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220001 - Algebra

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 749 - MAT - Department of Mathematics

Academic year: 2019

Degree: BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: FRANCISCO CARRERAS ESCOBAR

Degree competences to which the subject contributes

Specific:

2. The ability to solve mathematical problems that may arise in an engineering context. The ability to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics and optimisation

Transversal:

1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

Teaching methodology

The theory lessons would be intended to introduce the basic concepts of each topic, as well as examples and practical cases that allow each student to understand the topics. A basic reference will be a text book written by the departmental section that is freely available in the Atenea platform.

The practical lessons would be intended to solve problems that are set before the lessons. The problems are also available freely in the Atenea platform. This book would help the students to get familiar with the basic concepts and the ability of expressing themselves properly.

As a complement, a collection of transparencies as a resume of the textbook and a solved problem book will be also available.

The teacher will set a fixed hour to solve doubts. There will be, along with the midterm and final exams, two evaluation tasks.

Learning objectives of the subject

Comprehension and capability of application of the concept of linearity and it operative translation: matrix calculus.
Basic operative part of the whole course: study, resolution and discussion of lineal equation systems, matrix calculus, use of both the Gauss and determinant solving methods, resolution of polynomial equations.
Basic conceptual part of the course: acquirement and assimilation of the basic notions of vector spaces, including lineal dependence, subspaces, bases, dimension, components and change of base, and derivation of scalar product, including module, angle, orthogonality and orthogonal projection, orientation, vector product and the method of least squares.
The language of linear transformation with special insistence in endomorphism, including kernel, image, rank, change of base and plane isometries classification: reflections, translations, glide reflections, and rotations.

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Matrix diagonalization techniques, especially orthogonal diagonalization of symmetric matrix, its application in the studies of quadratic forms and tensors, and, finally, the basic ideas of analytic plane geometry, both linear geometry, first grade: coordinates, straight lines, planes, parallels and perpendicularity, angles, distances, areas and volumes)as well as second grades: curves of the planes (conics) and surfaces (quadrics).

Study load

Total learning time: 150h	Hours large group:	32h	21.33%
	Hours medium group:	28h	18.67%
	Self study:	90h	60.00%

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Content

1. Linear equation systems, matrix calculus and determinants

Learning time: 28h

Theory classes: 3h
Practical classes: 8h
Self study : 17h

Description:

Related activities:

Specific objectives:

2. Vector and Euclidean spaces.

Learning time: 37h

Theory classes: 9h
Practical classes: 5h
Self study : 23h

Description:

Related activities:

Specific objectives:

3. Linear transformations, diagonalization and tensors.

Learning time: 49h

Theory classes: 11h
Practical classes: 8h
Self study : 30h

Description:

Related activities:

Specific objectives:

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4. Linear and quadric geometry.	Learning time: 36h Theory classes: 9h Practical classes: 7h Self study : 20h

Description:

Related activities:

Specific objectives:

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Planning of activities

ACTIVITY 1: THEORY SESSIONS	Hours: 76h Theory classes: 26h Practical classes: 10h Self study: 40h
ACTIVITY 2: PRACTICAL SESSIONS	Hours: 38h Practical classes: 18h Self study: 20h
ACTIVITY 3: 1ST CONTROL EVALUATION	Hours: 1h Theory classes: 1h
ACTIVITY 4: 2ND CONTROL EVALUATION	Hours: 5h Theory classes: 1h Self study: 4h
ACTIVITY 5: MIDTERM EXAM	Hours: 12h Theory classes: 2h Self study: 10h
ACTIVITY 6: FINAL EXAM	Hours: 16h Theory classes: 2h Self study: 14h

Qualification system

Problem class activities: weight 15%+10%

First midterm exam: weight 25%

Final exam: weight 50%

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Regulations for carrying out activities

In case of the lack of attendance to a particular evaluation task would lead to a grade of cero in that task. A valid justification, along with the document that evidences its veracity, would give the right to do the task in the later days.

Bibliography

Basic:

Amer Ramon, R. Curs d'àlgebra lineal [on line]. 2a ed. Terrassa: Universitat Politècnica de Catalunya, 1998 [Consultation: 22/02/2011]. Available on: <http://ruth.upc.es/algebra/curs_algebra_lineal.pdf>. ISBN 8484987841.

Amer Ramon, R. [et al.]. Enginyeria aeronàutica: àlgebra lineal: exercicis i problemes. [Terrassa]: UPC, 2010.

Complementary:

Amer Ramon, R. Àlgebra lineal: problemes resolts. Barcelona: Edicions UPC, 2003. ISBN 8476532768.

Amer Ramon, R. [et al.]. Transparències d'àlgebra lineal. [Terrassa]: UPC, 2004.

Others resources: