

**1. General information****Course:** MATHEMATICS FOR ECONOMICS II**Type:** BASIC**Degree:** 316 - UNDERGRADUATE DEGREE IN ECONOMICS**Center:** 5 - FACULTY OF ECONOMICS AND BUSINESS**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 53309**ECTS credits:** 6**Academic year:** 2022-23**Group(s):** 10 17**Duration:** First semester**Second language:****English Friendly:** Y**Bilingual:** N**Lecturer:** MARIA EMILIA GARCIA PEREZ - Group(s): 10 17

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2. Pre-Requisites

It is recommendable having taken the previous course Matemáticas I para la Economía and more concisely, the topics on Algebra: vector spaces, matrices, and quadratic forms and their classification. And on Calculus: dominium, continuity, derivatives and graphical representation of a function of a single variable; topology in the real line and integration methods.

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

Matemáticas II para la economía is the second and last course about mathematics in the degree. This implies that it contains very important topics that are relevant in understanding great part of the rest of courses in the degree (and particularly those with a strong quantitative component). Matemáticas II is conceived to provide the student with the basic concepts of the analysis of several variables and an introduction to optimization methods.

In relation with professional skills, the main goal of the course is to introduce, from a mathematical perspective, the models and methods of quantitative analysis, including methods for decision making.

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

Code	Description
E03	Ability to find economic data and select relevant facts.
E06	Application of professional criteria to the analysis of problems, based on the use of technical tools.
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.
G03	Develop oral and written communication skills in order to prepare reports, research projects and business projects and defend them before any commission or group of professionals (specialised or non-specialised) in more than one language, by collecting relevant evidence and interpreting it appropriately so as to reach conclusions.
G04	Ability for the use and development of information and communication technology in the development of professional activity.
G05	Capacity for teamwork, to lead, direct, plan and supervise multidisciplinary and multicultural teams in both national and international environments.

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

Train the student to work out problems in creative and innovative ways.

Train the student to listen to and defend arguments orally or in writing

To know the tools and methods for quantitative analysis of markets, sectors and companies, including models for decision-making and economic forecasting models.

Enable student for autonomous work and learning, as well as for personal initiative

Train the student to search for information in order to analyze it, interpret its meaning, synthesize it and communicate it to others.

6. Units / Contents**Unit 1: The R^n space****Unit 1.1** Introduction and basic concepts

- Unit 1.2** Basic topological aspects of R^n
- Unit 2: Functions of several variables**
- Unit 2.1** Previous definitions
- Unit 2.2** Limits and continuity
- Unit 2.3** Derivatives and differentiability
- Unit 3: Vectorial functions of several variables**
- Unit 3.1** Previous definitions
- Unit 3.2** Limits and continuity
- Unit 3.3** Derivatives and differentiability
- Unit 4: Multiple integration**
- Unit 4.1** Multiple definite integration. Definition and properties
- Unit 4.2** Double integrals over rectangular, type I and type II regions
- Unit 4.3** Change of variables. Polar coordinates
- Unit 5: Introduction to optimization problems**
- Unit 5.1** Introduction to modeling. Basic concepts of optimization problems
- Unit 5.2** Types of problems. Classification of main methods to solve problems. Weirstrass theorem
- Unit 5.3** Convexity analysis. Local-global theorem
- Unit 6: Classic programming**
- Unit 6.1** Optimization without restrictions
- Unit 6.2** Optimization subject to equality restrictions
- Unit 7: Optimization subject to inequality restrictions**
- Unit 7.1** Standard form
- Unit 7.2** Kuhn-Tucker conditions of optimality

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	E03 G01	1.33	33.25	N	-	Presentation and explanation by the teacher of the contents of the subject.
Class Attendance (practical) [ON-SITE]	Problem solving and exercises	E06 G01	0.67	16.75	N	-	Exercise classes, group tutorials and seminars.
Other on-site activities [ON-SITE]	Assessment tests	E06 G01 G03 G04 G05	0.1	2.5	Y	Y	Assessment activities: tests, problem solving and/or group activities.
Mid-term test [ON-SITE]	Assessment tests	G01 G03	0.1	2.5	Y	Y	Problem solving written tests.
Final test [ON-SITE]	Assessment tests	G01 G03	0.1	2.5	Y	Y	Final exam of the whole subject.
Study and Exam Preparation [OFF-SITE]	Self-study	E03 E06 G01 G03 G04	1.4	35	N	-	
Other off-site activity [OFF-SITE]	Self-study	G01	2	50	N	-	
Other off-site activity [OFF-SITE]	Problem solving and exercises	G01 G04	0.2	5	Y	N	
Group tutoring sessions [ON-SITE]	Group tutoring sessions	G01 G03 G05	0.1	2.5	Y	N	
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

