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.

General:
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.
2. 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.
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 65h</th>
<th>43.33%</th>
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</thead>
<tbody>
<tr>
<td>Self study:</td>
<td>85h</td>
<td>56.67%</td>
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## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Learning time:</th>
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<tbody>
<tr>
<td><strong>2. Linear maps</strong></td>
<td>Linear maps. Kernel and Image. Injective, surjective and bijective morphisms. Matrix of a linear map. Invariant subspaces.</td>
<td>28h</td>
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</table>
We will do a mid-term exam (EP) and also evaluate participation at Problem sessions (P). The Final Exam (EF) has 3 parts: exercises, problems and theoretical questions.

\[ \text{NF} = \max \{0.3 \text{ EP} + 0.05 \text{ P} + 0.65 \text{ EF}, \text{ EF}\} \]

**Bibliography**

**Basic:**

**Complementary:**