

**1. General information****Course:** MATHEMATICS FOR BUSINESS I**Code:** 54304**Type:** BASIC**ECTS credits:** 6**Degree:** 329 - UNDERGRADUATE DEGREE PROGRAMME IN BUSINESS MANAGEMENT AND ADMINISTRATION (TA)**Academic year:** 2022-23**Center:** 15 - FACULTY OF SOCIAL SCIENCES AND INFORMATION TECHNOLOGIES**Group(s):** 60**Year:** 1**Duration:** First semester**Main language:** Spanish**Second language:****Use of additional languages:****English Friendly:** Y**Web site:****Bilingual:** N

Lecturer: ALVARO MARTINEZ PEREZ - Group(s): 60				
Building/Office	Department	Phone number	Email	Office hours
Despacho 2.9	ANÁLISIS ECONÓMICO Y FINANZAS	926051370	alvaro.martinezperez@uclm.es	First semester: Tuesdays and Fridays from 9 to 11 and from 15 to 17. Second semester: Tuesdays and Fridays from 10 to 11 and from 13 to 14.

**2. Pre-Requisites**

Obligatory: Not established

Recommended: Since mathematics is a subject where concepts and proceedings are all related with each other, it would be convenient to have a solid basis from high school. In particular, it is convenient the knowledge of;

Algebraic expressions: integer algebraic operations; Ruffini's rule; factor decomposition of algebraic expressions; fraction simplification; basic algebraic structures.

•Powers

•Radicals: Reduction to common index radicals; fractal exponents, extraction e introduction of factors; operations with radicals.

•Inequalities: Geometric resolution.

•Progressions: arithmetic progressions, geometric progressions.

•Real valued functions: Domain and continuity; derivability and diferenciability: graphic representation of functions.

•Trigonometry: angles; trigonometric functions; graphic representation of trigonometric functions; trigonometric equivalences; trigonometric inverse functions.

•Logarithms and exponential functions.

•Introduction to elemental derivation.

**3. Justification in the curriculum, relation to other subjects and to the profession**

Mathematics I for business is part of the *Cuantitative Methods for Business* modulus. Therefore, it is an essential subject for many others subjects in the Degree.

Mathematical concepts never appear isolated but based on previous definitions. Therefore, it is difficult to understand any content without understanding the previous lesson. Thus, the success in studying mathematics is based on having a general vision of the subject giving context to each new concept which can not be learnt isolated.

The first part, devoted to linear algebra, gives the basi knowlege for a great part of economic theory models. The second part, devoted to one variable calculus will be the basis for the basic functions used in enocomy such as offer and demand functions.

It must be considered that mathematics are an instrumental subject for the rest of specidic subjects in the degree since it is applied in many areas of business and economy. However, although is not considered as a pure object of study, the subject is developed with all due rigour and formality to allow the students to pursue futur PhD studies in economics.

In relation with the profession it is worth noting that the aim of this subject is to know the models and techniques of cuantitative analisys in business including the models for decission making in business and economic forecast.

**4. Degree competences achieved in this course****Course competences**

Code	Description
E07	Understand the economic environment as a result and application of theoretical or formal representations on how the economy works. To do so, it will be necessary to be able to understand and use common handbooks, as well as articles and, in general, leading edge bibliography in the core subjects of the curriculum.
E11	Know the workings and consequences of the different economic systems
G01	Possession of the skills needed for continuous, self-led, independent learning, which will allow students to develop the learning abilities needed to undertake further study with a high degree of independence.

## 5. Objectives or Learning Outcomes

### Course learning outcomes

Description

Work out problems in creative and innovative ways.

Know the tools and methods for the quantitative analysis of the company and its environment, including models for business decision making as well as economic forecast models.

