



Faculty of Business Economics

UPCT



Course unit description:

Mathematics for Business I

Degree/s: Degree in Business Administration and Management

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1. Subject data

Name	Mathematics for Business I				
Subject area	Mathematics				
Module	Quantitative Methods for Business				
Code	510101008				
Degree programme	Degree in Business Administration and Management				
Curriculum	2016				
Centre	Faculty of Business Economics				
Type	Basic Formation				
Length of subject	Termly	Term	1	Course	1 st
Language	English				
ECTS	6	Hours / ECTS	25	Total workload (hours)	150

2. Lecturer data

Lecturer in charge	M. Belén Cobacho Tornel		
Department	Quantitative and Computer Methods		
Knowledge area	Quantitative Methods for Business and Economics		
Office location	3 rd floor, office 328		
Telephone	968325402	Fax	968325745
email	belen.cobacho@upct.es		
URL / WEB	http://www.upct.es/~de/giepps/belcobacho/belcobacho.php		
Office hours	Published on 'Aula Virtual' and on bulletin board		
Location	Office 328		

Qualification/Degree	Mathematics Degree PhD Universidad Politécnica de Cartagena
Academic rank at UPCT	Profesor Contratado Doctor
Year of admission in UPCT	1999
Number of five-year periods (<i>quinquennios</i>) if applicable	3
Research lines (if applicable)	Health Economics, Public Policies Assessment
Number of six-year periods (<i>sexenios</i>) if applicable	1
Professional experience (if applicable)	More than 15 years in courses related to Mathematics for Business and Operations Research.
Other topics of interest	Innovation in Teaching

3. Subject description

3.1. General description

This course is presented as a basic subject to unify and strengthen basic concepts in Mathematics already known by the students. The students will also progress in new concepts, methods and analysis techniques, focusing on the needs for other courses in the Business Degree, as well as a general mathematical background for future business professionals.

3.2. How the subject contributes to a professional career

This course provides the student with part of the mathematical support that they will need throughout their education during the Degree. We should also emphasize the educational nature of this course in the use of logical-deductive reasoning, which will allow a better approach to the problems, and rigor and order when solving problems and proposing decisions based on them.

3.3. Relationship with other subjects in the programme

The subject *Mathematics for Business I* is part of the block Mathematics, which is moreover formed by the courses *Mathematics for Business II* (2nd year, 4.5 ECTS, 1st Semester, mandatory) and *Operations Research* (3rd year, 4.5 ECTS, 2nd Semester, elective). It is also related to other courses in the Degree with a quantitative Background (Statistics, Financial Mathematics, Microeconomics, Econometrics).

3.4. Incompatibilities defined in the programme

None.

3.5. Recommendations to do the subject


Some previous knowledge in basic Mathematics is required (Basic Algebra and Calculus with one variable), which students should have likely acquired during the previous stages of their education. Thus, students should be at ease with performing elementary mathematical operations, elementary powers, using parentheses, brackets, etc., as well as usual mathematical notation. Students should also know how to solve systems of equations and matrix calculations. Students should attend class regularly, check the web page of the course regularly, do the assignments and turn them in on the due date, do their own work and work with classmates, participate in the classroom and in the forum of the web, contact the instructor if they have questions, use the English language as much as possible, try to improve their English by attending to English lessons, using the resources provided.

3.6. Special provisions

As set forth in article 6 of the *Reglamento de las Pruebas de Evaluación de los Títulos Oficiales de Grado de la UPCT* the corresponding vice-rector may establish special adaptations in methodology and the development of lessons for students who suffer from a disability or some limitation, in order to enable them continued studies.

The student who, because of their circumstances, may require special measures of this kind should inform the teacher at the beginning of the semester.

Likewise, foreign students who may have difficulty with the language should notify the teacher.

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4. Competences and learning outcomes

4.1. Basic curricular competences related to the subject

Que los estudiantes hayan demostrado poseer y comprender conocimientos en un área de estudio que parte de la base de la educación secundaria general, y se suele encontrar a un nivel que, si bien se apoya en libros de texto avanzados, incluye también algunos aspectos que implican conocimientos procedentes de la vanguardia de su campo de estudio.

