to pass the course, students must obtain at least 5 out of 10 points in the final in-person exam for the course in any of the exam sessions: first, second or single assessment test. If the final exam is failed, the final weighted grade for the course cannot exceed 4.9 out of 10.

·In the second exam session, in addition to these requirements, students will be offered the opportunity to improve the part corresponding to continuous assessment – exclusively in relation to theoretical-practical activities – by means of a new submission or substitute activity, with special dates being proposed for this purpose. Given that participation in synchronous communication activities, online questionnaires, and participation in discussion forums cannot be recovered in their original format due to their intrinsic characteristics, the mark obtained in this new submission or substitute activity will represent 50% of the final mark, assuming the full weighting assigned to continuous assessment.

·In accordance with the General Regulations for Assessment and Grading of Official Courses and UCV Qualifications, single assessment is linked to the inability of students to attend synchronous communication sessions. It is, therefore, an extraordinary and exceptional assessment system available to students who, for justified and accredited reasons, are unable to undergo the continuous assessment system and who request it from the professor responsible for the subject, who will expressly decide on the admission of the student's single assessment request and notify them of its acceptance or rejection. The evidence to be presented and/or the test(s) to be taken in the single assessment by the student will consist of the same theoretical and practical activities as those included in the continuous assessment - which will be expanded to take account of the readjustment in the assessment instruments - as well as the final exam. In this case, the final mark will be obtained by applying the following percentages: 50% theoretical-practical activities and 50% final exam. This criterion will apply to both the first and second exam sessions. As in the previous case, and for the second exam session, students will be offered the opportunity to improve their marks in the theoretical-practical activities section by submitting a new assignment or completing a substitute activity, with special dates being proposed for this purpose. As in the other modalities, if the final in-person exam is failed, the final weighted grade for the course cannot exceed 4.9 points out of 10.

·During the course, the lecturer will define and detail good practices in the use of artificial intelligence (AI) tools applied to the content. Students who violate these good practices, either in the continuous assessment tests or in the final examination, will receive a mark of 0 (zero points) in the corresponding test.

·During synchronous sessions, students will endeavour to keep their webcams on for the entire duration of the class, except in cases of technical problems that are duly justified and

communicated to the teacher in advance. This measure seeks to ensure academic interaction, verification of actual attendance, and the proper development of the online teaching-learning process.

·As second-year students join the virtual teaching group to facilitate their learning, their assessment will be carried out in accordance with the criteria set out for this purpose.

MENTION OF DISTINCTION:

The mention of “Honors” may be awarded to students who have obtained a grade equal to or greater than 9.0. Their number may not exceed five percent of the students enrolled in a group in the corresponding academic year, unless the number of students enrolled is lower.

Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

M1	Problem solving, commentaries, summaries to hand in periodically.
M3	Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.
M5	Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.
M7	Supervised monographic sessions with shared participation.
M9	Application of multidisciplinary knowledge.
M11	Personalized and small group attention. Period of instruction and / or orientation conducted by a tutor with the objective of reviewing and discussing the materials and topics presented in classes, seminars, readings, conducting work, etc.
M13	Set of oral and/or written tests used in initial, formative or additive assessment of the student.
M14	Student study: Group Individual preparation of readings, essays, problem solving, seminars, papers, reports, etc. to be presented or submitted in theoretical lectures, practical and/or small-group tutoring sessions.

M16 Group preparation of readings, essays, problem solving, seminars, papers, reports, etc. to be presented or submitted in theoretical lectures, practical and/or small-group tutoring sessions.

M17 Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.

M19 Groupwork sessions in the chat under supervision of the lecturer. Analysis of economic and business case studies, both real and fictitious, in order to build knowledge through the student's interaction and activity. Critical analysis of values and social commitment.

M21 Monographic sessions though the semester, which will be aimed at current aspects and applications of the subject.

M23 Set of written or oral tests used for the initial, formative or cumulative assessment of the student.

M25 Student study: Individual preparation of readings, essays, problem solving, seminars, papers, reports, etc., for their discussion or submission in electronic format.

M27 Individual support for the monitoring and orientation of the learning process. It will be carried out by a lecturer and will pursue the revision and discussion of the materials, topics, readings, tasks, etc.

M29 Group preparation of readings, essays, problem solving, seminars, papers, reports, etc., for their discussion or submission.

M31 Participation in discussion forums related to the subject under the supervision of the lecturer.

