UAB
Universitat Autònoma de Barcelona

Algebra

Code: 103801
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computer Engineering	FB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

Basic concepts on rational and real numbers.

Basic concepts on the method of solution of systems of linear equations.

Objectives and Contextualisation

The course is an introduction to linear algebra, emphasizing the most functional and instrumental aspects of linear techniques.
The basic objective is to achieve a rapid and efficient transition between the three following levels of knowledge:

• Ability to express written reasoning.
• Abstract knowledge of mathematical notions related to linear phenomena.
• To gain insight into mathematical notions by way of hands-on manipulation.

Learning Outcomes

1. CM02 (Competence) Integrate mathematical models and tools into problems that require an IT solution.
2. KM02 (Knowledge) Explain algorithmic procedures related to mathematical models and tools.
3. SM02 (Skill) Apply knowledge of algebra to solve general computer engineering problems.
4. SM05 (Skill) Analyse the algorithmic needs of mathematical models for solving science and engineering problems.

Content

Block I: Complex numbers

Vector representation and polar form of complex numbers. De Moivre's Formula. Calculation of nth roots. Roots of polynomials and polynomial factorization.

Block II: Matrices

Operations with matrices. Invertible matrices. Elemental transformations and row-reduction of matrices. Systems of linear equations. Rank of a matrix. Theorem of Rouché. Rank and linear dependence of rows and columns of matrices. Determinants.

Block III: Vector spaces and linear maps

Vector spaces. Linear combinations. Linear independence of vectors. Bases, dimension and coordinates. Subspaces. Linear maps. Kernel and range of a linear map. Isomorphisms.

Block IV: Diagonalization of matrices

Characteristic polynomial, eigenvalues and eigenvectors of a square matrix. Diagonalization of matrices. Computation of powers of a matrix.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lectures	30	1.2	
Type: Supervised			
Seminars	5	0.2	
Tutorials	15	0.6	
Type: Autonomous			
Problem solving	50	2	
Study of the theoretical concepts	26	1.04	

The central part of the learning process is based on the work by the student. The lecturer's mission is to help the student in this task by providing information or pointing to sources where such information can be obtained, and tutoring their steps so that the learning process can be carried out effectively.
In line with these ideas, and in accordance with the objectives of the subject, the development of the course will be based on the following activities:

Lectures: The scientific and technical knowledge of the subject will be presented in the form of master classes. In them, the basic concepts set out in the syllabus will be shown to the student and indications will be given on how to complete and gain insight into these notions.

Tutorials: In those, attention will be paid to the scientific and technical knowledge exposed in the lectures to complete the students' understanding. In these classes the basic techniques of the course will also be practiced, by means of the resolution of practical exercises.
Workshops: In the workshops, students will be proposed the development of an activity, whose resolution will allow to measure the assimilation of the material developed both in the lectures, tutorials, and seminars. These workshops will be assessed on fixed dates that will be announced in due course (on the Virtual Campus).

Seminars: Seminar sessions will be devoted to discuss the material to be dealt with at the workshops. Communication with students will be done through the Virtual Campus, where all the subject materials will be available.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Workshops	30%	7	0.28	CM02, KM02, SM02, SM05
2 Written tests	70%	17	0.68	CM02, KM02, SM02, SM05

The evaluation is based on continuous assessment. There will be two individual written theoretical-practical tests:

- The first test will be carried out during the semester and will have a weight of 30% on the final grade.
- The second test will be carried out within the weeks reserved for exams, and will have a weight of 40% on the final grade.

The remaining 30% of the final grade will be obtained by means of two tutored workshops and eventually the delivery of problems on the 'Campus Virtual'.
There will be a resit exam corresponding to the two previous theoretical and practical tests, corresponding to 70% of the final grade. There is no resit exam corresponding to the two workshops of the course. This method of assessment will be the same for all the students enrolled, regardless of the number of times they have enrolled in the subject.

In order to pass the course, the total assessment must exceed 5 points out of 10: corresponding to the grade for the workshops and the two theoretical-practical tests, as long as the weighted average of the theoretical-practical tests reaches a minimum of 4 over 10. In case of having to take the resit exam, the grade

of the course will be computed by taking the weighted average of the grade of the workshops and the resit test of the two theoretical-practical tests.

