



## Guia docent (provisional) ACMATM - Advanced concepts and models for ATM

Última modificació: 14/05/2021

**Unitat responsable:** Escola d'Enginyeria de Telecomunicació i Aeroespacial de Castelldefels  
**Unitat que imparteix:** 748 - FIS - Departament de Física.

**Titulació:** MASTER EN ENGINYERIA AERONÀUTICA (Pla 20XX). (Assignatura obligatòria).

**Curs:** 2021      **Crèdits ECTS:** 5.0      **Idiomes:** Anglès

### PROFESSORAT

---

**Professorat responsable:** Adeline de Villardi de Montlaur

### CAPACITATS PRÈVIES

---

Previous concepts include knowledge of Air Traffic Management and optimization methods, given in any bachelor's degree in aerospace engineering and reviewed in previous subjects of this Master's degree, as well as familiarity with the use of computing tools for engineering. Familiarity with at least one computer language (C, Matlab, Python...) is required.

### REQUISITS

---

Concepts seen in 220309 - Transport Aeri i Sistemes de Navegació  
([https://www.upc.edu/estudis/pdf/guia\\_docent.php?codi=220309&idioma=en](https://www.upc.edu/estudis/pdf/guia_docent.php?codi=220309&idioma=en))

### COMPETÈNCIES DE LA TITULACIÓ A LES QUALS CONTRIBUEIX L'ASSIGNATURA

---

#### Específiques:

**CEEaeronav2:** Modelar, analizar y diseñar diferentes estrategias y algoritmos para el diseño del espacio aéreo, la gestión del equilibrio entre demanda y capacidad y la provisión de servicios de tránsito aéreo.

#### Genèriques:

#### Transversals:

## METODOLOGIES DOCENTS

---

The course combines the following teaching methodologies:

- Theory classes.
- Autonomous learning: students will study using self-learning material.
- Cooperative learning: students will form small group (2-4 people) to fulfill some of the activities of the course.
- Project based learning: students will build a small team project (3-4 people).

Directed learning hours will consist in exercises and practical examples, after the theory classes in which the professor exposes the content of the subject. With the directed learning hours, the students will be motivated to participate actively in their education and to complete the knowledge acquired during theory classes, usually with the help of computers.

## OBJECTIUS D'APRENENTATGE DE L'ASSIGNATURA

---

In this course, new worldwide air traffic management systems, already developed or in the process of development will be presented. Some optimization techniques and operative research techniques used in the field will be proposed, as well as modeling and optimization techniques.

At the end of the course, the student will be able to:

- . identify current ATM challenges,
- . identify metrics, key performance areas and indicators relevant to the field,
- . model ATM problems using mathematical techniques, and choose the most adequate optimization technique,
- . validate research techniques related to air traffic management and air traffic control.

## HORES TOTS DE DEDICACIÓ DE L'ESTUDIANTAT

---

Tipus	Hores	Percentatge
Hores aprenentatge autònom	80,0	64.00
Hores grup gran	30,0	24.00
Hores grup petit	15,0	12.00

**Dedicació total:** 125 h



## CONTINGUTS

### Introduction and review of new ATM concepts

**Descripció:**

- Harmonization of SESAR + NextGen
- Rest of the world (Onesky etc)
- Relevance of TBO and CDM

**Dedicació:** 6h

Grup gran/Teoria: 2h

Grup petit/Laboratori: 1h

Aprentatge autònom: 3h

### Advanced concepts and models

**Descripció:**

- Air traffic flow management (ATFM):
  - From Ration by schedule (RBS) to ground holding problem (GHP),
  - Collaborative trajectory options (CTOP)
  - Advanced demand and capacity balancing (A-DCB)
- Airspace management: DAC (dynamic airspace configuration, Flight-centric air traffic control (ATC), etc).
- Air traffic services (ATS): Conflict detection and resolution algorithms, Airspace capacity modelling, Integrated network and ATC planning (INAP), etc.
- User driven prioritisation processes

**Dedicació:** 31h

Grup gran/Teoria: 8h

Grup mitjà/Pràctiques: 3h

Aprentatge autònom: 20h

### ATM Performance

**Descripció:**

- ATM performance measurement, monitoring and target setting.
- ATM key performance areas (KPAs) and (key) performance indicators -(K)PI

**Dedicació:** 16h

Grup gran/Teoria: 8h

Aprentatge autònom: 8h



## Project

### Descripció:

Working in groups, the students will perform a literature review to select a current ATM challenge and will develop an algorithm to propose a solution to it. Focus will be made on identifying the problem, extracting realistic data, choosing the best method to solve it, validating the model and correctly extracting results, statistics and conclusions. Sustainability criteria will also be taken into account in the development of the solution.

**Dedicació:** 72h Grup  
gran/Teoria: 12h  
Grup petit/Laboratori: 11h  
Aprentatge autònom: 49h

## SISTEMA DE QUALIFICACIÓ

---

Class participation and class exercises: 15%

Assignments and short presentations: 30%

Project: 55%