220375 - Resistant Elements in Aeronautics

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 737 - RMEE - Department of Strength of Materials and Structural Engineering
Academic year: 2017
Degree: MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 3

Teaching languages: English

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Teaching staff
Coordinator: Roberto Flores

Teaching methodology
The program of the course is structured around three different kinds of activities:
1. Theoretical lectures.
2. Application lectures.
3. Examination sessions
During the theory lessons the students shall be introduced to the fundamentals of the subject under consideration.
During the application lessons the students will solve, with help from the teacher, problems illustrating the application of
the concepts taught during the theoretical lectures.
During the exams the students shall solve, on their own, application problems as a means of assessing their
understanding of the subject.

Learning objectives of the subject
- Introduce the students to the areas of classical mechanics and strength of materials in order to gain a basic
understanding of the loads experienced by aerospace vehicles.
- Describe the main characteristics and behavior of semi-monocoque structures.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 75h</th>
<th>Hours large group:</th>
<th>Self study:</th>
</tr>
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<tbody>
<tr>
<td>27h</td>
<td>48h</td>
<td>36.00%</td>
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## Content

| **Fundamentals of classical mechanics.** | **Learning time:** 35h  
Theory classes: 13h  
Self study: 22h |
|---|---|
| **Description:**  
- Force and moment equilibrium  
- Rigid body dynamics. Free body diagrams.  
- Relative motion. Principle of equivalence and inertial loads.  
| **Related activities:**  
- Theory lessons (Activity 1) where the basic concepts are laid out.  
- Application lectures (Activity 2) where problems are solved allowing the student to assess his progress.  
- Mid-term exam (Activity 3). |

| **Introduction to strength of materials** | **Learning time:** 29h  
Theory classes: 10h  
Self study: 19h |
|---|---|
| **Description:**  
- Concept of stress and strain.  
- Stress and strain tensors. Principal stresses and strains.  
- Linear elastic materials.  
- Equations of internal equilibrium.  
- Statically determinate and indeterminate structures.  
- Trusses and beams. Axial force, shear force, bending moment and torsion moment.  
- Generalized cross-sectional force diagrams for isostatic beams.  
| **Related activities:**  
- Theory lessons (Activity 1) where the basic concepts are laid out.  
- Application lectures (Activity 2) where problems are solved allowing the student to assess his progress.  
- Final exam (Activity 4). |

| **Introduction to the characteristics of aerospace structures** | **Learning time:** 11h  
Theory classes: 7h  
Self study: 4h |
|---|---|
| **Description:**  
- Introduction to the elastic instability of slender structures.  
- Morphology of semi-monocoque structures.  
| **Related activities:**  
- Theory lessons (Activity 1) where the basic concepts are laid out.  
- Final exam (Activity 4). |
Qualification system

The course grade will be computed averaging the grades of the two exams:
? Mid-term exam (50%)
? Final exam (50%)

Bibliography