19388 - AW - Aviation Weather

**Coordinating unit:** 300 - EETAC - Castelldefels School of Telecommunications and Aerospace Engineering  
**Teaching unit:** 748 - FIS - Department of Physics  
**Academic year:** 2019  
**Degree:** MASTER'S DEGREE IN AEROSPACE SCIENCE AND TECHNOLOGY (Syllabus 2015). (Teaching unit Optional)  
**ECTS credits:** 5  
**Teaching languages:** English

**Teaching staff**

**Coordinator:** Defined at the EETAC web page

**Prior skills**

To be able to operate with the concepts and laws of mechanics, thermodynamics and fluid mechanics.

To be able to operate in differential and integral calculus of vector fields.

**Degree competences to which the subject contributes**

**Basic:**
- CB6. (ENG) CB6 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.
- CB10. (ENG) CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.
- CB7. (ENG) CB7 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio.
- CB8. (ENG) CB8 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios.
- CB9. (ENG) CB9 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.

**Specific:**
- CE4 MAST. (ENG) CE4: Aplicar el método científico para el estudio de la fenomenología particular del ambiente aeroespacial.

**Transversal:**
- CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.
- CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.

**Teaching methodology**

The contents of the course will be explained by theoretical lessons combining blackboard and slides and practical exercises

**Learning objectives of the subject**

At the end of the course, the student should be able to:
- Identify the different layers of the atmosphere and their main characteristics, the atmospheric composition and
atmospheric phenomena in the troposphere.
- To define the fundamental physical variables: pressure, humidity, density, and temperature that drives atmospheric dynamics.
- Understand the thermal equilibrium, the radiative balance and stability of the atmosphere and apply them to flying conditions.
- Understand the origin of the horizontal and vertical movements of the air and how they affect to aviation.
- Understand the importance of water vapour in the atmosphere, its measurement, phase changes, and the formation of fog and clouds, and its influence on aviation.
- Understand the physics of clouds, and to be able to identify the 10 basic types, and associated weather phenomena.
- Know how precipitation occurs and how thunderstorms are formed and develop.
- Know the main hazards affecting aviation: CAT, icing, visibility, turbulence and how to forecast and avoid them.
- Understand the basics of general circulation and synoptic meteorology.
- Be able to understand and explain METARs, SIGMETs, significant weather charts.
- To understand the meteorological aspects of flight planning.

<table>
<thead>
<tr>
<th>Study load</th>
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<tbody>
<tr>
<td><strong>Total learning time:</strong> 125h</td>
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<tr>
<td>Hours large group:</td>
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<tr>
<td>Hours medium group:</td>
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<tr>
<td>Hours small group:</td>
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<tr>
<td>Guided activities:</td>
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<tr>
<td>Self study:</td>
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# Introduction

**Learning time:** 11h  
*Theory classes: 3h*  
*Self study: 8h*

**Description:**  
- Presentation and previous concepts. Meteorological scales. Importance of meteorology and climatology in aviation.  
- Definition, structure and composition of the atmosphere.  
- Main variables used to study the atmosphere: temperature, pressure, density, wind speed and direction. Units of measurement.  
- International Standard Atmosphere. The hydrostatic approximation.  

# Heat, stability and atmospheric dynamics

**Learning time:** 32h  
*Theory classes: 10h*  
*Guided activities: 2h*  
*Self study: 20h*

**Description:**  
- Turbulence and winds in the atmosphere. Different types of wind depending on their horizontal scale: micro and mesoscale systems.  
- Altimeter settings on a plane or airport. Problems and relation with atmospheric pressure and temperature.  
- Main isobaric features: cyclones, anticyclone, ridge, trough  
- Wind shear. CATs

# Water in the atmosphere: humidity, clouds and precipitation

**Learning time:** 24h  
*Theory classes: 6h*  
*Guided activities: 2h*  
*Self study: 16h*

**Description:**  
- Water vapor in the atmosphere: pressure, condensation. Definitions of humidity.  
- Stability of the saturated air. Cloud formation.  
- Clouds classification: description, observation keys, and influence to the flight conditions. Cloud base and ceiling. Main weather phenomena associated to clouds. Condensation trails.  
- Thunderstorms.
## General circulation and synoptic meteorology

**Learning time:** 18h

- **Theory classes:** 4h
- **Guided activities:** 2h
- **Self study:** 12h

### Description:
- Geostrophic wind, gradient wind.
- Air masses: origin and effect on the weather.
- Fronts: types, associated precipitation and flight conditions.

## Meteorological information for aviation

**Learning time:** 19h

- **Theory classes:** 4h
- **Guided activities:** 3h
- **Self study:** 12h

### Description:
- Message and local reports: METAR, SPECI, TAF, SIGMET.
- Significant weather maps.
- Flight plans.
- Weather forecast from numerical models.

## Meteorological hazards for aviation

**Learning time:** 21h

- **Theory classes:** 8h
- **Guided activities:** 1h
- **Self study:** 12h

### Description:
- Visibility. Causes of atmospheric obscurity
- Differentiate between the different types of visibility: horizontal visibility, slant visibility, prevailing visibility, RVR
- Icing: Definition, formation and types of icing.
- Significance of both hazards to aviation.
- Turbulence at low levels. Definition. Orographic waves, rotors, wind shear.
- CAT
- Thunderstorms and severe weather.
- Relation of meteorological hazards on fly phases.
- Climate change and aviation: influence and impacts of climate change on aviation.

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**Qualification system**

It will be defined in the EETAC web page
### Regulations for carrying out activities

All the activities to be evaluated are compulsory. Any exam or deliverable not presented on time will be evaluated with a zero mark. All the evaluations are individual.

### Bibliography

**Basic:**


**Complementary:**