4.2. General curricular competences related to the subject

Aplicar los métodos matemático-estadísticos y las tecnologías de la información y la comunicación para el tratamiento, valoración, y previsión de la información económico-empresarial.

4.3. Specific curricular competences related to the subject

Identificar las técnicas básicas del Álgebra y el Cálculo y su aplicación al campo económico y empresarial.

4.4. Transversal curricular competences related to the subject

Trabajar en equipo (nivel 1).

4.5. Subject learning outcomes

1. Aplicar conocimientos matemáticos para la resolución de problemas sencillos planteados en el ámbito económico-empresarial.
2. Plantear y resolver problemas sencillos de Álgebra Lineal seleccionando de forma crítica los métodos y resultados teóricos más adecuados.
3. Definir e identificar los conceptos básicos del Álgebra lineal en el ámbito de los espacios vectoriales y las aplicaciones lineales.
4. Clasificar según su signo las formas cuadráticas tanto sin restringir como restringidas a sub-espacios vectoriales.
5. Reconocer y manipular funciones matemáticas y económicas de varias variables.
6. Aplicar los conocimientos de cálculo diferencial a la resolución de problemas y la toma de decisiones en el ámbito económico y empresarial.
7. Aplicar técnicas elementales del cálculo diferencial con aplicaciones a la resolución de problemas sencillos.

5. Contents

5.1. Curricular contents related to the subject

An introduction to the main elements and tools in Linear Algebra. Strengthening of contents in Differential Calculus with one variable and extension to more than one variable. Applications to Business and Economics.

5.2. Theory syllabus (teaching modules and units)

Unit I. Linear algebra

1. Vector spaces. Linear maps.
2. Diagonal matrixes. Quadratic forms.

Unit II. Mathematical analysis

3. Derivative and its applications to Business.
4. Integration.

5.3. Practice syllabus (name and description of every practical)

1. Vector spaces. Linear maps.
2. Diagonal matrixes. Quadratic forms.
3. Derivative and its applications to Business.
4. Integration.

Description for the four sections: Practical exercises for modeling and solving simulated situations related to the concepts will be proposed, to be solved on and off-campus at least once per week, individually and/or by groups. Occasionally some of them could be carried out in the computers classroom to use mathematical software as a tool for computations.

Risk prevention

Promoting the continuous improvement of working and study conditions of the entire university community is one the basic principles and goals of the Universidad Politécnica de Cartagena.

Such commitment to prevention and the responsibilities arising from it concern all realms of the university: governing bodies, management team, teaching and research staff, administrative and service staff and students.

The UPCT Service of Occupational Hazards (*Servicio de Prevención de Riesgos Laborales de la UPCT*) has published a "Risk Prevention Manual for new students" (*Manual de acogida al estudiante en materia de prevención de riesgos*), which may be downloaded from the e-learning platform ("Aula Virtual"), with instructions and recommendations on how to act properly, from the point of view of prevention (safety, ergonomics, etc.), when developing any type of activity at the University. You will also find recommendations on how to proceed in an emergency or if an incident occurs.

Particularly when carrying out training practices in laboratories, workshops or field work, you must follow all your teacher's instructions, because he/she is the person responsible for your safety and health during practice performance. Feel free to ask any questions you may have and do not put your safety or that of your classmates at risk.

5.4. Theory syllabus in English (teaching modules and units)

Unit I. Linear algebra

1. Vector spaces. Linear maps.
2. Diagonal matrixes. Quadratic forms.

Unit II. Mathematical analysis

3. Derivative and its applications to Business.
4. Integration.

5.5. Detailed description of learning goals for every teaching module


Unit I: Linear Algebra

- Defining a vector space and its properties.
- Defining the concept of vector sub-space and its characteristics.
- Analysing if a subset is a vector sub-space or not.
- Defining the concept of linear combination.
- Defining the concepts of generating system, linear dependency and linear independency.
- Defining and using the concept of basis in a vector space.
- Defining the concept of coordinates of a vector in a basis and calculating them
- Defining the concept of linear map.
- Calculating the matrix of a linear map in the canonical bases.
- Defining the concepts of eigenvalue, eigenvector, characteristic polynomial and calculating them.
- Studying if a matrix is diagonalizable and calculate diagonal associated matrices.
- Defining the concept of quadratic form and analysing its sign.
- Using the minors method and the eigenvalues method to study the sign of a quadratic form.
- Defining the concept of restricted quadratic form.
- Studying the sign of a quadratic form restricted to a vector sub-space.

