

**Algebra**

Code: 103808  
ECTS Credits: 6

Degree	Type	Year	Semester
2500897 Chemical Engineering	FB	1	1

**Contact**

Name: Enric Nart Viñals  
Email: Enric.Nart@uab.cat

**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: No

**Teachers**

Ferran Cedó Giné  
Jaume Moncasi Solsona  
Francesc Bars Cortina

**Prerequisites**

There is no prerequisite. It is recommended that the student knows the concepts of rational, real and complex numbers. Also, it is advisable to know some method for the resolution of linear systems of equations.

**Objectives and Contextualisation**

The course introduces the most elementary aspects of Linear algebra, focussing on the instrumental purpose of the linear techniques.

A fundamental aim is to achieve an efficient transition between the following levels of knowledge:

- 1) abstract knowledge of some mathematical concept related to linear techniques
- 2) robust domain of this concept thanks to its practical manipulation

**Competences**

- Develop personal attitude.
- Develop thinking habits.
- Work in a team.

**Learning Outcomes**

1. Develop critical thinking and reasoning
2. Develop curiosity and creativity.
3. Develop scientific thinking.
4. Work cooperatively.

## Content

### I: COMPLEX NUMBERS

Complex numbers. Vectorial representation. Complex exponential and polar coordinates. Roots of polynomials. Fundamental theorem of algebra.

### II: MATRICES

Matrix operations. Invertible matrices. Elementary transformations and echelon form of matrices. Linear systems of equations. Rank of a matrix. Theorem of Rouché. Determinants. Areas and volumes. Dot product. Measure of lengths and angles.

### III: VECTOR SPACES

Vector Spaces. Linear combinations of vectors. Subspaces. Linear dependence of vectors. Bases, dimension and coordinates. Linear mappings. Isomorphisms.

### IV: MATRIX DIAGONALIZATION

Proper values and vectors of a square matrix. Diagonalization. Applications: matrix powers and linear systems of differential equations.

## Methodology

Oral expositions. The scientific and technological content of the subject will be explained in these classes. The main reference handbook is: Enric Nart i Xavier Xarles "Apunts d'àlgebra lineal", Materials de la UAB, núm. 237, 2016.

Practical classes. The different topics of the subject will be practised with concrete examples and exercises.

Seminars. Some special exercises will be proposed to the students, who will have to submit on-line their answers within a concrete lapse of time, usually 72 hours.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Oral expositions	45	1.8	3, 2, 1, 4
Type: Supervised			
Seminars	13	0.52	3, 2, 1, 4
Type: Autonomous			
Exercises	14	0.56	3, 2, 1, 4

## Assessment

### SEMINARS

There will be 8 seminars along the course.

Six of them will consist in submitting (on-line) the resolution of an exercise, within a lapse of time of 72 hours.

Two seminars will consist in submitting (on-line) the resolution of two exercises, already worked out in previous seminars, within a lapse of time of 2 hours.

Altogether, this means solving 10=6+4 exercises, to be marked with 0,15 points each.

Thus, this activity weights 15% of the final mark. This contribution of the seminars will not be reevaluated.

#### ORDINARY EXAMS

There will be two written exams, taking about 2 hours each. These exams will weights 40% and 45% of the final degree, respectively.

#### REEXAMINATION

There will be an extra exam for the students not having passed the ordinary evaluation process. This special exam will weight 85%, to be added to the 15% of the seminars' mark.

The students who do not pass the ordinary evaluation and do not attend the reexamination will be qualified as "Not evaluated".

#### EVALUATION OF STUDENTS FROM PREVIOUS COURSES

The students who did not pass this subject in previous courses will have to pass the ordinary exams and/or reexamination, exactly as all other regular students.

As far as the seminars are concerned, there will be two options. They can be evaluated following the normal schedule, or be substituted by an special exam of 4 exercises, selected among the ordinary seminar exercises.

The students opting for this special exam, are begged to communicate their intentions to the professor in charge of the subject AT THE BEGINNING OF THE COURSE.

### Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Seminars	15%	20	0.8	3, 2, 1, 4
Two exams	85%	58	2.32	3, 2, 1, 4

### Bibliography

S. I. Grossman, Álgebra lineal con aplicaciones, McGraw-Hill, 1991.

E. Nart - X. Xarles, Apunts d'àlgebra lineal, Materials de la UAB, núm. 237, 2016.