

1. DATOS BÁSICOS

Subject	Certification and Maintenance of Aerospace Vehicles
Degree	Degree in Aerospace Engineering (Aircraft)
School/Faculty	School of Architecture, Engineering and Design
Course	Third
ECTS	6 ECTS
Type	Requested by degree
Language	English
Mode	Face to face
Semester	First semester
Academic Course	2020/2021
Teacher/Coordinator	Rafael Pax

2. INTRODUCTION

The subject “Maintenance and Certification of Aerospace Vehicles” is a required subject within the curriculum of the Degree in Aerospace Engineering at the European University of Madrid.

In order to ensure the safety of an aerospace vehicle, the three pillars of Design/Manufacturing, Operation, and Maintenance must be ensured, in compliance with specific Regulations. Except for the Operation, this course covers both Initial Airworthiness (Design/Manufacturing) and Continuous/Continuing Airworthiness (generically Maintenance). Both have to be demonstrated to the Aeronautical Authority, to be able to fly.

This Regulation provides requirements whose means of compliance require the knowledge of almost all the aeronautical engineering subjects. In this course the student is provided with the necessary knowledge to understand the reason for each requirement of the Regulations, and thus be able to develop and apply technical solutions that will comply with it. Interrelation with the organization and management of aeronautical companies is also provided in the course along with a review of Maintenance plans

The subject belongs to the module of "Aerospace vehicles II":

- Aeronautical Structures 6 ECTS (third year)
- Aerodynamics and Aeroelasticity 6 ECTS (third year)
- Space Vehicles and Missiles 6 ECTS (third year)
- Flight Mechanics 6 ECTS (third year)
- Aerospace Vehicle Maintenance and Certification 6 ECTS (third year)
- Aircraft design 6 ECTS (fourth year)

3. COMPETENCES and LEARNING OUTCOMES

Core competences:

- CB4: To allow students to communicate information, ideas, problems and solutions both to a specialized and non-specialized audience

Cross-curricular competences:

- CT3. Installation, operation and maintenance in the field of Aeronautical Engineering, in accordance with the acquiring knowledge as published in paragraph 5 of the Ministerial order CIN/308/2009, aerospace vehicles.
- CT4. Validation and certification in field of Aeronautical Engineering, in accordance with the acquiring knowledge as published in paragraph 5 of the Ministerial order CIN/308/2009, aerospace vehicles.
- CT5 Capacity to conduct activities of Design, Technical management, Expertise, writing Reports, Inspections, provide technical opinions and suggestions on tasks related to the aeronautical engineering field, in typical aerospace assignment position
- CT6: Capacity to participate in test flights to take measurements of take-off distance, lift velocity, stall velocity, maneuverability, and landing performances.
- CT7: Capacity to analyze and assess the social and environmental impact of the technical solutions.

Specific competences:

- CE21: Adequate and applied knowledge to engineering field: Fundamentals of sustainability, maintainability, and operability of aerospace vehicles..
- CE25: Adequate and applied knowledge to Engineering in: Calculation methods, Design and Program Management of aircraft; the use of experimental aerodynamics and the most significant parameters in the theoretical application; the management of experimental techniques, equipment and measuring instruments discipline; the simulation, design, analysis and interpretation of experimental and flight operations; the maintenance systems and certifications of aircraft.

Learning outcomes:

- RA1. To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this module
- RA2: To establish Maintenance plans
- RA3: To establish Certification plans

In this table it is shown the relationship between the competences and the Learning Outcomes:

Competences	Learning Outcomes
CT3, CT5, CT7, CE21	RA1
CT4, CT6, CT8	RA2
CB4, CE21, CE25	RA3

4. CONTENTS

The subject is organized in 4 units

1. Airworthiness Concepts

- Airworthiness Concepts
- Civil Aviation Authorities
- Certification Process and Aeronautical Companies
- Regulations for Aircraft Certification and maintenance
- Certification Plan and entry into Service of Aircraft
- Introduction to Maintenance. Maintenance Companies
- Maintenance plans generation
- Software Certification

2. Review of an Airworthiness Code (CS25)

- Flight
- Loads and Structures. .
- Fatigue and Damage tolerance. Intact and Damaged Structure
- Fire and Lightning Strike
- Materials and Construction details
- Manufacturing
- EWIS