IN-CLASS LEARNING

IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
On-campus Class M3	R1, R2, R3	22,50	0,90
Practical Class M5	R1, R2, R3, R4, R5	15,00	0,60
Seminar M7	R1, R2, R3	4,50	0,18
Group Presentation of Papers M9	R1, R2, R3, R4, R5	6,00	0,24
Office Assistance M11	R1, R2, R3, R4, R5	6,00	0,24
Assessment M13	R1, R2, R3, R4, R5	6,00	0,24
TOTAL		**60,00**	**2,40**

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Group Work M16	R1, R2, R3, R4, R5	30,00	1,20
Independent Work M14	R1, R2, R3, R4, R5	60,00	2,40
TOTAL		**90,00**	**3,60**

ON-LINE LEARNING

SYNCHRONOUS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Synchronous Virtual Session M17	R1, R2, R3	4,00	0,16
Synchronous Vitual Practical Session M19	R1, R2, R3, R4, R5	4,00	0,16
Seminar and Synchronous Virtual Videoconference M21	R1, R2, R3	4,00	0,16
On-site or Synchronous Virtual Assesment M23	R1, R2, R4, R5	3,00	0,12
TOTAL		**15,00**	**0,60**

ASYNCHRONOUS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Individual Work M25	R1, R2, R3, R4, R5	60,00	2,40
Tutorial Support Sessions M27	R1, R2, R3, R4, R5	5,00	0,20
Group Work M29	R1, R2, R3, R4, R5	10,00	0,40
Discussion Forum M31	R1, R2, R3, R4, R5	10,00	0,40
Continuous Assessment Tasks M1	R1, R2, R3, R4, R5	50,00	2,00
TOTAL		**135,00**	**5,40**

Description of the contents

Description of the necessary contents to acquire the learning outcomes.

Theoretical contents:

Content block	Contents
Linear Algebra	Matrix calculus: Basic operations, determinants, ranks. Systems of linear equations. Diagonalisation of matrices. Applications of linear algebra to economics: discrete dynamic models, Markov processes. Appendix. Vector spaces. Linear applications. Diagonalisation.
Calculus	Real function of real variable. Limits, continuity, derivability, optimisation. Review. Real function of several variables. Introduction. Differentiation. Economic interpretation. Optimisation. Real function of real variable. Integration. Application to Calculus Economics: continuous dynamic models, introduction to differential equations.

Temporary organization of learning:

Block of content	Number of sessions	Hours
Linear Algebra	12,00	24,00
Calculus	18,00	36,00

References

Basic bibliography

·Calderón Montero, S., & Rey Borrego, M. L. (2012). *Matemáticas para la economía y la empresa*. Ediciones Pirámide.

·ISBN: 978-84-368-2685-2

·Edición: 1.ª, 2012. Idioma: español.

·Sydsaeter, K., Hammond, P., Strøm, A., & Carvajal, A. (2016). *Matemáticas para el análisis económico* [Traducción al español de *Essential Mathematics for Economic Analysis*]. Pearson.

·Si se usa la versión inglesa original: Sydsaeter, K., Hammond, P., & Strøm, A. (2016). *Essential Mathematics for Economic Analysis* (2.ª ed.). Pearson Education. ISBN: 978-0273681809.

·Rodríguez Ruiz, J. (2018). *Álgebra lineal. Teoría*. Ediciones Académicas (EDIASA).

·ISBN: 978-84-9469805-7

·Lugar de publicación: Madrid, España.

·García Llamas, C., Matilla García, M., & Rodríguez Ruiz, J. (2013). *Matemáticas para los grados en economía y empresa. Cálculo diferencial. Teoría.* Ediciones Académicas (EDIASA).

·ISBN: 978-84-9247789-0

·Lugar de publicación: Madrid, España.

Further reading

·Rodríguez Ruiz, J., Matilla García, M., & García Llamas, C. (2013). *Matemáticas para los grados en economía y empresa: Álgebra lineal. Ejercicios y problemas resueltos.* Ediciones Académicas (EDIASA).

·ISBN: 978-84-9247789-0 (la misma referencia de la editorial)

·Lugar de publicación: Madrid, España.

·Herrero de Egaña, A. (2011). *Cálculo para empresarios y economistas (Matemáticas II).* Ediciones Académicas (EDIASA).

·Calvo, C., & Ivorra, C. (2012). *Las matemáticas en la economía a través de ejemplos en contextos económicos.*Tirant lo Blanch.

·Larson, R., & Edwards, B. H. (2010). *Cálculo 2 de varias variables*. McGraw-Hill.