### Additional outcomes

1.- Being capable of proposing, studying and solving a linear system. To do this: 1.1.- Knowing the different types of matrices and operate with them. 1.2.- Being able to calculate the determinant and the inverse of a matrix. 1.3.- Proposing linear systems from real situations and deciding if the system has a solution or not. In case it has a solution, being able to find it. 2.- Given a linear map representing certain economic situation, being able to find the corresponding matrix and, if possible, present it in the most simple way (diagonal). To do this: 2.1.- The student should be familiar with the vector space  $R^n$  and be capable of giving a base for it. 2.2.- The student will know the different linear maps and how to operate with them. 2.3.- Establish an isomorphism between linear maps and matrices. 2.4.- Being able to calculate the eigenvalues and eigenvectors of a matrix. 2.5.- Finding the diagonalization of a matrix. 3.- Computing quadratic forms to optimize functions. To do this: 3.1.- Knowing the normed space. 3.2.- Studying the sign of a quadratic form in  $R^n$  and also when restricted to a subspace. 4.- Being able to compute the sum of an infinite series of real numbers. To do this: 4.1.- Knowing about sequences of real numbers and having tools to compute their limit. 4.2.- Defining series from sequences and computing their sum. 5.- Being able to study a real valued function with real variable. To do this: 5.1.- Being able to solve limits, continuity and derivability of a function. 5.2.- Knowing the procedure for graphic representation of functions.

## 6. Units / Contents

**Unit 1: Basic elements of linear algebra**

**Unit 2:  $R^n$  vectorial space**

**Unit 3: Linear maps and associated matrices**

**Unit 4: Matrix diagonalization**

**Unit 5: Quadratic forms**

**Unit 6: Real numbers: sequences and series**

**Unit 7: Real valued functions of a real variable**

### ADDITIONAL COMMENTS, REMARKS

This syllabus contains two different parts.

Parte I: Linear Algebra. (Units 1-5), note that quadratic forms are not linear.

Parte II: Single variable calculus (Temas 6 y 7)

The contents of this teaching guide have been agreed by the mathematics area and therefore are similar in every campus in the UCLM where this degree is offered.

## 7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	E07 E11	1.33	33.25	N	-	Teaching the subject by lecturer (MAG)
Class Attendance (practical) [ON-SITE]	Problem solving and exercises	E07 E11 G01	0.67	16.75	N	-	Worked example problems and cases resolution by the lecturer and the students (PRO)
Other on-site activities [ON-SITE]	Assessment tests	E07 E11 G01	0.1	2.5	Y	Y	Other evaluation activities (EVA)
Progress test [ON-SITE]	Assessment tests	E07 G01	0.1	2.5	Y	Y	Test on Linear Algebra (EVA)
Final test [ON-SITE]	Assessment tests	E07 G01	0.1	2.5	Y	Y	Final test of the complete syllabus of the subject (EVA)
Other off-site activity [OFF-SITE]	Problem solving and exercises	G01	0.2	5	N	-	Self study (EST)
Study and Exam Preparation [OFF-SITE]	Self-study	E07 E11 G01	1.4	35	N	-	Self study (EST)
Group tutoring sessions [ON-SITE]	Group tutoring sessions	E07 G01	0.1	2.5	N	-	Individual or small group tutoring in lecturer's office, classroom or laboratory (TUT)
Other off-site activity [OFF-SITE]	Self-study	E07 G01	2	50	N	-	Self study (EST)
<b>Total:</b>			<b>6</b>	<b>150</b>			
<b>Total credits of in-class work: 2.4</b>			<b>Total class time hours: 60</b>				
<b>Total credits of out of class work: 3.6</b>			<b>Total hours of out of class work: 90</b>				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

## 8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Other methods of assessment	20.00%	0.00%	Non-compulsory activity that can be retaken. To be carried out before end of teaching period
Final test	80.00%	100.00%	Final test of the whole syllabus.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

#### Evaluation criteria for the final exam:

##### Continuous assessment:

The course follows an evaluation system based on the assessment of various training activities and an exam. The student is required to obtain a 4 (out of 10) in the final evaluation test to make an average with the grade obtained in the rest of the proposed training activities.

Any student may change to the non-continuous assessment mode as long as they have not participated during the teaching period.

