

## SUBJECT TEACHING GUIDE

G320 - ALGEBRA

Degree in Chemical Engineering

Academic year 2020-2021

1. IDENTIFYING DATA					
Degree	Degree in Chemical Engineering			Type and Year	Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Mathematics Basic Training Module				
Course unit title and code	G320 - ALGEBRA				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web	<a href="https://ocw.unican.es/course/view.php?id=279">https://ocw.unican.es/course/view.php?id=279</a>				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION				
Name of lecturer	RODRIGO GARCIA MANZANAS				
E-mail	rodrigo.manzanas@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 4. DESPACHO (S4015)				
Other lecturers	NEILA EMMA CAMPOS GONZALEZ				

### 3.1 LEARNING OUTCOMES

- At the end of the course the student will be able to:

- Manage matrices and determinants properly.
- Solve systems of linear equations by various methods.
- Mastering the concepts of vector space and Euclidean vector space.
- Work with linear applications.
- Diagonalize an endomorphism, when possible.

For this, both analogue (notes, books, etc.) and digital (MATLAB) media will be used.

#### 4. OBJECTIVES

- Interpret and communicate the studied concepts with mathematical rigor.
- Critically argue opinions based on abstract logical reasoning.
- Correctly apply the theoretical knowledge acquired to solve problems in the field of Algebra , both by hand and by using computer tools.
- Consolidate the minimum knowledge of Algebra that allows to face with guarantees the future study of other fundamental subjects of the degree.

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	<p><b>BLOCK 1</b></p> <p>Lesson 1: Matrices</p> <ul style="list-style-type: none"> <li>- Operations with matrices and determinants</li> <li>- Inverse matrix and elementary matrices</li> <li>- Echelon reduced form of a matrix</li> <li>- Matrix factorization</li> </ul> <p>Lesson 2: Systems of linear equations</p> <ul style="list-style-type: none"> <li>- Matrix form of a system</li> <li>- Classification of systems</li> <li>- Resolution of systems by different methods</li> </ul> <p>Lesson 3: Vector spaces</p> <ul style="list-style-type: none"> <li>- Vector space and subspace</li> <li>- Implicit and parametric forms</li> <li>- Intersection and sum of subspaces</li> <li>- Linear dependence and independence</li> <li>- Bases and coordinates</li> <li>- Complement vector subspace</li> </ul>
2	<p><b>BLOCK 2</b></p> <p>Lesson 4: Euclidean space</p> <ul style="list-style-type: none"> <li>- Scalar product</li> <li>- Orthogonal vector subspace and projection</li> <li>- Approximation of a transcendent function by a polynomial</li> <li>- Approximate solution of incompatible systems by least squares</li> <li>- Fit to a point cloud</li> </ul> <p>Lesson 5: Linear applications</p> <ul style="list-style-type: none"> <li>- Kernel and image</li> <li>- Classification of linear applications</li> <li>- Matrix of a linear application</li> </ul> <p>Lesson 6: Diagonalization of endomorphisms</p> <ul style="list-style-type: none"> <li>- Eigenvalues and eigenvectors</li> <li>- Eigenspaces</li> <li>- Diagonalization</li> </ul>

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Midterm exam (block 1)	Written exam	No	Yes	35,00
Midterm exam (block 2)	Written exam	No	Yes	35,00
Other evaluable evidence	Others	No	No	30,00
Final exam	Written exam	Yes	Yes	0,00
<b>TOTAL</b>				<b>100,00</b>

### Observations

The final grade for the course results from a weighted average of the marks obtained in: The midterm exam covering block 1 (35%), the midterm exam covering block 2 (35%) and the 'other evaluable evidence' item (30%). However, to pass the subject (for which a minimum grade of 5 out of 10 will be required) it is mandatory to have obtained a minimum grade of 3 in both block 1 and block 2.

Students whose final grade is less than 5 may go to the final exam in the ordinary call, in which each student will take the block (or blocks) that he/she considers necessary, thereby renouncing the mark that had been obtained in the corresponding midterm exam (or exams).

In case that the grade for any of the two blocks is under 3 after the final exam, the subject will be considered failed (even if the mark resulting from the weighted average of all evaluable items is above 5). In these situations, the final grade will be that of the block with the lowest qualification.

Students who have not passed the subject after the final exam in the ordinary call may go to the exam that will be held in the extraordinary call, for which the qualification obtained for the 'other evaluable evidence' item will be saved, but not that of blocks 1 and 2. This exam will cover the entire subject and will consist of a part with theoretical-practical questions and another part with problems to solve with MATLAB.

### NOTE:

In the event of extraordinary and duly justified causes (for example, a new health alert for COVID-19), part or all of the evaluation tests contemplated in this guide could be carried out remotely.

### Observations for part-time students

For part-time students, the final grade will come determined exclusively by a final exam. In case the grade obtained in the ordinary call were below 5 (out 10), they will have a second opportunity in the extraordinary call. In any of these cases, the exam will cover the entire subject and will constitute 100% of the final grade.

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

- Apuntes proporcionados por los profesores: <https://ocw.unican.es/course/view.php?id=279>
- J. de Burgos Román; Álgebra Lineal, Ed. McGraw-Hill: <http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=102714>
- J. Arvesú y otros; Problemas Resueltos de Álgebra Lineal. Ed. Thomson: <http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=228756>
- K. Donnelly; MATLAB manual: Computer Laboratory Exercises, Saunders College Publishing: <http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=123290>

