1. BASIC INFORMATION

Course	Algebra
Degree Program	Degree in Aerospace Engineering in Aircraft
School	Architecture, Engineering and Design
Year	First year
ECTS	6
Credit type	Mandatory
Languages/s	English
Mode	On-Campus
Semester	Second semester
Academic year	25-26
Coordinating professor	Janaina Cejudo Sanches
Professors	Janaina Cejudo Sanches and Jorge Erice Calvo Sotelo

2. PRESENTATION

'Algebra' is one of the basic first-year subjects, worth 6 ECTS, of the University Degree in Industrial Systems Engineering. It belongs to the Mathematic module made up of the following subjects:

- Algebra.
- Calculus I.
- Calculus II.
- Calculus III.
- Statistics.

Algebra provides basic knowledge and tools that are necessary for a large part of Degree subjects. It develops Mathematic attitudes, such as a critical point of view, the need for verification or the assessment of precision. It will allow us to study the theoretical and practical concepts of Linear Algebra, which will be essential in later subjects that require the use of matrices and algebraic transformations. In addition, we will encourage to reason and to apply the mathematical methodology in multiple aspects of professional training.

3. LEARNING OUTCOMES

Knowledge

KN19 (CON19). Identify the knowledge of basic subjects and technologies, enabling the student to learn new methods, theories and technologies, and endowed it with great versatility to adapt to new situations (autonomous learning).

Specific knowledge of the subject:

- Acquire knowledge of linear algebra and an introduction to complex numbers.
- Acquire basic knowledge of differential equations.

Skills:

SK01 (HAB01) FB01. Ability to solve mathematical problems that may arise in engineering. Aptitude to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics, and optimization.

Specific skills of the subject:

- Solve problems in applied mathematics.
- Prepare structured and rigorous engineering reports (based on laboratory practices).
- Solve matrices, determinants, and systems of linear equations.
- Use geometry, vector spaces, and linear applications.
- Perform diagonalization operations.

Competences:

CP12. Generate new ideas and concepts from known ideas and concepts, reaching conclusions or solving problems, challenges, and situations in an original way in the academic and professional environment.

CP16. Collaborate with others in achieving a shared academic or professional objective, actively participating, demonstrating empathy, and practicing active listening and respect for all team members.

CP17. Integrate analysis with critical thinking in an evaluation process of different ideas or professional possibilities and their potential for error, relying on evidence and objective data that lead to effective and valid decision-making.

4. CONTENTS

1. Linear algebra. Introduction to complex numbers
2. Matrices, determinants, systems of linear equations
3. Geometry
4. Vector spaces. Linear applications
5. Diagonalization
6. Introduction to differential equations

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- Master classes
- Cooperative learning
- Problems based learning (PBL)
- Oriented academic activities

6. LEARNING ACTIVITIES

The following table shows, for each learning activity: ***i*)** the total time the student will spend, ***ii*)** the time distribution between in-class and off-class time, and ***iii*)** the course policy about the use of artificial intelligence (AI) in that activity.

Campus-based mode:

Learning activity	Total time	In-class Time	Use of AI
Lectures / masterclasses	30 hours	30 hours (100%)	Allowed
Laboratory / problem-solving workshops	12 hours	12 hours (100%)	Not Allowed
Group research and integrative group work	50 hours	18 hours (47%)	Assessed
Self-study	70 hours	0 hours (0%)	Promoted
TOTAL	**150 hours**	**60 hours (40%)**	

Further details about the AI-use policy will be published through the virtual campus platform once the course has started.

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Campus-based mode:

Assessment system	Weight
SE01 – Exams and objective tests	30-35%
SE02 – Articles, essays and reports	15-30%
SE03 – Peer-evaluation, working sessions and alternative assessment procedures	15-30%
SE04 – Off-class events, conferences and seminars (*)	10%
SE05 – Core/cross-curricular competences (performance)	10-15%

(*) If these activities could not be carried out, the corresponding weight would split evenly between systems SE02 and SE03.

When you access the course on the *Virtual Campus*, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

7.1. Ordinary exams period

To pass the course in the first exam period, you must obtain:

- A score of 5,0 out of 10 or greater in the final test.
- An average final score (according to the previous table) equal or greater than 5,0 out of 10.
- 50% attendance.

When the minimum required to carry out the weighted average of the evaluable activities is not met (the minimum is not reached in the 2 first previous points), the final grade will be:

- the weighted average if its value is less than or equal to 4,0
- 4,0 if the value of the weighted mean is greater than 4,0
- If the attendance requirement is not met, the student will can only pass in the extraordinary period

The grade in the first exam period will be considered as **NP** (Not Presented) when the student has not delivered any evaluable activity of those that are part of the weighted average.

7.2. Extraordinary exams period

To pass the course in the second exam period, you must obtain:

- A score of 5,0 out of 10 or greater in the final test.
- An average final score (according to the previous table) equal or greater than 5,0 out of 10

When the minimum required to carry out the weighted average of the evaluable activities is not met (the minimum is not reached in any of the previous points), the final grade will be:

- the weighted mean if its value is less than or equal to 4,0
- 4,0 if the value of the weighted mean is greater than 4,0

The grade in the second exam period will be considered as **NP** (Not Presented) when the student has not delivered any new evaluable activity in relation to the previous ordinary period.

Students must compensate all the evaluable assignments they did not successfully passed in the ordinary session or all the necessary ones to achieve a weighted average over 5,0 out of 10.

8. SCHEDULE

The subject is organized in units of contents, each of which will require in-depth study of the topics listed in **section 4**. The number of activities to be carried out and/or their weeks of completion are approximate and may be modified based on the development of the subject. Such changes will be notified in a timely manner through Canvas.

Week	Unit	Deliverables and/or assessment tests
1	2	
2		Individual/collaborative activity 1
3		
4	3	Individual/collaborative activity 2
5		

6		Individual/collaborative activity 3
7	4	
8		Individual/collaborative activity 4
9		
10	5	
11		**Midterm exam**
12		Individual/collaborative activity 5
13		
14	6	Individual/collaborative activity 6
15		
16		Group project presentation
17		Individual/collaborative activity 7
18		**Final exam**

9. BIBLIOGRAPHY

The main reference work for this subject is:

- LAY D. C., *Linear Algebra and its Applications*. Addison Wesley, 2006.
- C. ALSINA, E. TRILLAS. *Lecciones de Algebra y Geometría*. Barcelona, Gustavo Gil, 1984.
- P. SANZ, F.J. VÁZQUEZ, P. ORTEGA. *Álgebra Lineal*. Prentice Hall, 2002.
- L. MERINO, E. SANTOS. *Álgebra Lineal con Métodos Elementales*. Ed. Paraninfo 2016.
- STRANG G., *Linear Algebra and its Applications*. Cengage Learning, 4th Edition, 2005.

10. DIVERSITY MANAGEMENT UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms of methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.

3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.

4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at: orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail. Your assessment is necessary for us to improve.

Thank you very much for your participation.