Classes in assessable activities that together account for at least 50% of the total evaluation of the subject and, in that case, must communicate it before the end of the class period.

Regarding the evaluation in case of illness or other special circumstances see article 7 of the Student Evaluation Regulation of the University of Castilla-La Mancha.

Additional note: The rules of the Mathematics Area for the realization of any exam (partial, ordinary or extraordinary) are the following: it is forbidden to carry and/or use any cell phone (or calculator) during the exam. In case a student carries and/or uses a cell phone (or calculator) during the exam, will immediately fail with a 0 score in base of Article 9 of the Student Evaluation Regulations.

##### Non-continuous evaluation:

The final exam will consist of the necessary tests (written or oral) to validate the competencies on the subject.

Regarding the evaluation in case of illness or other special circumstances see article 7 of the Student Evaluation Regulation of the University of Castilla-La Mancha.

#### Specifications for the resit/retake exam:

Assessment test/s that represent 100% of the final grade for the subject

Note: As in the ordinary convocatory, if the final exam score is less than a 40%, the continuous evaluation will not be considered and the final grade of the course will be the grade of the final exam.

#### Specifications for the second resit / retake exam:

It will be a final test which gives the 100% of the final grade.

Note: The rules of the Mathematics Area for the realization of any exam (partial, ordinary or extraordinary) are the following: it is forbidden to carry and/or use any cell phone (or calculator) during the exam. In case a student carries and/or uses a cell phone (or calculator) during the exam, will immediately fail with a 0 score in base of Article 9 of the Student Evaluation Regulations.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	33.25
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	16.75
Other on-site activities [PRESENCIAL][Assessment tests]	2.5
Progress test [PRESENCIAL][Assessment tests]	2.5
Final test [PRESENCIAL][Assessment tests]	2.5
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	35
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Other off-site activity [AUTÓNOMA][Self-study]	50
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	33.25
Class Attendance (practical) [PRESENCIAL][Problem solving and exercises]	16.75
Other on-site activities [PRESENCIAL][Assessment tests]	2.5
Progress test [PRESENCIAL][Assessment tests]	2.5
Final test [PRESENCIAL][Assessment tests]	2.5
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	35
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Other off-site activity [AUTÓNOMA][Self-study]	50
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Anton, H	Introducción al álgebra lineal	Limusa		ISBN: 978-968-18-631	2010	
Arvesú Carballo, Jorge	Problemas resueltos de álgebra lineal	Thomson		84-9732-284-3	2005	
Barbolla, R. y Sanz, P.	Álgebra lineal y teoría de matrices	Prentice Hall			2001	
Blanco García, S. García Pineda, P. y Pozo García, E.	Matemáticas empresariales I. Enfoque teórico y práctico. Vol. 2. Cálculo	AC Madrid		ISBN: 84-9732-172-3	2002	

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Burgos Román, J.	Álgebra lineal.	McGraw-Hill	ISBN: 84-481-0134-0	1997
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Cancelo, J. R., López Ortega, J. y otros.	Problemas de álgebra lineal para economistas.	Tebar Flores		1995
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García, A., García, F. y A. Gutiérrez.	Cálculo I. Teoría y Problemas de Análisis Matemático en una Variable.	Clagsa		1998
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Jarne, G. ; Perez-Grasa, I. ; Miguillón, E.	Matemáticas para la economía: álgebra lineal y cálculo diferencial.	McGraw-Hill	ISBN: 84-481-1197-4.	2004
López, M. y Vegas, A.	Curso básico de matemáticas para la economía y la dirección de empresas I.	Pirámide		2001
Stewart, J	Cálculo en una variable.	Thomson		2001
Vignerón Tenorio A. y Beato Sirvent, J.	Matemáticas básicas para la Economía y la Empresa.	Servicio de Publicaciones de la Universidad de Cádiz		2006
Sydsaeter, K.	Matemáticas para el análisis económico.	Prentice Hall	ISBN: 0-13-240615-2.	2006