220031 - DHAD - Helicopter and Aircraft Design

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 220 - ETSEIAT - Terrassa School of Industrial and Aeronautical Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 4,5
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: Jordi Ventosa
Aleix Baez

Degree competences to which the subject contributes

Specific:
1. GrEVA - An adequate understanding of the following, as applied to engineering: calculation methods for aeronautical design and development; the use of aerodynamic experimentation and the most important parameters in theoretical application; the experimental techniques, equipment and measuring instruments used in the discipline; simulation, design, analysis and interpretation of in-flight experiments and operations; aircraft maintenance and certification systems.
2. GrEVA - An adequate understanding of the following, as applied to engineering: aircraft systems and automatic flight control systems in aerospace vehicles.
3. GrEVA - Applied knowledge of aerodynamics, mechanics and thermodynamics, flight mechanics, aircraft engineering (fixed-wing and rotary-wing), structural theory.

Teaching methodology
Teaching methods basically fall into:
1. Theoretical contents in attended sessions, made with the help of presentations and / or other documents previously uploaded in Athena.
2. Practical exercises in attended sessions, for the direct application of the theory. Teacher proposes exercises and gives instructions for the students, so that autonomously they obtain the resolution. Shortly before the end of the class, the teacher gives the solution with the final results, so that students can compare their numerical values.
3. Teamwork assignments, in which a project is proposed, that students should develop out of class time.

Learning objectives of the subject

1. Understand and identify the different elements and systems comprising a rotary wing aircraft (mainly the helicopter).
2. Understand the physical principles that support the theory of rotary wing aircraft, in particular the momentum theory and the blade element theory.
3. Using the aforementioned theories, apply them properly in order to compute performance of rotary wing aircraft, as well as its stability and controllability.
4. Acquire knowledge that enables to carry out the preliminary design of a helicopter and justify techniques used on a particular design....
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group:</th>
<th>31h</th>
<th>27.56%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>14h</td>
<td>12.44%</td>
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<tr>
<td></td>
<td>Self study:</td>
<td>67h 30m</td>
<td>60.00%</td>
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## Content

<table>
<thead>
<tr>
<th>Module</th>
<th>Learning time</th>
<th>Description</th>
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</table>
| **Module 1: General Concepts and Description of Helicopters** | **3h 30m**    | Theory classes: **2h**  
|                                             |               | Self study: **1h 30m**  |
| **Module 2: Theoretical Fundamentals of Helicopters** | **35h**       | Theory classes: **9h**  
|                                             |               | Practical classes: **5h**  
|                                             |               | Self study: **21h**  |
| **Module 3: Helicopter Performance**         | **35h**       | Theory classes: **9h**  
|                                             |               | Practical classes: **5h**  
|                                             |               | Self study: **21h**  |
| **Module 4: Dynamics and Vibrations of Blades** | **19h**       | Theory classes: **5h**  
|                                             |               | Practical classes: **2h**  
|                                             |               | Self study: **12h**  |
| **Module 5: Stability and Control of Helicopters** | **16h**       | Theory classes: **4h**  
|                                             |               | Practical classes: **2h**  
|                                             |               | Self study: **10h**  |
**Qualification system**

42% Partial Exam.
42% Final Exam.
16% Teamwork assignment.

**Regulations for carrying out activities**

For both the partial and final exam, students can make use of a form under the conditions indicated in class and/or Athena.
In case of being unable to attend the partial exam or fail it, the student will have a second opportunity at the same day of the final exam.

**Bibliography**

**Basic:**


**Complementary:**


**Others resources:**

- Module 6: Preliminary Helicopter Design and Applicable Regulations
  - Learning time: 4h
    - Theory classes: 2h
    - Self study : 2h