Course guide
300086 - ACATM - Advanced Concepts and Models for ATM

Last modified: 06/06/2024

Unit in charge: Castelldefels School of Telecommunications and Aerospace Engineering
Teaching unit: 748 - FIS - Department of Physics.

Degree: MASTER'S DEGREE IN AERONAUTICAL ENGINEERING (Syllabus 2014). (Optional subject).

Academic year: 2024 **ECTS Credits:** 5.0 **Languages:** English

LECTURER

Coordinating lecturer: Adeline de Villardi de Montlaur

Others:

PRIOR SKILLS

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.

REQUIREMENTS

220309 Air transport and Navigation Systems

TEACHING METHODOLOGY

Specific competence:

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.

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.

LEARNING OBJECTIVES OF THE SUBJECT

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.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	24.00
Self study	80,0	64.00
Hours small group	15,0	12.00

Total learning time: 125 h

CONTENTS

Introduction and review of new ATM concepts

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

Full-or-part-time: 6h
Theory classes: 2h
Laboratory classes: 1h
Self study : 3h

Advanced concepts and models

Description:
- 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

Full-or-part-time: 31h
Theory classes: 8h
Laboratory classes: 3h
Self study : 20h

ATM Performance

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

Full-or-part-time: 16h
Theory classes: 8h
Self study : 8h

Project

Description:
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.

Full-or-part-time: 72h
Theory classes: 12h
Laboratory classes: 11h
Self study : 49h

GRADING SYSTEM

Class participation and class exercises: 15%
Assignments and short presentations: 30%
Project: 55%