Unit II: Mathematical Analysis

- Knowing some mathematical functions used in Business and Economics.
- Defining scalar and vector functions.
- Knowing the concept of contour line.
- Calculating the first order partial derivatives of a function with more than one variable.
- Defining the partial derivatives of n- order.
- Calculating the gradient vector, the Jacobian matrix and the Hessian matrix of a function.
- Knowing the concept of differential of a matrix.
- Knowing how to apply the concepts of partial derivative and differential to variations in functions.
- Knowing the concept of marginal function and its applications to Business and Economics.
- Knowing the concept of elasticity and its applications to Business and Economics.
- Calculating the derivative of an implicit function using the Implicit Function Theorem.
- Defining the concept of marginal rate of substitution.

- Defining the concept of homogeneous function and its main properties.
- Using the concept of homogeneous function to analyse returns to scale.
- Calculating indefinite and definite integrals.
- Defining the concept of improper integral.
- Calculating improper integrals.
- Calculating double integral in rectangles.
- Defining the concept of differential equation.
- Solving first order differential equations.

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6. Teaching method

6.1. Teaching method

Teaching activity	Teaching techniques	Student workload	Hours
Theory classes	Presentation lesson taught using the lecture method. Answering questions raised by students. The lecturer will be able to formulate questions that could be gradable or not. All the written materials will be in English.	<u>In-class</u> : Taking notes. Asking questions.	25
		<u>Self-study</u> :	
Practical classes and problems	Problems are raised and solved. Participation by the students is strengthened through group and cooperative learning. Occasionally, problems will be solved by using computers. The lecturer will be able to formulate problems that could be gradable or not. All the written materials will be in English.	<u>In-class</u> : Active participation. Problem solving. Asking questions	35
		<u>Self-study</u> :	
Student self-work	Studying exercises, assignments, reports, to present or give to the instructor. The study of theoretical and practical contents by students is included. Some of the activities will be able to be done by groups and/or by using computers.	<u>In-class</u> :	
		<u>Self-study</u> : Solving exercises, assignments, preparing reports. Studying theoretical and practical contents. Practicing with computer.	83
Evaluation	Written exams and assessable activities. All the assessable activities will be done in English.	<u>In-class</u> : Doing exams and assessable exercises, assignments or projects presentation.	5
		<u>Self-study</u> :	
Tutorials	Answering questions about theoretical and practical contents, checking the development process of assignments and exercises by students.	<u>In-class</u> : Asking questions during the lectures or the office hours.	2
		<u>Self-study</u> :	
			150

6.2. Learning outcomes (4.5) / teaching activities (6.1)

	Learning outcomes (4.5)									
Teaching activities (6.1)	1	2	3	4	5	6	7	8	9	10
Theory lectures			X		X					
Practical classes and problems	X	X		X	X	X	X			
Student self-work	X	X	X	X	X	X	X			

7. Assessment method

7.1 Assessment method

Assessment activity	Type		Assessment methods and criteria	Percentage (%)	Assessed learning outcomes (4.5)
	Summative	Formative			
Written or oral exams	x		Written exams with practical exercises. Part of these exams could need the use of software.	60 – 100%	1,2,3,4,5,6,7
Participation and involvement in the teaching-learning process	x	x	Participation during the lectures and on the web forums. Contribution to the web page (answering classmates' questions, links of interest, etc.). General attitude, motivation, involvement, regular attendance to classes.	Up to 20%	1,2,4,5,6,7
Evaluation of projects and reports	x		Oral or written presentation of assessable activities, individually or in groups.	Up to 20%	1,2,4,5,6,7
February session: Exams weight will be between 60 and 100%. The remaining activities between 0 and 20% each.					
June and September sessions: Only one exam weighted 100%. The remaining activities 0%.					

