Degree competences to which the subject contributes

Specific:
1. CE1. Ability to solve arithmetic problems related to engineering. Aptitude to apply knowledge concerning: linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial equations, numerical methods, numerical algorithms, statistics and optimization.

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

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 150h</th>
<th>Hours large group: 60h</th>
<th>40.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 0h</td>
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<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
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</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>1. Complex numbers</th>
<th>Learning time: 20h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 8h</td>
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<tr>
<td></td>
<td>Practical classes: 0h</td>
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<tr>
<td></td>
<td>Self study: 12h</td>
</tr>
</tbody>
</table>

**Description:**

How to operate with complex numbers and how to use them to decompose polynomials.

1. Complex numbers. Form Cartesian, polar and exponential.
2. Operations and properties. Euler formula.
4. Decomposition of polynomials in the real and complex.

<table>
<thead>
<tr>
<th>2. Vector spaces.</th>
<th>Learning time: 26h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 10h</td>
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<tr>
<td></td>
<td>Practical classes: 0h</td>
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<tr>
<td></td>
<td>Self study: 16h</td>
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</table>

**Description:**

How to determine the dependence / independence of vectors and calculate dimensions and bases of a subspace.

3. Linear independence of vectors.
4. Dimension and basis of a vector space.

<table>
<thead>
<tr>
<th>3. Linear maps</th>
<th>Learning time: 30h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 12h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td></td>
<td>Self study: 18h</td>
</tr>
</tbody>
</table>

**Description:**

Linear maps, calculation kernel and image and its dimensions. His performance for solving systems. vectors and eigenvalues.

1. Linear maps. Matrix associated with the linear map.
2. Image and kernel of a linear map. Rank Theorem.
3. Interpretation of a linear system in terms of a linear map.
4. Preimage of a vector.
### 4. Differential calculus

**Learning time:** 35h  
- Theory classes: 18h  
- Practical classes: 0h  
- Self study: 17h

**Description:**  
Regarding the functions of a real variable: Study of continuity, differentiability study and calculation of the tangent, the Taylor polynomial calculation, calculation of relative and absolute extreme.

1. Review of elementary functions.  
5. Extreme absolute and relative.

### 5. Integration calculus

**Learning time:** 32h  
- Theory classes: 12h  
- Practical classes: 0h  
- Self study: 20h

**Description:**  
Calculate change of variable primitives and parts. Calculation of integrals of rational functions. Rule Barrow.

1. Revision immediate calculation primitives. Change of variable and integration by parts.  
2. Primitives rational functions.  
3. Global defined as area. Barrow's rule.  
4. Applications to the calculation of areas and volumes.
Bibliography

Basic:


Complementary:

Boadas Elvira, Joan. Funcions reals d'una variable real [on line]. Vilanova i la Geltrú: Escola Universitària Politècnica de Vilanova i la Geltrú, Universitat Politècnica de Catalunya, 2001 [Consultation: 15/01/2015]. Available on:

Others resources: