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

To use of fundamental tools of differential calculus to study one variable functions, and the obtain approximations of functions by Taylor polynomial.

To understand the Fundamental Theorem of Integrative Calculus and its use to the solution of several problems.

To know and apply the numerical methods to calculate zeros and integrate numerically. To know machine precision and relative and absolute errors.

To know fundamental concepts and examples where to use vector spaces and linear maps.

To use free software to solve some applied problems.
### Study load

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

#### 1. Linear algebra

**Learning time:** 36h  
- Theory classes: 18h  
- Self study: 18h

**Description:**  
1. Vector spaces: To find out linear dependency/independency of vectors and calculate dimensions and basis of subspaces.  
2. Linear maps: how to calculate the kernel and image and dimensions, its interpretation to solve linear systems. Rotations.  
3. Use of linear algebra to geometric and model problems.

#### 2. Differential calculus

**Learning time:** 38h  
- Theory classes: 18h  
- Self study: 20h

**Description:**  
Real functions of one real variable: Study of continuity, study of derivability and tangent line calculus, errors and approximations, Taylor polynomial, calculus of relatives extremes, numerical methods to find zeros and use of Octave/Matlab.  
1. Review of elemental functions and piecewise functions.  
5. Application to the study of local functions: Extremes.  

#### 3. Integral calculus

**Learning time:** 28h  
- Theory classes: 14h  
- Self study: 14h

**Description:**  
Real functions of one real variable: Calculus of definite integrals by change of variables, by parts and of rational functions (Barrow rule). Numerical methods to calculate definite integrals and its application under Octave/Matlab platform.  
2. Definite integral by change of variable, by parts and of rational functions.  
3. Applications of definite integrals.  
Planning of activities

<table>
<thead>
<tr>
<th>TASK 1</th>
<th>Hours: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
<td></td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Individual written exam, the week of first exams, of content given until then.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TASK 2</th>
<th>Hours: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 2h</td>
<td></td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Continued evaluation of the rest of content given after Task 1 until the end of the course, done the last week of exams.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TASK 3</th>
<th>Hours: 20h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities: 20h</td>
<td></td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Evaluation non presentational that can consist of projects or/and tests via WIRIS platform.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TASK 4</th>
<th>Hours: 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory classes: 3h</td>
<td></td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Individual written final exam of all contents.</td>
<td></td>
</tr>
</tbody>
</table>

Qualification system

A1=mark Task 1, attended exam (all contents done until the middle period of exams)
A2=mark Task 2, attended exam (all contents done after the middle period of exams until the last period of exams)
A3=mark Task 3, evaluación continuada (all contents)
A4=mark Task 4, prova final (all contents)

The final mark is:

FINAL MARK = MAX (0.3*A1 + 0.3*A2 + 0.4*A3, 0.4*A3 + 0.6*A4)

where all qualifications are calculated over 10.

Task A4 will be reevaluated.
340021 - FOMA-N1O43 - Fundamentals of Mathematics

Bibliography

Basic:


Complementary:


Others resources: