Last update: 06-05-2019

230451 - ALG - Linear Algebra and Geometry

Coordinating unit: 230 - ETSETB - Barcelona School of Telecommunications Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2019
Degree: BACHELOR'S DEGREE IN ENGINEERING PHYSICS (Syllabus 2011). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Barja Yañez, Miguel Angel

Others: Plans Berenguer, Bernat

Degree competences to which the subject contributes

Specific:

1. Ability to solve math problems that may arise in engineering. Ability to apply knowledge about linear algebra, geometry, differential geometry, differential and integral calculus, ordinary and partial differential equations, probability and statistics.
2. Ability to select numerical and optimization methods suitable for solving physical and engineering problems. Ability to apply the knowledge of numerical algorithms and optimization.

Generical:

2. ABILITY TO IDENTIFY, FORMULATE, AND SOLVE PHYSICAL ENGINEERING PROBLEMS. Planning and solving physical engineering problems with initiative, making decisions and with creativity. Developing methods of analysis and problem solving in a systematic and creative way.

Transversal:

1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
3. 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

We will give 3 hours a week of Theory classes and 2 hours a week of Problem Sessions.

Learning objectives of the subject

Good knowledge of:
-Vector Spaces.
-Matrix Calculus.
-Linear maps.
-Diagonalization process.
-Scalar products and Euclidean spaces.
-Affine and Euclidian geometry. Linear varieties.

Last update: 06-05-2019

230451 - ALG - Linear Algebra and Geometry

Study load

Total learning time: 150h	Hours large group:	65h	43.33%
	Self study:	85h	56.67%

Last update: 06-05-2019

230451 - ALG - Linear Algebra and Geometry

Content

1. Vector Spaces

Learning time: 32h

Theory classes: 7h
Practical classes: 8h
Guided activities: 4h
Self study : 13h

Description:
Fields. The field of complex numbers. Polynomials and factorizations.
Vector spaces. Linear combinatios, independence. Basis and dimensions. Subspaces, sum, intersection and complementary subspaces. Ranks o matrices. Linear systems. The Rouché-Frobenius theorem. Determinants.

2. Linear maps

Learning time: 28h

Theory classes: 7h
Practical classes: 4h
Guided activities: 4h
Self study : 13h

Description:
Linear maps. Kernel and Image. Injective, surjective and bijective morphisms. Matrix of a linear map. Invariant subspaces.

3. Diagonalization

Learning time: 30h

Theory classes: 8h
Practical classes: 5h
Guided activities: 4h
Self study : 13h

Description:
Eigenvectors and eigenvalues. Characteristic polinomial. Diagonalization criterium. Cayley-Hamilton theorem. Introduction to Jordan form.

4. Euclidian and unitary spaces

Learning time: 29h

Theory classes: 8h
Practical classes: 4h
Guided activities: 4h
Self study : 13h

Description:
Bilinear and quadratic forms. Inner product, norm and angle. Euclidian space. Orthonomal basis. Gramm-Schmidt theorem. Projection theorem. Symmetric endomorphisms and Spectral theorem. Isometries. Orthogonal matrices. Unitary spaces and matrices.

Last update: 06-05-2019

230451 - ALG - Linear Algebra and Geometry

Qualification system

We will do a mid-term exam (EP) and also evaluate participation at Problem sessions (P). The Final Exam (EF) has 3 parts: exercices, problems and theoretical questions.

NF=màx {0.3 EP + 0,05 P + 0.65 EF, EF}

Bibliography

Basic:

Castellet, M.; Llerena, I. Àlgebra lineal i geometria. 4a ed. Bellaterra: Publicacions de la UAB, 2000. ISBN 847488943X.

Hernández, E. Álgebra y geometría. 2a ed. Wilmington, Delaware, EUA; Madrid: Addison Wesley Iberoamericana; UAM, 1994. ISBN 847488943X.

Complementary:

Audin, M. Geometry. Berlin: Springer Verlag, 2003. ISBN 3540434984.