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
Assessment of active participation	15.00%	0.00%	During the attendance class, different evaluation activities will be requested: test, cooperative activity, individual or group exercises of Units 1, 2 and 3.
Mid-term tests	35.00%	0.00%	Individual written problem solving test corresponding to Units 1, 2, 3.
Assessment of active participation	15.00%	0.00%	During the attendance class, different evaluation activities will be requested: test, cooperative activity, individual or group exercises of Units 4,5,6 y 7
Mid-term tests	35.00%	0.00%	Individual written problem solving test corresponding to topics 4, 5, 6 and 7.
Test	0.00%	100.00%	There will be a final exam of the whole subject in 4 parts: 1) Test of Units 1,2 and 3. 2) Written test on Units 1,2 and 3. 3) Test on Units 4, 5, 6 and 7. 4) Written test on Units 4, 5, 6 and 7. RECOVERABLE CHARACTER: The student can recover each of the 4 continuous evaluation systems described by completing the corresponding part of this final test.
Total:	100.00%	100.00%	

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 subject follows an evaluation system based on the assessment of various training activities and two exams. The student is required to obtain at least a 4 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 class teaching period in assessable activities that together account for at least 50% of the total assessment of the subject and, in that case, they must communicate it before the end of the class period.

Regarding the evaluation in case of illness or other special circumstances (mitigating rules), see article 6 of the Student Evaluation Regulation of the University of Castilla-La Mancha.

Non-continuous evaluation:

In accordance with section b of point 4.2. of the 2022 Student Regulations, any student may switch to the non-continuous assessment modality, by the procedure established by the teacher, provided that they have not participated during the class teaching period in evaluable activities that together involve at least the 50% of the total evaluation of the subject.

The evaluation will be carried out with two exams and two tests that are considered necessary to evaluate all the competencies of the subject.

Regarding the evaluation in case of illness or other special circumstances (mitigating rules), see article 6 of the Student Evaluation Regulation of the University of Castilla-La Mancha.

Specifications for the resit/retake exam:

It will consist of a multiple choice test (30%) and an exam with development questions (70%).

Specifications for the second resit / retake exam:

The evaluation will be carried out on a single written test, being necessary to pass the subject a minimum score of 5 out of 10.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Unit 1 (de 7): The Rn space	
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
Mid-term test [PRESENCIAL][Assessment tests]	2.5
Final test [PRESENCIAL][Assessment tests]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	35
Other off-site activity [AUTÓNOMA][Self-study]	50
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
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
Mid-term test [PRESENCIAL][Assessment tests]	2.5
Final test [PRESENCIAL][Assessment tests]	2.5
Other off-site activity [AUTÓNOMA][Self-study]	50
Other off-site activity [AUTÓNOMA][Problem solving and exercises]	5
Group tutoring sessions [PRESENCIAL][Group tutoring sessions]	2.5
Study and Exam Preparation [AUTÓNOMA][Self-study]	35
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Caballero, R.E., Calderón, S., Galache, T.P., González, A.C., Rey, M.L. y Ruiz, F.	Matemáticas aplicadas a la economía y la empresa. 434 ejercicios resueltos y comentados	Ediciones Pirámide			2000	
Chiang, A.C. and Wainwright, K.	Fundamental Methods of Mathematical Economics	McGraw-Hill			2005	
Fuente, A.	Mathematical methods and models for economists.	Cambridge University Press.			2000	
Guzmán, L., Sánchez, M., Muñoz, A. y Santos, J.	Fundamentos matemáticos para la administración y dirección de empresas. Análisis y Optimización	Editorial Centro de Estudios Ramón Areces, S.A.			1999	
Martín, Q.; Santos, M.T. y De Paz, Y.	Investigación operativa	Pearson Prentice-Hall.			2005	
Purcell, E.J. y otros	Cálculo. (8a edición).	Prentice-Hall.			2001	
Stewart, J.	Cálculo multivariable. (4a edición).	Thomson.			2002	
Uña, I., San Martín, J. y Tomeo, V.	Problemas resueltos	Thomson.			2007	
Apostol, T.M.	Calculus. Vol. 1 y Vol 2. (2a edición).	Reverte.			1994	
Barbolla, R.; Cerdá, E. y Sanz, P.	Optimización	Prince-Hall.			2001	
Besada, M., García, F.J., Miras, M.A. y Vázquez, C.	Cálculo de varias variables. Cuestiones y ejercicios resueltos	Prentice Hall			2001	

