Degree competences to which the subject contributes

Specific:

1. Capacity to solve mathematical problems that can appear in engineering. Aptitude to apply knowledge about:
   - linear algebra; geometry; differential geometry; differential and integral calculus;
   - differential equations and derived partial equations; numerical methods; numerical algorithm; statistics and optimisation.

Teaching methodology

There are 2 hours per week of "magistral lectures" (exposition of theoretical aspects), and 2 hours per week of "problem solving".

Learning objectives of the subject

At the end of the course, students should be able: 1) To apply the fundamental theorems of vector calculus; 2) To draw the phase portrait of 2D and 3D systems of linear ODEs with constant coefficients; 3) To determine the stability of some solutions of systems of nonlinear ODEs; and 4) To solve some basic PDEs (heat, waves, Laplace, etc.).

Study load

<table>
<thead>
<tr>
<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>
</tr>
<tr>
<td></td>
<td>Hours small group: 0h</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

### Vector Calculus

**Learning time:** 60h  
- Theory classes: 12h  
- Practical classes: 12h  
- Self study: 36h

**Description:**  
Line and surface integrals of functions and fields. Green, Stokes and Gauss theorems.

### Ordinary Differential Equations

**Learning time:** 50h  
- Theory classes: 10h  
- Practical classes: 10h  
- Self study: 30h

**Description:**  

### Partial Differential Equations

**Learning time:** 30h  
- Theory classes: 6h  
- Practical classes: 6h  
- Self study: 18h

**Description:**  

## Qualification system

A partial exam (EP), a final exam (EF) and a class exam (PC). The final score is the maximum between $0.1 \times PC + 0.3 \times EP + 0.6 \times EF$, and $0.4 \times EP + 0.6 \times EF$. The reevaluation exam is a single test and its score replaces any other previous score.

## Regulations for carrying out activities

In all exams, only a handwritten sheet can be used. The use of a calculator, a primitive table or other tables, and (of course) mobile phones or similar devices is not allowed. Changes of group are not allowed for the class exam.
240131 - Differential Equations

Bibliography

Basic:


Complementary:


Others resources:

https://mat-web.upc.edu/etseib/ed/