



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: -

Type of learning: Classroom-based learning / Online

Languages in which it is taught: English, Spanish

Lecturer/-s:

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Module organization

Quantitative Methods

Subject Matter	ECTS	Subject	ECTS	Year/semester
Information Systems	12,00	Information Systems for Management I	6,00	1/2
		Information Systems for 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 the high 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, R3, 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

The evaluation system will be articulated as follows:

- At the end of the teaching of each lesson (or two lessons if the content fits better) a test of the contents worked will be carried out. The sum of the marks corresponding to those tests will be 15% of the final grade.

- Also associated with the completion of each lesson (or two lessons if the content fits better), a collection of activities -of a theoretical and practical nature- will be delivered (3 in total). It will be carried out in pairs and whose average mark will cover another 25 % of the final grade.

- The date corresponding to delivery will be indicated in form and time on the platform. As a guide, deliveries are expected to have a cadence of one per month from October to December (both inclusive).

- Class attendance and participation will cover another 10% and the final exam will be weighted accordingly by the remaining 50%.

It will be essential to obtain a grade greater than or equal to 5 in the final exam to pass the subject. In case of not reaching 5 in any of these parts, the rest of the marks obtained in the other sections will not be taken into account in the final mark. Extraordinary dates will be proposed for the delivery of the deliverable activities for those students who, having not passed the 1st call, consequently attend the 2nd call and wish to raise their average in this section. However, the grade corresponding to the objective tests and class participation cannot be recovered due to their intrinsic characteristics.

The evaluation instruments used to measure the achievement of learning results are specified in:

- Solving simple problems of a numerical nature (practice assessment);
- Short open questions of both a practical and theoretical nature (with a manifest intention of



evaluating conceptual knowledge, ability to critically appraise results, and how to justify them).

Online teaching

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

Observations

The evaluation system will be articulated as follows:

- At the end of the teaching of each lesson (or two lessons if the content fits better), an online test of the contents worked will be carried out. The average of the marks corresponding to these tests will be 15% of the final grade.

- Also associated with the completion of each lesson (or two lessons if the content fits better), a collection of activities will be proposed to deliver (3 in total) of a theoretical and practical nature. It will be carried out individually or in groups and the average mark will cover another 25% of the final grade.

- The date corresponding to delivery will be indicated in form and time on the platform. As a guide, deliveries are expected to have a cadence of one per month from October to December (both inclusive).

- Attendance and participation will cover another 10% and the final exam will be weighted accordingly by the remaining 50%.

It will be essential to obtain a grade greater than or equal to 5 both in the part associated with carrying out deliverable activities and in the final exam to pass the subject. In case of not reaching 5 in any of these parts, the rest of the marks obtained in the other sections will not be taken into account in the final mark. Extraordinary dates will be proposed for the delivery of the deliverable activities and online tests for those students who, having not passed the 1st call, consequently attend the 2nd call and wish to raise their average in this section. However, the grade corresponding to the objective tests and class participation cannot be recovered due to their intrinsic characteristics.

The evaluation instruments used to measure the achievement of learning results are specified in:

- Solving simple problems of a numerical nature (practice assessment);



- Short open questions of both a practical and theoretical nature (with a manifest intention of evaluating conceptual knowledge, ability to critically appraise results, and how to justify them);
- Accounting of participation in discussion forums and synchronous communication with assessment of both individual and group activities that arise in them (question / answer in the debate on questions of theory and / or practice).

MENTION OF DISTINCTION:

According to Article 22 of the Regulations governing the Evaluation and Qualification of UCV Courses, the mention of "Distinction of Honor" may be awarded by the professor responsible for the course to students who have obtained, at least, the qualification of 9 over 10 ("Sobresaliente"). The number of "Distinction of Honor" mentions that may be awarded may not exceed five percent of the number of students included in the same official record, unless this number is lower than 20, in which case only one "Distinction of Honor" may be awarded.

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, 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 Virtual 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 Assessment 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, Ranges. Systems of Linear Equations. Diagonalization of matrices. Applications to the Economics of Linear Algebra: discrete dynamic models, Markov processes. Annexed. Vector spaces. Linear applications. Diagonalization.
Calculus	Real function of real variable. Limits, continuity, derivability, optimization. Review Real function of several variables. Introduction. Differentiation. Economic interpretation. Optimization Real function of real variable. Integration Application to the Economics of Calculus: 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 References

- Calvo, C. e Ivorra, C. (2012). Las Matemáticas en la Economía a través de ejemplos en contextos económicos. Ed. Tirant lo Blanch. Valencia. (disponible en línea)
- Canós, M. J., Ivorra, C. y Liern, V. (2002). Matemáticas para la Economía y la Empresa. Ed. Tirant lo Blanch. Valencia.
- Cámara S., Ángeles et al. "Problemas resueltos de Matemáticas para Economía y Empresa" Editorial AC (Thomson). Madrid. (2002)
- Haeussler, E.F. and Paul, R.S. (2018). Introductory mathematical analysis for Business, Economics and the Life and Social Sciences. Ed. Prentice Hall. 14a Edition.
- Ivorra, C. (2007). Matemáticas Económico-Empresariales. Laboratori de Materials, 2. PUV.
- Ivorra, C. y Juan, C. (2007). Matemáticas Empresariales. Laboratori de Materials, 7 . PUV.
- Sydsaeter, Knut, and Peter Hammond . "Matemáticas para el Análisis Económico". Pearson Educación 1996

