Degree competences to which the subject contributes

Specific:
1. CE 9 AERO. Comprender la globalidad del sistema de navegación aérea y la complejidad del tráfico aéreo. (CIN/308/2009, BOE 18.2.2009)

Transversal:
2. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.
3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Teaching methodology

Exposition classes and activities

Learning objectives of the subject

At the end of the course the student should be able to:
- Explain the meaning of 4D trajectories, network operations, SWIM, CDM and traffic synchronization.
- Identify novelties and contributions in research articles on ATM.
- Use/develop evaluation tools to measure the efficiency of the air space.
- Determine, from SESAR official documents, the advantages and inconveniences of the different research contributions.
- Sintetize in a research paper some novel ideas on air traffic management, apply methods to test the ideas and present the results.
### Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours large group:</th>
<th>Hours small group:</th>
<th>Guided activities:</th>
<th>Self study:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong></td>
<td>150h</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>26h</td>
<td>26h</td>
<td>14h</td>
<td>84h</td>
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<tr>
<td></td>
<td>17.33%</td>
<td>17.33%</td>
<td>9.33%</td>
<td>56.00%</td>
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</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>(ENG) Introduction to research</th>
<th>Learning time: 9h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 5h</td>
</tr>
<tr>
<td>Related activities:</td>
<td>(ENG) A0, A1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(ENG) Organization of SESAR JU</th>
<th>Learning time: 3h 30m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 2h 30m</td>
</tr>
<tr>
<td>Description:</td>
<td>(ENG) Institutions involved in the Joint Undertaking. Budget. Projects. Stakeholders</td>
</tr>
<tr>
<td>Related activities:</td>
<td>(ENG) A0, E1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(ENG) Current and future air traffic</th>
<th>Learning time: 24h 30m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td></td>
<td>Self study: 14h 30m</td>
</tr>
<tr>
<td>Related activities:</td>
<td>(ENG) A0, A2, A3, E1</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>(ENG) Complexity theory</th>
<th>Learning time: 13h 30m</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 8h 30m</td>
</tr>
<tr>
<td>Description:</td>
<td>(ENG) Emerging behaviours. Complexity models. Simulation.</td>
</tr>
<tr>
<td>Related activities:</td>
<td>(ENG) A0, A4, E1</td>
</tr>
</tbody>
</table>
### Functional Airspace Blocks

**Description:**
(ENG) Dynamic sectorization

**Related activities:**
(ENG) A0, A5, E2

**Learning time:** 24h 30m
- Theory classes: 4h
- Laboratory classes: 4h
- Guided activities: 2h
- Self study: 14h 30m

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### Business Trajectory Management

**Description:**

**Related activities:**
(ENG) A0, A6, E2

**Learning time:** 19h 30m
- Theory classes: 1h
- Laboratory classes: 4h
- Guided activities: 2h
- Self study: 12h 30m

---

### Flight Synchronization

**Description:**
(ENG) Contracts for trajectory execution. Controlled Time of Arrivals/Over. Multiples TCA/TCOs

**Related activities:**
(ENG) A0, A6, E2

**Learning time:** 21h 30m
- Theory classes: 3h
- Laboratory classes: 4h
- Guided activities: 2h
- Self study: 12h 30m
### (ENG) Ground flight information systems

**Learning time:** 8h 30m  
Theory classes: 6h  
Self study: 2h 30m  

**Description:**  
(ENG) Aeronautical datalinks: air/air, air/ground, ground/ground. Information systems. Tools for collaborative decision.  

**Related activities:**  
(ENG) A0, E1

### (ENG) Conflict Automation

**Learning time:** 22h 30m  
Theory classes: 4h  
Laboratory classes: 4h  
Guided activities: 2h  
Self study: 12h 30m  

**Description:**  

**Related activities:**  
(ENG) A0, A6, E2
## Planning of activities

<table>
<thead>
<tr>
<th></th>
<th>Hours: 26h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0</td>
<td>Theory classes: 26h</td>
</tr>
</tbody>
</table>

### Description:
Attend to lectures

### Support materials:
Slides

### Descriptions of the assignments due and their relation to the assessment:
none

### Specific objectives:
Theory

<table>
<thead>
<tr>
<th></th>
<th>Hours: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
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<tr>
<td></td>
<td>Guided activities: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 5h</td>
</tr>
</tbody>
</table>

### Description:
Research activity

### Support materials:
Atenea

### Descriptions of the assignments due and their relation to the assessment:
D1 (5%)

### Specific objectives:
Practic knowledge

<table>
<thead>
<tr>
<th></th>
<th>Hours: 9h</th>
</tr>
</thead>
<tbody>
<tr>
<td>A2</td>
<td>Laboratory classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 1h</td>
</tr>
<tr>
<td></td>
<td>Self study: 6h</td>
</tr>
</tbody>
</table>

### Description:
Flight Data Parsing

### Support materials:
Atenea

### Descriptions of the assignments due and their relation to the assessment:
D2 (5%)

### Specific objectives:
Data processing
### A3

<table>
<thead>
<tr>
<th>Hours</th>
<th>9h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laborary classes</td>
<td>2h</td>
</tr>
<tr>
<td>Guided activities</td>
<td>1h</td>
</tr>
<tr>
<td>Self study</td>
<td>6h</td>
</tr>
</tbody>
</table>

**Description:**
Airspace performance indicators

**Support materials:**
Same as A2

**Descriptions of the assignments due and their relation to the assessment:**
D3 (5%)

**Specific objectives:**
Data processing and validation

### A4

<table>
<thead>
<tr>
<th>Hours</th>
<th>9h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laborary classes</td>
<td>2h</td>
</tr>
<tr>
<td>Guided activities</td>
<td>1h</td>
</tr>
<tr>
<td>Self study</td>
<td>6h</td>
</tr>
</tbody>
</table>

**Description:**
Network Simulations

**Support materials:**
Same as A2 plus processing tool

**Descriptions of the assignments due and their relation to the assessment:**
D4 (5%)

**Specific objectives:**
Learning of processing tool

### A5

<table>
<thead>
<tr>
<th>Hours</th>
<th>21h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laborary classes</td>
<td>6h</td>
</tr>
<tr>
<td>Guided activities</td>
<td>3h</td>
</tr>
<tr>
<td>Self study</td>
<td>12h</td>
</tr>
</tbody>
</table>

**Description:**
Practice of dynamic sectoring

**Support materials:**
Atenea

**Descriptions of the assignments due and their relation to the assessment:**
D5 (15%)

**Specific objectives:**
Practics and Theoretical knowledge. CE9
### A6
**Description:**
Project on future ATM

**Support materials:**
Atenea

**Descriptions of the assignments due and their relation to the assessment:**
D6 (25%)

**Specific objectives:**
Practic and theoretic knowledge. CE9.

**Hours:** 48h
- Laboratory classes: 12h
- Guided activities: 6h
- Self study: 30h

### E1
**Description:**
Exam 1

**Support materials:**
Bibliography

**Descriptions of the assignments due and their relation to the assessment:**
C1 (20%)

**Specific objectives:**
Validation of acquired knowledge

**Hours:** 10h
- Self study: 10h

### E2
**Description:**

**Support materials:**

**Descriptions of the assignments due and their relation to the assessment:**

**Specific objectives:**

**Hours:** 10h
- Self study: 10h

---

**Qualification system**
weighted mean within activities

**Regulations for carrying out activities**
Individual
Bibliography

Basic: