Course guide
240131 - 240131 - Differential Equations

Unit in charge: Barcelona School of Industrial Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2022  ECTS Credits: 6.0  Languages: Catalan, Spanish

LECTURER
Coordinating lecturer: PERE GUTIERREZ SERRES

Others:

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)
* to use software in order to obtain numerical approximations in problems from the previous items

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>60,0</td>
<td>40.00</td>
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Total learning time: 150 h
CONTENTS

Vector Calculus

Description:
Line and surface integration of functions and vector fields. Integral theorems: Newton-Leibniz, Green, Gauss and Stokes.

Related competencies:
CE1. 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.

Full-or-part-time: 65h
Theory classes: 13h
Practical classes: 13h
Self study: 39h

Ordinary Differential Equations (ODEs)

Description:

Related competencies:
CE1. 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.

Full-or-part-time: 60h
Theory classes: 12h
Practical classes: 12h
Self study: 36h

Partial Differential Equations (PDEs)

Description:

Related competencies:
CE1. 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.

Full-or-part-time: 25h
Theory classes: 5h
Practical classes: 5h
Self study: 15h

GRADING SYSTEM

A partial exam (EP), a final exam (EF) and a practice exam (M). The final score is 0.35*EP+0.55*EF+0.1*M. The reevaluation exam (R) is a single test and its score replaces the previous EP and EF scores, and hence the final score, in this case, becomes 0.9*R+0.1*M (to be maximized with the final score previously obtained).
EXAMINATION RULES.

In the partial and final exams, only a sheet made by oneself 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.

BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

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