Course guide
220032 - DA - Aeroplane Design

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 220 - ETSEIAT - Terrassa School of Industrial and Aeronautical Engineering.
Degree: BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Compulsory subject).
Academic year: 2022  ECTS Credits: 4.5  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: ESTER COMELLAS SANFELIU
Primer quadrimestre:
ESTER COMELLAS SANFELIU - Grup: 21

Others:

PRIOR SKILLS

The student must arrive with knowledge of aerodynamics, flight mechanics and aerospace structures. During the course, you must also apply concepts related to economics and materials science. It is also recommended that students master technical English as it will be used throughout the course.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
3. 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.
5. GrEVA - Applied knowledge of aerodynamics, mechanics and thermodynamics, flight mechanics, aircraft engineering (fixed-wing and rotary-wing), structural theory.

Transversal:
2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY

The teacher will review the fundamentals of airplane design in the expository classes. Students must have read the material and performed the preparatory activities indicated in Atenea. During practical sessions, the syllabus will be further worked on through the development of key aspects of the group assignment, which will consist in the conceptual design of an airplane.
LEARNING OBJECTIVES OF THE SUBJECT

The main objective of this course is to bring students to the different aspects of the Aircraft design:
2. Functional design of the different parts of an airplane. Integration and interferences.
3. Influence of the actions of the aircraft and aerodynamics in the design process.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>31.0</td>
<td>27.56</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>14.0</td>
<td>12.44</td>
</tr>
<tr>
<td>Self study</td>
<td>67.5</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 112.5 h

CONTENTS

**Introduction to airplane design**

**Description:**
Unit 1: History of flight  
Unit 2: Economical aspects  
Unit 3: Project phases  
Unit 4: General configuration

**Full-or-part-time:** 12h 30m  
Theory classes: 5h  
Practical classes: 3h  
Self study : 4h 30m

**Performances and global design**

**Description:**
Unit 5: Weight and balance of the aeroplane  
Unit 6: Methods for performance estimation  
Unit 7: Preliminary sizing  
Unit 8: Weight-range diagram  
Unit 9: Drag

**Full-or-part-time:** 40h  
Theory classes: 9h  
Practical classes: 4h  
Self study : 27h
Design of different functional blocks of an airplane

**Description:**
Unit 10: Fuselage design  
Unit 11: Wing design  
Unit 12: Tail design  
Unit 13: Landing gear design

**Full-or-part-time:** 43h  
Theory classes: 13h  
Practical classes: 5h  
Self study: 25h

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Structural design of airplanes

**Description:**
Unit 14: Loads on the airplane  
Unit 15: Airframe design

**Full-or-part-time:** 17h  
Theory classes: 4h  
Practical classes: 2h  
Self study: 11h

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**ACTIVITIES**

**Graded activities**

**Description:**
Graded activities that will be done throughout the course via Atenea and in the theoretical sessions in class.

**Specific objectives:**
Incentivate the preparation of material required previous to each theoretical session. Encourage autonomous learning.

**Delivery:**
Dates to be agreed at the beginning of the course.

**Full-or-part-time:** 17h 30m  
Theory classes: 2h  
Self study: 15h 30m
### Mid term assignment delivery

**Description:**
First delivery of the assignment.

**Specific objectives:**
Assess the knowledge of modules 1 and 2. Encourage autonomous learning.

**Delivery:**
Date to be agreed at the beginning of the course.

**Related competencies:**
- CE26-GREVA. GrEVA - Applied knowledge of aerodynamics, mechanics and thermodynamics, flight mechanics, aircraft engineering (fixed-wing and rotary-wing), structural theory.
- CE25-GREVA. 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.
- 06 URI N3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

**Full-or-part-time:** 22h
Self study: 22h

### End term assignment delivery

**Description:**
End term assignment delivery.

**Specific objectives:**
Assess the knowledge of modules 3 and 4. Encourage autonomous learning.

**Delivery:**
Date to be agreed at the beginning of the course.

**Related competencies:**
- CE26-GREVA. GrEVA - Applied knowledge of aerodynamics, mechanics and thermodynamics, flight mechanics, aircraft engineering (fixed-wing and rotary-wing), structural theory.
- CE25-GREVA. 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.
- 06 URI N3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

**Full-or-part-time:** 22h
Self study: 22h
**Defense of group assignment**

**Description:**
Each student will participate in at least one presentation of the assignment done in groups, where they will have to synthesize and defend the work done.

**Delivery:**
Date to be agreed at the beginning of the course.

**Full-or-part-time:** 12h
- Theory classes: 4h
- Self study: 8h

**In-person sessions**

**Full-or-part-time:** 39h
- Theory classes: 25h
- Practical classes: 14h

**GRADING SYSTEM**

The grading system will consist of the graded activities completed throughout the course, a group assignment and two presentations of the group assignment. In the mid terms, the assignment (with the theory explained so far) and an oral presentation will be evaluated. At the end, the complete assignment will be delivered and a second presentation will be made. Each student must at least present once, either in mid term or at the end.

The evaluation final consists of the midterm hand-in of the group assignment 20%, the final hand-in of the group assignment 50%, the individual grade of the presentation 20% and the mean of the graded activities 15%.

**BIBLIOGRAPHY**

**Basic:**

**Complementary:**