The "non-evaluable" qualification will be awarded only to students who do not turnout at the second theoretical-practical test nor at the resit exam and who have not committed any irregularity that may lead to a variation of the qualification ofan instance of evaluation. In the case of not passing the subject, the numerical grade will be the lowest value between 4 and the weighted average of the grades of the different tests. Notwithstanding other disciplinary measures thatmay be deemed appropriate, and in accordance with the current academic regulations, the irregularities committed by the student that can lead to a variation of the qualification of an instance of evaluation will result in obtaining zero marks for the corresponding instance. Therefore, copying or letting someone else copy during an exam/workshop or any other situation where assessment is being carried will entail failing the said activity, without the chance of being recovered during the same academic year. If this activity has a minimum associated mark, then the student will fail the subject. These irregularities include, among others:

- the total or partial copy of a workshop, report, or any other activity of assessment;
- let someone else copy;
- present a group work not done entirely by the members of the group (applied to all members,not only to those who have not worked);
- present as own materials prepared by a third party, even if they are translations or adaptations, and generally work with non-original and exclusive elements due the student;
- Have communication devices (such as mobile phones, smart watches, camera pens, etc.) accessible during theoretical-practical assessment tests (individual exams);
- Talk with classmates during the theoretical-practical assessment tests (exams);
- Copy or attempt to copy from other students during the theoretical-practical assessment tests (exams);
- Use or attempt to use written material related to the subject during the theoretical-practical evaluation tests (exams), when these have not been explicitly allowed.

The dates for tests corresponding to continuous assessment will be published on the virtual campus and may be subject to possible changes of programming, due to possible incidents; the virtual campus will be the usual platform for exchanging information between lecturers and students. For each of the different assessment activities,the lecturer will establish a date to handle claims or clarify doubts about the mark obtained. Whenever the academic calendar allows it, this review of examinations will take place approximately one week after the marks have been made public. Students with a mark greater than or equal to 9.4 will be able to obtain a "Matrícula d'Honor" and these will be decided upon the completion of all the evaluation tests. This will depend on the lecturer of the group to which the student(s) belongs, with the help of all the lecturers of the course if necessary.

Unique assessment

Students who have accepted the single assessment modality will have to take a final test which will consist of a theory and problem test. These tests will take place on the same day, time and place as the tests of the second part of the continuous assessment modality. When it has finished, it will deliver the mandatory workshops and delivery in the continuous assessment activities.

The student's grade will be the weighted average of the previous activities, where the theory exam will account for 70% of the grade and the workshops and presentations 30%.

If the final grade does not reach 5, the student has another opportunity to pass the subject through the remedial exam that will be held on the date set by the degree coordinator. The same recovery system will be applied as for continuous assessment. The workshop and deliveries part is not recoverable.

In this subject, the use of Artificial Intelligence (AI) technologies is allowed as an integral part of the development of the work, provided that the final result reflects a significant contribution of the student in the analysis and personal reflection. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in theuse of AI will be considered a lack of academic honesty and may lead to a penalty in the grade of the activity, or greater penalties in serious cases.

In case of doubt about the interpretation of the evaluation method, the Catalan written version remains as the reference.

Bibliography

- E. Nart, X.Xarles, Apunts d'àlgebra lineal, Materials de la UAB, núm. 237, 2016, 2a edició 2019.
- E. Nart, Notes d'àlgebra lineal, Materials de la UAB, núm. 130, 2a edició, 2006.
- M. Madeu, A. Ruiz, Apunts d'àlgebra lineal, Bellaterra : Universitat Autònoma de Barcelona, cop. 2020 (recurs electrònic d'accés lliure).
- S. I. Grossman, Álgebra lineal con aplicaciones, McGraw-Hill, 1991.
- J.A. Carballo, F.M. Español, J.S. Ruiz. Problemas resueltos de àlgebra lineal. Ediciones Paraninfo. S.A., 2015.

Software

In this course, the use of software will not be evaluated, but calculation tools such as Sage or Maxima may eventually be used.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	411	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	412	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	431	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	432	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	451	Catalan/Spanish	first semester	afternoon
(PAUL) Classroom practices	452	Catalan/Spanish	first semester	afternoon
(SEM) Seminars	411	Catalan/Spanish	first semester	morning-mixed
(SEM) Seminars	412	Catalan/Spanish	first semester	morning-mixed
(SEM) Seminars	431	Catalan/Spanish	first semester	morning-mixed
(SEM) Seminars	432	Catalan/Spanish	first semester	morning-mixed
(SEM) Seminars	451	Catalan/Spanish	first semester	afternoon
(SEM) Seminars	452	Catalan/Spanish	first semester	afternoon
(TE) Theory	41	Catalan	first semester	morning-mixed
(TE) Theory	43	Catalan	first semester	morning-mixed

(TE) Theory	45	Catalan	first semester	afternoon