Further Readings

- Alegre, P. et al. "Ejercicios resueltos de matemáticas Empresariales". Vol. 1 y 2., Ed. AC. (1993; 2002/2004)
- Alegre, P. et al. (1995). Matemáticas Empresariales. Colección Plan Nuevo. Ed. AC.
- Balbás, A. et al. "Análisis Matemático para la Economía. Cálculo Diferencial." Ed. A.C. Madrid (1989)
- Balbás. "Análisis Matemático para la Economía. Cálculo Integral y Sistemas dinámicosl." Ed. A.C. Madrid.(2005)
- Bradley, G.L. y Smith, K.J. (1998). Cálculo en una variable. Volumen I. Ed. Prentice Hall.
- Casany, "Cálculo integral". Ed. Nau Llibres
- Casasús, T. et al. (1991). Matemáticas Empresariales. Ed. La Nau Llibres.
- Coquillat, F. "Espacio vectorial, afín y euclídeo. Metodología y problemas". Ed. Tebar Flores. (1985)
- Coquillat, F. "Cálculo integral. Metodología y problemas". Ed. Tebar Flores
- Díaz-Hernando, J.A. "Cálculo Diferencial. Funciones Reales de una Variable Real." Ed. Tebar Flores.
- Díaz-Hernando, J.A. "Cálculo Diferencial. Funciones Reales de Varias Variables" Ed. Tebar Flores.
- García García, J., López Pellicer, M. "Álgebra Lineal y Geometría. Curso Teórico – Práctico". Ed Marfil.
- Guerra J.C. et al. "Matemáticas empresariales. Cálculo integral. Ecuaciones diferenciales". Ed. Nau Llibres.
- Guerrero Casas, F.M., Vázquez Cueto, M.J. "Manual de Álgebra Lineal para la economía y la empresa". Ed. Pirámide. (1998).
- Guerrero Casas, F.M., Vázquez Cueto, M.J. " Manual de Cálculo Diferencial e Integral para la economía y la empresa". Ed. Pirámide. 1998.



- Haeussler, E.F. y Paul, R.S. (2003). Matemáticas para administración y economía. 10 ed. (S D 039292)
- Muñoz, F. et al. "Manual de Álgebra Lineal". Ed. Ariel Economía.
- Seymour Lipschutz. "Álgebra Lineal". Ed. Mc. Graw-Hill.
- Sydsaeter, K. y Hammond, P. J. (2002). Matemáticas Esenciales para el Análisis Económico. Ed. Prentice Hall.



Addendum to the Course Guide of the Subject

Due to the exceptional situation caused by the health crisis of the COVID-19 and taking into account the security measures related to the development of the educational activity in the Higher Education Institution teaching area, the following changes have been made in the guide of the subject to ensure that Students achieve their learning outcomes of the Subject.

Situation 1: Teaching without limited capacity (when the number of enrolled students is lower than the allowed capacity in classroom, according to the security measures taken).

In this case, no changes are made in the guide of the subject.

Situation 2: Teaching with limited capacity (when the number of enrolled students is higher than the allowed capacity in classroom, according to the security measures taken).

In this case, the following changes are made:

1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject will be made through a simultaneous teaching method combining onsite teaching in the classroom and synchronous online teaching. Students will be able to attend classes onsite or to attend them online through the telematic tools provided by the university (videoconferences). In any case, students who attend classes onsite and who attend them by videoconference will rotate periodically.

In the particular case of this subject, these videoconferences will be made through:

☒ Microsoft Teams

☐ Kaltura



Situation 3: Confinement due to a new State of Alarm.

In this case, the following changes are made:

1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject, as well as the group and personalized tutoring, will be done with the telematic tools provided by the University, through:

☒ Microsoft Teams

☐ Kaltura

Explanation about the practical sessions:



2. System for Assessing the Acquisition of the competences and Assessment System

ONSITE WORK

Regarding the Assessment Tools:

☒ The Assessment Tools will not be modified. If onsite assessment is not possible, it will be done online through the UCVnet Campus.

☐ The following changes will be made to adapt the subject's assessment to the online teaching.

Course guide		Adaptation	
Assessment tool	Allocated percentage	Description of the suggested changes	Platform to be used

The other Assessment Tools will not be modified with regards to what is indicated in the Course Guide.

Comments to the Assessment System:



ONLINE WORK

Regarding the Assessment Tools:

☒ The Assessment Tools will not be modified. If onsite assessment is not possible, it will be done online through the UCVnet Campus.

☐ The following changes will be made to adapt the subject's assessment to the online teaching.

Course guide		Adaptation	
Assessment tool	Allocated percentage	Description of the suggested changes	Platform to be used

The other Assessment Tools will not be modified with regards to what is indicated in the Course Guide.

Comments to the Assessment System: