

## COURSE GUIDE

2023/24

**Faculty** 151 - Faculty of Economics and Business. Álava Department

**Cycle** .

**Degree** GADEMP10 - Bachelor's Degree in Business Management & Administration

**Year** First year

## COURSE

25824 - Mathematics I

**Credits, ECTS:** 6

## COURSE DESCRIPTION

"Mathematics I" is a 1st course basic subject in the Degree of Business Administration and Management.

## COMPETENCIES/LEARNING RESULTS FOR THE SUBJECT

The learning results of the subject will be:

- &#8226; Understand and handle notation and mathematical language.
- &#8226; Skills to manipulate algebraic expressions.
- &#8226; Understand notions and problems of economic content expressed in mathematical language.
- &#8226; Pose, solve and interpret algebra problems.
- &#8226; Pose, solve and interpret problems of differential calculation of functions of a variable.

In addition, in this subject the students will work the following transversal competences:

- &#8226; Autonomous learning
- &#8226; Ability of analysis and synthesis
- &#8226; Decision-making and problem-solving

## CONTENIDOS TEÓRICO-PRÁCTICOS

### PART I: LINEAR ALGEBRA

#### Topic 1.- MATRICES AND VECTORS.

- &#8226; Matrices: operations with matrices
- &#8226; Types of matrices
- &#8226; Vectors: operations with vectors
- &#8226; Geometric meaning of vectors and operations between vectors
- &#8226; Scalar product of vectors. Module (length) of a vector. Distance between two points.
- &#8226; Linear dependency/independence between vectors

#### Topic 2.- DETERMINANTS AND INVERSE MATRICES

- &#8226; Determinant of a square matrix
- &#8226; Order determinant less than or equal to the third party
- &#8226; Superior to third order determinant
- &#8226; Properties of determinants
- &#8226; Creating zeros in a determinant
- &#8226; Inverse of a matrix.
- &#8226; Properties of the reverse matrix
- &#8226; Calculation of the inverse matrix

#### Topic 3.- RANGE THEORY AND SYSTEMS OF LINEAR EQUATIONS

- &#8226; Linearly dependent and independent vectors
- &#8226; Range of a matrix
- &#8226; Properties of the range of a matrix
- &#8226; Calculation of the range of a matrix
- &#8226; System of linear equations. Matrix and vector expression
- &#8226; Compatibility study: Rouché-Fröbenius theorem
- &#8226; Homogeneous linear systems
- &#8226; Matrix methods for solving linear systems
- &#8226; Linear systems with economic significance

#### Topic 4.- DIAGONALIZATION OF MATRICES

- &#8226; Approach to the problem
- &#8226; Diagonalization of matrices
- &#8226; Applications of diagonalization

### PART II: CALCULATION IN A VARIABLE

#### Topic 5.- FUNCTIONS OF A VARIABLE

- &#8226; More frequent functions
- &#8226; Domain of a function
- &#8226; Inverse function.
- &#8226; Functions defined by pieces. Absolute value function.

## Topic 6.- LIMITS, CONTINUITY AND DERIVATION OF FUNCTIONS

• Limits of a function at one point.

• Properties of the limits

• Operations with infinities. Indeterminations

• L'Hôpital rule for resolution of indeterminate limits.

• Continuity.

• Definition of derivative. Geometric meaning. Derivable function at one point.

• Successive derivatives. Chain rule.

• Derivation of implicit functions.

• Derivatives in economics.

## Topic 7.- CONTINUITY AND DERIVABILITY

• Properties of continuous functions

• Properties of continuous and derivable functions

• The differential of a function. Meaning

• Polynomial approach of functions.

## Topic 8.- INTEGRATION

• Indefinite Integral.

• General and economic applications of the indefinite integral

• Defined integral: concept and properties.

• Economic applications of the defined integral

## TEACHING METHODS

The organisation of this subject will be distributed according to the division that is established in the official schedule between master class sessions and classroom practice sessions.

In the master class sessions the various topics that make up the subject will be developed. These may have a theoretical or practical character. The theoretical classes have as objective the introduction and justification of the concepts and results that are part of the subject. The compression and expansion of the contents of the subject is favored by the use of the recommended basic manuals. With the practical orientation classes, it is intended that the student manage to properly assimilate and manage the concepts introduced in the theoretical part.

The practical classroom sessions seek to strengthen the knowledge and mastery of the learned procedures, as well as investigate their practical use in situations close to economic reality. To this end, these sessions are proposed as classes of directed work. These exercises will be performed individually and in some sessions cooperatively, and will be available on the e-gela platform

## TYPES OF TEACHING

Types of teaching	M	S	GA	GL	GO	GCL	TA	TI	GCA
Hours of face-to-face teaching	51	0	9						
Horas de Actividad No Presencial del Alumno/a	72	0	18						

**Legend:** M: Lecture-based

S: Seminar

GA: Applied classroom-based groups

GL: Applied laboratory-based groups

GO: Applied computer-based groups

GCL: Applied clinical-based groups

TA: Workshop

TI: Industrial workshop

GCA: Applied fieldwork groups

## Evaluation methods

- Continuous evaluation
- End-of-course evaluation

## Evaluation tools and percentages of final mark

- Written test, open questions 50%
- Exercises, cases or problem sets 50%

## ORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT

In the first call the evaluation will be mixed. The final exam will be a written test (on the date indicated by the school) in which the student will solve exercises that will represent 50 % of the final rating. In addition to this test, the work carried out by the student throughout the course will be evaluated and this will represent 50 % of the final rating. The works to be developed by the students will be described in detail in the guide for the students and will consist of practices and exercises to be developed that will be evaluated individually.

In this subject we will work the transversal competence of problem solving and decision making based on reasoned judgments, autonomous learning and capacity for analysis and synthesis at level 1. For the development of this competence, a series of practical tasks will be proposed that will be described in detail in the guide for students.

Although we will prioritize a continuous assessment, the students will have the right to be evaluated through the final evaluation system, regardless of whether they have participated in the system of continuous evaluation. Students who opt for a final evaluation system will be able to prove the achievement of knowledge and competences inherent in the subject through a single final test.

### **EXTRAORDINARY EXAMINATION PERIOD: GUIDELINES AND OPTING OUT**

In the extraordinary call there will be a single final test with exercises to develop and test questions that will comprise 100 % of the subject. This will represent 100 % of the qualification of the call or 80 % if the student have completed all the practices.

### **MANDATORY MATERIALS**

The e-gela platform of the UPV/EHU will be used as a repository of information, where the necessary material will be published for the follow-up of the subject (program, teaching guide, proposed problems, practice guide and complementary resources) as for the development of evaluation tests.

### **BIBLIOGRAFÍA**

#### **Basic bibliography**

Edwards, C.H., Penney, D.E., Calvis, D.T. 2018. Differential Equations and Linear Algebra C. Henry Edwards, Global Edition. Pearson Education

#### **Detailed bibliography**

Aleskerov, F., Ersel, H., Piontkovski, D. 2011. Linear Algebra for Economists. Springer.

Laurence D. Hoffmann, L.D., Bradley, GL. 2010. Calculus for Business, Economics, and the Social and Life Sciences. McGraw-Hill.

#### **Journals**

#### **Web sites of interest**

<https://eGela.ehu.eus/>

<https://www.geogebra.org>

<https://www.wolframalpha.com>

<https://www.superprof.es/apuntes/escolar/matematicas/>

<https://www.socrative.com>

### **OBSERVATIONS**