7.2. Control and monitoring methods (optional)

Class attendance, attitude and participation: The student will be assessed in classroom attendance and participation in the classes and on the web forum during the course. Assignments will be assessed during the course.

Partial and global exams: Partial and/or global tests will be done on the contents covered during the course, which will include theoretical and practical questions and problems to be solved (some of them could be done by using computer). The characteristics of the exams, as well as the date, time and location will be indicated on the official announcement, given at least 15 days before the scheduled exams period.

All the assessed activities will be asked to be done in English. These tests (exams, classroom participation, solving practical cases, etc) enable detecting possible gaps and make it possible to consolidate the most important concepts of the course.

8. Bibliography and resources

8.1. Basic bibliography

TEXTBOOKS (alphabetic order)

- Alcaraz, E., B. Hughes. Diccionario de términos económicos, financieros y comerciales. Ariel Economía. [Inglés-Español Spanish-English dictionary].
- Hoy, M., J. Livernois, et al. Mathematics for Economics. Third Edition. The MIT Press, 2011. [General Maths, Linear Equations, Matrices, Vector Spaces, eigenvalues, quadratic forms, Derivatives, Differentiation].
- Sydsaeter, K. and P. Hammond. Essential Mathematics for Economic Analysis. Third Edition. Prentice Hall, 2008.

8.2. Supplementary bibliography

- Llorens Fuster, J.L. Introducción al uso de DERIVE. Aplicaciones al Álgebra y el Cálculo. Universidad Politécnica de Valencia, 1995. [Units 1 to 3. Exercises using DERIVE].

8.3. On-line resources and others

Business Maths UPCT B. Cobacho Youtube Channel:

<https://www.youtube.com/user/BusinessMathsUPCT>

Mathematics for Business I web:

<https://aulavirtual.upct.es/>

Mathematics for Business I in OCW UPCT:

<http://ocw.bib.upct.es/course/view.php?id=121>

University's on-line library:

<http://ocw.bib.upct.es/>

Dpto. Economía Aplicada - Universidad de Valladolid. Guía de trabajo. Álgebra Lineal. [Units 1 and 2. Theory and exercises]

http://www2.eco.uva.es/~lmeneses/Guia_de_Trabajo/Pagina_inicio/master.htm

González Pareja A. y otros. Aspectos básicos de Matemáticas para la Economía: Un texto virtual y abierto. [Matemáticas básicas]

<http://eco-mat.ccee.uma.es/libro/libro.htm>

Lasmaticas.es. Vídeos con contenidos de Matemáticas de Educación Secundaria (Enseñanza Media). [Matemáticas básicas]

<http://www.dmae.upct.es/~juan/matbas/matbas.htm>

Lessons, calculators, and worksheets created to assist students and teachers of algebra

<http://algebrahelp.com/>

Algebra, Applied Mathematics, Calculus and Analysis, Probability and Statistics and others
<http://mathworld.wolfram.com/>

Some mathematical terms:

http://www.speakenglish.co.uk/vocab/shapes_and_mathematical_terms?lang=es

Pronunciation of mathematical expressions in English:

<http://sigloxxi.fcie.uam.es/informatica/media/math-pronunciation.pdf>

Mathematical expressions and terms Spanish-English-Spanish:

<http://esl.proz.com/glossary-translations/spanish-to-english-translations/89/>

Business dictionaries

Alcaraz, E., B. Hughes. Diccionario de términos económicos, financieros y comerciales. Ariel Economía. [Inglés-Español Spanish-English dictionary].

<http://www.businessdictionary.com/>

<http://www.prenhall.com/glossary/a.html>

<http://www.ats-group.net/dictionaries/dictionary-business-english-spanish.html>

Pronunciation dictionaries

<http://www.howjsay.com>

<http://www.acapela-group.com/text-to-speech-interactive-demo.html>

International unit converter

<http://www.easyunitconverter.com/>

General English

www.englishpage.com

www.oup.com/elt/englishfile

Curiosities about Mathematics:

<http://goldennumber.net/>