



IDENTIFYING DATA

Mathematics: Linear algebra

Subject	Mathematics: Linear algebra			
Code	O07G410V01102			
Study programme	(*)Grao en Enxeñaría Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	1st	1st
Teaching language	#EnglishFriendly Spanish Galician			

Department

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General description This subject is part of Mathematics and it is taught in the first semester of the first course. The other subjects of Mathematics are: Calculus I, in the first semester of the first course and Calculus II in the second semester of the first course. Competences of linear algebra are acquired, being a part of them fundamental for the other subjects of Mathematics.

The subject has the character of basic training. It provides the mathematical basis to different disciplines in the field of the aeronautical engineering such as the calculation and manufacture of vehicles and numerical simulation.

English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.

Competencies

Code

- A1 That the students demonstrate to possess and understand knowledge in an area of study that is part of the general education (second level), and often found at a level that, although based on advanced textbooks, also includes some aspects that involve knowledge from the avant-garde of the field of study
- B2 Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
- C1 Capability to solve mathematical problems that may arise in engineering. Aptitude to apply the knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.
- C32 Appropriate knowledge applied to engineering: methods of calculation and development of materials and defence systems; management of experimental techniques, equipment and measuring instruments; numerical simulation of the most significant physical-mathematical processes; inspection, quality control and fault detection techniques; their most appropriate methods and repair techniques.
- D1 Capability of analysis, organization and planification.
- D3 Capability of oral and written communication in native language
- D4 Capability of autonomous learning and information management
- D5 Capability to solve problems and draw decisions
- D6 Capability for interpersonal communication
- D8 Capability for critical and self-critical reasoning

Learning outcomes

Expected results from this subject	Training and Learning Results
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Capacity to apply the main concepts, technical and numerical methods of linear algebra to other branches of mathematics and engineering.	A1	B2	C1 C32	D1 D3 D4 D5 D6 D8
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Contents

Topic	
BLOCK I	1. Real and complex numbers. 2. Systems of linear equations.
BLOCK II	3. Vector spaces. 4. Linear transformations and matrices.
BLOCK III	5. Euclidean vector spaces. 6. Diagonalisation. Orthogonal transformations.
BLOCK IV	7. Numerical methods: resolution of systems of linear equations. Computation of eigenvalues.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	1	2
Lecturing	13	17	30
Problem solving	29	37	66
Autonomous problem solving	5	20	25
Essay questions exam	2	10	12
Essay questions exam	2.5	12.5	15

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Introductory activities	Activities directed to take contact and gather information on the students, as well as to present the subject.
Lecturing	Exposition of the contents of the subject. It will be illustrated with numerous examples and applications.
Problem solving	Approach, analysis, resolution and debate of a problem or exercise related with the subject, given to illustrate and complete the explanation of each lesson.
Autonomous problem solving	It will be proposed exercises and problems that the students have to resolve in group by using collaborative learning as a integrated methodology.

Personalized assistance

Methodologies	Description
Introductory activities	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Lecturing	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Problem solving	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Autonomous problem solving	Attention and resolution of doubts to the students in relation to the different activities of the matter.
Tests	Description
Essay questions exam	Before the realisation of the exam, attention and resolution of doubts to the students in relation to the different activities of the matter.
Essay questions exam	Before the realisation of the exam, attention and resolution of doubts to the students in relation to the different activities of the matter.

Assessment

Description	Qualification	Training and Learning Results
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Autonomous problem solving	Resolution of a collection of exercises where it will be employed collaborative learning.	20	A1	B2	C1 C32	D1 D3 D4 D5 D6 D8
Essay questions exam	Partial exam that takes in the corresponding contents to the master sessions and the resolution of problems of the thematic blocks I and II. It consists of two parts: *One of short questions of theoretical-practical character(20%). *Another one of problems/exercises (80%). Length: 2 hours	40	A1	B2	C1 C32	D3 D4 D5 D8
Essay questions exam	Long answer tests and development Partial exam that takes in the corresponding contents to the master sessions and the resolution of problems of the thematic block III. It consists of two parts: *One of short questions of theoretical-practical character(20%). *Another one of problems/exercises (80%). Length: 2.5 hours	40	A1	B2	C1 C32	D3 D4 D5 D8

Other comments on the Evaluation

CRITERIA OF EVALUATION FOR THE FIRST CERTIFICATED QUALIFICATION

- If a student does not carry out any of the deliveries of exercises or does not present any of the exams, they will be assigned a qualification of 0 points.
- Minimum requirements to pass the subject:** P1: qualification of the first partial exam (out of 10); P2: qualification of the second partial exam (out of 10); E: qualification of problems resolution (out of 10)
 - $P1, P2 \geq 2,5$
 - $(P1 + P2)/2 \geq 4$
- In case of not fulfilling the minimum requirements to pass the subject, the certificated qualification will be:

$$\min(4, (P1 + P2)/2)$$

- In case to fulfil the minimum requirements to pass the subject, the certificated qualification will be:

$$\max((P1 + P2)/2, 0.8 \times (P1 + P2)/2 + 0.2 \times E)$$

CRITERIA OF EVALUATION FOR THE SECOND CERTIFICATED QUALIFICATION and non-assistant students

Proof of long answer and development:

Description: Exam with two parts: one theoretical-practical and another one in which they will solve exercises. This exam will be about the contents related to the master sessions and to the resolution of problems.

Qualification: E: resolution of problems during the semester (out of 10); P: exam (out of 10)

The qualification of the students will be calculate by the following formula:

$$\max(P, 0.8 \times P + 0.2 \times E)$$

DATES OF EVALUATION

The calendar of exams approved officially by the Xunta de Centro of the EEAE is published in the webpage
<http://aero.uvigo.es/gl/docencia/exames>

Sources of information

Basic Bibliography

Burgos, Juan de, **Álgebra lineal y geometría cartesiana**, 3ª ed, S.A. Mc Graw Hill, 2006

Grossman, S. I., **Álgebra lineal**, 7ª, S.A. Mc Graw Hill, 2012

Hernández, E., **Álgebra y Geometría**, 3ª, Addison-Wesley, 2012

Lay, D. C., **Álgebra lineal y sus aplicaciones**, 4ª ed, Pearson, 2012

Complementary Bibliography

Castellet, M. ; Llerena, I., **Álgebra Lineal y Geometría**, 1ª ed, Reverté, 1991

Lipschutz, S., **Álgebra Lineal**, 2ª ed, S.A. Mc Graw Hill, 1992

Merino, L.; Santos, E., **Álgebra Lineal con métodos elementales**, 1ª ed, Paraninfo, 2006

Baker, R.; Kuttler, K., **Linear algebra with applications**, 1st ed, World Scientific, 2014

Recommendations