PROFESSORAT

Professorat responsable: JUAN PEDRO MELLADO GONZALEZ

CAPACITATS PRÈVIES

Basic knowledge of thermodynamics and fluid mechanics is required. Basic knowledge of calculus, algebra and mathematical analysis is required.

METODOLOGIES DOCENTS

Each session consists of a theoretical part and a practical part. In the practical part, a set of small exercises will be solved and discussed in class to fix the main ideas and concepts of the session. The take-home assignments will also be discussed during this practical part, when needed. The course material will be the course slides, audiovisual material, and a small set of simulation and observational data to illustrate the analysis approaches described in the course.

OBJECTIUS D’APRENETATGE DE L’ASSIGNATURA

This course is an introduction to meteorology and its importance in aerospace science and engineering.

At the end of the course, the student will be able
- to understand the structure and composition of the atmosphere,
- to understand atmospheric dynamics, both horizontal motions (advection, geostrophic wind, gradient wind, thermal winds) and vertical motions (convection, turbulence) and how they affect to navigation,
- to understand the importance of water in the atmosphere (water vapor, fog and cloud formation, precipitation) and his influence on navigation and surface operations,
- to understand the factors and hazards that affect navigation (icing, visibility, turbulence), the prevention tools and risk minimization.

HORES TOTALS DE DEDICACIÓ DE L’ESTUDIANTAT

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Dedicació total: 75 h
# Module 1: Introduction, structure of the atmosphere and energy budget

**Descripció:**
- Importance of meteorology and climatology in aviation.
- Structure and composition of the atmosphere. Characteristic properties: temperature, pressure, density, wind speed and direction. Units of measurement.
- Characteristic scales. The hydrostatic approximation.
- International Standard Atmosphere.
- Thermal equilibrium of the atmosphere.
- The greenhouse effect.

**Dedicació:** 12h 30m  
Grup gran/Teoria: 5h  
Aprentatge autònom: 7h 30m

# Module 2: Atmospheric dynamics

**Descripció:**
- Turbulence and wind. 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. Clear air turbulence (CAT).

**Dedicació:** 25h  
Grup gran/Teoria: 10h  
Aprentatge autònom: 15h

# Module 3: Water in the atmosphere

**Descripció:**
- Water vapor in the atmosphere. Phase change. 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.

**Dedicació:** 12h 30m  
Grup gran/Teoria: 5h  
Aprentatge autònom: 7h 30m
Module 4: General circulation and synoptic meteorology

Descripció:
- The global atmospheric circulation. Major features: cells, belts, jet stream, Rossby waves. Distribution of areas of low and high pressure. Cyclones and anticyclones.
- Geostrophic wind, gradient wind.
- Air masses: origin and effect on the weather.
- Fronts: types, associated precipitation and flight conditions.

Dedicació: 12h 30m
Grup gran/Teoria: 5h
Aprenetatge autònom: 7h 30m

Module 5: Aeronautical applications

Descripció:
Meteorological hazards for aviation:
- Icing: Definition, formation and types of icing.
- Turbulence at low levels. Definition. Orographic waves, rotors, wind shear, CAT.
- Thunderstorms and severe weather.
- Relation of meteorological hazards on flight phases.
- Climate change and aviation: influence and impacts of climate change on aviation.

Meteorological information for aviation:
- Message and local reports: METAR, SPECI, TAF, SIGMET.
- Significant weather maps.

Dedicació: 12h 30m
Grup gran/Teoria: 5h
Aprenetatge autònom: 7h 30m

SISTEMA DE QUALIFICACIÓ

5 take-home assignments (each assignment contributes 20% to the final grade).

In case of failing, the grade will be based on one additional written in-class exam on the date fixed in the calendar of final exams. The grade obtained in the additional written in-class exam will range between 0 and 10 and will replace that of the course based on the take-home assignments.

BIBLIOGRAFIA

Bàsica:

Complementària: