Course guide
220008 - ENIA - Airspace, Air Navigation and Infrastructure

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 TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).
BACHELOR’S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2022  ECTS Credits: 4.5  Languages: Catalan

LECTURER

Coordinating lecturer: Enrique García Melendo
Others: Jon Tugores, Xavier Roca, Joan Antoni Castillo

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. GrETA/GrEVA - An overall understanding of air navigation systems and the complexity of air traffic
CE13. GrETA/GrEVA - An understanding of the uniqueness of airports in terms of infrastructure, structures and operation
CE14. GrETA/GrEVA - An understanding of air transport systems and coordination with other modes of transport.
CE17-GRETA. GrETA/GrEVA - An adequate understanding of the following, as applied to engineering: fundamental elements of the various types of aircraft; functional elements of air navigation systems and related electrical and electronic installations; the basics of the design and construction of airports and their various elements

Basic:
CB05-GRETA. That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

TEACHING METHODOLOGY

In the theoretical classes teachers will explain concepts, methods and results, showing them with some examples to facilitate understanding.
The sessions in the classrooms the teacher guide the student in applying theoretical concepts to workgroup.

LEARNING OBJECTIVES OF THE SUBJECT

Know the organization of the air transport system and air navigation system, their rules and the institutions that regulate these systems, and the elements of the air navigation and their relationship with the airport.
Particularly, to understand the air space structure, the instrumental navigation techniques, the procedures used by airplanes in the controlled air space, the navigations aids and their relationship with the airport both from standpoint of design and operation.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>67,5</td>
<td>60.00</td>
</tr>
<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>
</tbody>
</table>

Total learning time: 112.5 h
# CONTENTS

1. Introduction to air navigation

**Description:**
1.1 Definitions
1.2 History
1.3 Air navigation techniques

**Related activities:**
Theory lectures

**Full-or-part-time:** 10h
Theory classes: 2h
Self study : 8h

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2. Flight basic instruments

**Description:**
2.1 Anemometer, altimeter and vertical speed indicator
2.2 Attitude indicator, artificial horizon and direction indicator
2.3 Others

**Related activities:**
Theory and practice lectures

**Full-or-part-time:** 11h
Theory classes: 3h
Practical classes: 2h
Self study : 6h

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3. Institutional framework

**Description:**
3.1 Basic regulation
3.2 National agencies
3.3 International agencies

**Related activities:**
Theory lectures

**Full-or-part-time:** 9h
Theory classes: 2h
Self study : 7h
4. Air navigation systems

**Description:**
- 4.1 Visual flight
- 4.2 Instrumental flight with VORD/DME
- 4.3 Instrumental flight with NDB
- 4.4 Instrumental flight with ILS
- 4.5 Onboard Systems (ACAS, GPWS)
- 4.6 Autonomous systems (INS)

**Related activities:**
Theory and practice lectures

**Full-or-part-time:** 18h 30m
- Theory classes: 7h
- Practical classes: 4h
- Self study: 7h 30m

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5. Airspace

**Description:**
- 5.1 Division of the airspace
- 5.2 Classification of the airspace

**Related activities:**
Theory lectures

**Full-or-part-time:** 16h
- Theory classes: 4h
- Self study: 12h

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6. Navigational charts, flight plans and weather service

**Description:**
- 6.1 Navigational charts
- 6.2 Flight plans
- 6.3 Weather service

**Related activities:**
Theory and practice lectures

**Full-or-part-time:** 11h
- Theory classes: 3h
- Practical classes: 2h
- Self study: 6h
7. Air navigation services

**Description:**
7.1 Air Traffic Control service (ATC)
7.2 Flight Information Service (FIS)
7.3 Advisory Service
7.4 Alert Service

**Related activities:**
Theory lectures

**Full-or-part-time:** 10h
Theory classes: 2h
Self study: 8h

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8. Special activities in airspace

**Description:**
8.1 UAV

**Related activities:**
Theory and practice lectures

**Full-or-part-time:** 14h
Theory classes: 4h
Practical classes: 2h
Self study: 8h

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9. Airport infrastructures

**Description:**
9.1 Construction of airport infrastructure
9.2 Examples of airport infrastructure

**Related activities:**
Theory lectures

**Full-or-part-time:** 13h
Theory classes: 4h
Practical classes: 4h
Self study: 5h
# ACTIVITIES

## 1. Theory/practice classes

**Description:**
Pre and post lecture preparation and class attendance. Class demonstrations with software support to perform flight simulations.

**Specific objectives:**
Transferring the necessary knowledge for a correct interpretation of the developed contents during theory sessions, and answers to questions related to the course syllabus.

**Material:**
1. Recommended textbooks found in the course bibliography
2. Related technical articles.

**Delivery:**
This activity is related to midterm and final exams

**Full-or-part-time:** 105h
- Theory classes: 23h 30m
- Practical classes: 14h
- Self study: 67h 30m

## 2. Airport infrastructure practice session

**Description:**
Practice session performed in classroom related to airport infrastructures

**Specific objectives:**
To extend the presented contents in the theory sessions.

**Material:**
Support webpages

**Delivery:**
Students will develop a practice in classroom with the professor's support. Assessment of this activity will be a 10% of the final grade.

**Full-or-part-time:** 1h 30m
- Theory classes: 1h 30m

## 4. Mid-term exam

**Full-or-part-time:** 3h
- Theory classes: 3h
4. Final exam

Description:
It will consist on an individual exam in the classroom.

Specific objectives:
To develope and show the knowledge acquired during theory and practice sessions.

Material:
Exam statement

Delivery:
Resolved exam on the exam statements handed out to the student.

Full-or-part-time: 3h
Theory classes: 3h

GRADING SYSTEM

The final grade is the sum of the following grades:

\[
\text{Final grade} = 0.1 \times \text{Act} + 0.45 \times \text{ExPar} + 0.45 \times \text{ExFinal}
\]

Act: grade of the infrastructures report
ExPar: midterm exam grade
ExFinal: final exam grade

Students who did not take the midterm exam, or want to improve the grade obtained in the midterm exam, will have the option to improve or recover the result in the final exam. In this case the final grade will be:

\[
\text{Final grade} = 0.45 \times \text{Max} \left[ \text{ExPar}, (0.8 \times \text{ExRec} + 0.2 \times \text{ExPar1}) \right] + 0.45 \times \text{ExFinal} + 0.1 \times \text{Act}
\]

ExRec = Recovery exam.
Max = Maximum.

In other words, the midterm mark will improve as long as it is higher.

EXAMINATION RULES.

Except at the exam, the teacher is available to be consulted and it's possible to discuss the activities with the other students. A forum in ATENEA is enable to discuss and share information between the students or to ask for help from other students.

BIBLIOGRAPHY

Basic:

Complementary:

RESOURCES

Hyperlink:
- www.eurocontrol.int. Eurocontrol
- www.icao.int. International Civil Aviation Organization
- www.aena.es. Aeropuertos Españoles y Navegación Aérea
- www.esa.int. European Space Agency