3. Composite Structures Certification

4. Certification Plan

5. METHODOLOGIES OF TEACHING-LEARNING

The following methodologies of teaching-learning Will be applied:

- Lectures.
- Assignments (Exercises and work to be performed at home)
- Group learning.
- Project based learning
- Mentoring , performance assessments, tests

6. EDUCATIONAL ACTIVITIES

A continuación, se identifican los tipos de actividades formativas que se realizarán y la dedicación en horas del estudiante a cada una de ellas:

Modalidad presencial:

EDUCATIONAL ACTIVITY	Number of hours
Lectures	60 h
Group activities	20 h
Assignments	50 h
Mentoring, Knowledge tests and assessments	20 h
TOTAL	150 h

7. MONITORING and ASSESSMENT

ASSESMENT METHOD	WEIGHTR
Exams, tests, and other knowlege assessments	50%
Preparation of articles, and technical cases and exercises	20%
Alternative evaluation methods. Attention and participation in class, group Project, etc	10%
Field visits, conferences, etc	10%
Cross curriculum competences and performance observation	10%

7.1. First term Exam

To pass the subject in the first exam period call you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the subject, and an attendance of more than 50%, unless agreed with the teacher.

In any case, you will need to obtain a grade greater than or equal to 5.0 on exams, tests, and knowledge tests.

When the minimums required to carry out the weighted average of the evaluable activities are not met (the minimum is not reached in any of the previous points), the final grade will be:

- the weighted average if its value is less than or equal to 4
- 4 if the value of the weighted average is greater than 4

The mark in the call will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of which they are part of the weighted average

7.2. Second Term Exam

To pass the subject in second p you must obtain a grade greater than or equal to 5.0 out of 10.0 in the final grade (weighted average) of the subject.

In any case, it will be necessary for you to obtain a grade greater than or equal to 5.0 in the exams, tests, and knowledge tests.

Activities not passed in ordinary call, or those that were not delivered must be delivered.

When the minimums required to carry out the weighted average of the evaluable activities are not met (the minimum is not reached in any of the previous points), the final grade will be:

- the weighted average if its value is less than or equal to 4
- 4 if the value of the weighted average is greater than 4

The note in second period exam will be considered as NP (Not Presented) when the student has not submitted any new activity with respect to what is presented in the ordinary call

8. PLANNING

This is a tentative planning for the main activities of the subject:

Activity	Period
1. Airworthiness Concepts	6 weeks
Exam Unit 1	
2. Airworthiness Code review	6 weeks
3. Composite Structures Certification	1 week
4. Certification Plan	1 week
Exam Unit 2 and 3	
5. Global Review	1 week
Final exam	

This planning may suffer modifications from logistics reasons of the activities. Each modification will be properly announced to the students.

9. BIBLIOGRAPHY

The reference book/information for this subject comes from:

- EASA Easy Rules for part 21, part M and CS25/AMC 25

In addition to this, the following is available:

- Class Notes
- Guides and Exercises
- Content in the Virtual campus.

Another very interesting material related with this subjects:

- Airworthiness: An Introduction to Aircraft Certification. Filippo De Florio
- AMC 20-29 y Do 728
- Aircraft Structural Design, Niu
- Megson, Aircraft Structures for Engineering Students

10. DIVERSITY ATTENTION UNIT

Students with specific educational support needs:

Adaptations or curricular adjustments for students with specific educational support needs, in order to guarantee equal opportunities, will be set by the Diversity Attention Unit (UAD).

The issuance of a report of curricular adaptations / adjustments by this Unit will be an essential requirement, so students with specific needs for educational support should contact through: unidad.diversidad@universidadeuropea.es at the beginning of each semester.

HOW TO COMMUNICATE WITH YOUR TEACHER

When you have a question about the contents or activities, do not forget to write it in the forums of your subject so that all your classmates can read it.

It is possible that someone has your same doubt!

If you have any questions exclusively addressed to the teacher, you can send them a private message from the Virtual Campus. Also, in case you need to get deeper into a topic, you can agree on a tutorial.

It is advisable that you regularly read the messages sent by students and teachers, as they constitute one more way of learning