240131 - Differential Equations

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 749 - MAT - Department of Mathematics
Academic year: 2018
Degree: BACHELOR’S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Catalan, Spanish

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:
* to apply the fundamental theorems of Vector Calculus
* to solve, classify and draw the phase portrait of 2D and 3D systems of linear ODEs with constant coefficients
* to use the tools to determine the stability in some systems of nonlinear ODEs
* to solve some basic PDEs (wave, heat, Laplace/Poisson, etc)

Study load

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

<table>
<thead>
<tr>
<th>Module</th>
<th>Learning time:</th>
<th>Description:</th>
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<tbody>
<tr>
<td><strong>Vector Calculus</strong></td>
<td>65h</td>
<td>Line and surface integration of functions and vector fields. Integral theorems: Newton-Leibniz, Green, Gauss and Stokes.</td>
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### Qualification system

A partial exam (P), a final exam (F) and a practice exam (PC). The final score is 0.36*P+0.54*F+0.1*M. The reevaluation exam (R) is a single test and its score replaces the previous P and F scores, and hence the final score, in this case, becomes 0.9*R+0.1*M.

### Regulations for carrying out activities

In the partial and final exams, only a handwritten sheet can be used. For the practice exam, the allowed material will previously be announced. 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.
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Bibliography

Basic:


Complementary:


Others resources:

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