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	23-24
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.
- Statistics for engineering

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. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB1: That students have demonstrated to possess and understand knowledge in an area of study that is based on general secondary education, and it is usually found at a level that, although it is supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of their field of study.
- CG3: Knowledge in basic and technological subjects, which enables them to learn new methods and theories, and give them with versatility to adapt to new situations.

Cross-curricular competencies:

- CT2 - Autonomous learning: A set of skills to select search strategies, analysis, evaluation and management of information from various sources, as well as to learn and independently implement what has been learned.
- CT5 - Analysis and problem solving: Be able to critically evaluate information, decompose complex situations into their constituent parts, recognize patterns, and consider other alternatives, approaches and perspectives to find optimal solutions and efficient negotiations.

Specific competencies:

- CE1. Ability to solve mathematical problems that may set out in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential and partial derivatives equations; numerical methods; numerical algorithms; statistics and optimization.

Learning outcomes

- RA1: Understand the basic principles of linear algebra and its relation to matrix algebra: vector spaces, linear equations, linear applications, diagonalization.
- RA2: Solve and discuss any system of linear equations.
- RA3: Apply the techniques of linear algebra to geometric and physical problems related to engineering.
- RA4: Manage different coordinate systems (bases) and express linear transformations with respect to them.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB1,CG3,CT2,CE1	**RA1**. Understand the basic principles of linear algebra and its relation to matrix algebra: vector spaces, linear equations, linear applications, diagonalization.
CB1,CG3,CT5,CE1	**RA2**. Solve and discuss any system of linear equations.
CB1,CG3,CT2,CT5,CE1	**RA3**. Apply the techniques of linear algebra to geometric and physical problems related to engineering.
CB1,CG3,CT5,CE1	**RA4**. Manage different coordinate systems (bases) and express linear transformations with respect to them.

4. CONTENTS

1. Linear algebra. Introduction to complex numbers
2. Matrix, 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

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Individual or group tutoring	10
Resolution of exercises, problems, tests and practical work	20
Expositions and presentations by the teacher (Master classes)	19,5
Expositions and presentations asynchronous by the teacher (Master classes)	5,5
Preparation of real or simulated projects (through project- based learning methodology)	52,5
Search for information and / or preparation of written assignment and reports	12,5
Autonomous study	25
Evaluation tests	5
TOTAL	150

7. EVALUATION

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

Campus-based mode:

Assessment system	Weight (%)
Individual activities	30
Group project	20
Midterm exam	20
Final exam	30

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 weighted final grade equal or greater than 5 out of 10.
- It is mandatory to pass exam part, with at least a grade of 5 out of 10 points.
- It is mandatory to obtain a group project and activity grade above 5 out of 10 points.
- 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 any of the previous points), the final grade will be:

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

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.
- Have all activities delivered (individual activities and group activitiy) and have them graded with 5 or above out of 10 points.

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
- 4 if the value of the weighted mean is greater than 4

The grade in the second 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.

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 teaching development of the subject. Such changes will be notified to the student in a timely

manner through the Virtual Campus.

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.