

1. BASIC INFORMATION ON THE COURSE/MODULE

Subject	Mechanical and Graphic Design
Degree Program	Degree in Aerospace Engineering of Aircraft
Escuela/ Facultad	Arquitectura, Ingeniería y Diseño
Course	Second
ECTS	6 ECTS
Credit type	Degree Requirements
Language/s	English
Delivery Mode	Face to face
Semester	Second semester
Year	2019/2020
Coordinating Professor	Almudena Vega

2. PRESENTATION OF THE COURSE/MODULE

This course belongs to the “Motopropulsion II” module:

- Mechanical and Graphic Design 6 ECTS (second year)
- Fluid Mechanics II 6 ECTS (third year)

In the Fluid Mechanics II subject the following topics are covered: Mechanical design of aerostructures parts, assembly and components, assembly in aerostructures, finite element method, software simulation.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB1: That students have demonstrated knowledge and understanding in a field of study that part of the basis of general secondary education, and is usually found at a level that, while supported by advanced textbooks, includes some aspects that will knowledge of the forefront of their field of study
- CB4: To allow students to communicate information, ideas, problems and solutions both to a specialized and non-specialized audience

Cross-curricular competencies:

- CT1: Ability to design, development and management in the field of aeronautical engineering aimed, according to the knowledge acquired as provided in paragraph 5 of the Decree CIN/308/2009, aerospace vehicles.

- CT2: Planning, definition, direction and project management of design, stress analysis and production in the field of aeronautical engineering aimed, according to the knowledge acquired as provided in paragraph 5 of the Decree CIN/308/2009, vehicles aerospace.
- CT14: Problem solving with initiative, decision making, creativity, and critical thinking, professionally, and the preparation and defense of arguments (Troubleshooting).

Specific competencies:

- CE20: Adequate knowledge and applied to Engineering: The fracture mechanics approaches continuum and dynamic fatigue of structural instability and aeroelasticity.
- CE25: Adequate knowledge and applied to Engineering of: 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.

Notes: UNIQUE LEVEL: Competence developed at one level. Level 1 (N1): awareness about the importance of competences and basic application of it to several situations. Level 2(N2): interiorization and skillful handling of competences. Level 3 (N3): Full interiorization and handling of competences at any needed situation.

Learning outcomes:

- LO25: To develop design models with specific software.
- LO20. To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules
- LO21. From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module
- LO22. To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.

The table below shows the relation between the competencies developed during the course and the envisaged learning outcomes:

Competencies	Learning outcomes
CT1, CT2, CE20, CE25	LO25
CB1, CB4, CE20	LO20
CB4, CT1, CT14, CE20	LO21
CE20, CE25	LO22

The following table shows how the different types of activities are distributed and how many hours are assigned to each type:

Type of educational activity	Number of hours
Lecture-based class	20 h
Integration of team work	60 h
Self-study	50 h
Mentoring, academic monitoring and assessment	20 h
TOTAL	150 h

To develop the competencies and achieve the learning outcomes, you will have to complete the activities indicated in the table below:

Learning outcomes	Learning activity	Type of activity	Content
LO25 LO20 LO21 LO22	Activity 1	Integration of team work	UA0. CATIA v5. UA1. Basics of the mechanic design of aircrafts and satellites. Optimization of weight and volume. Thermal-structural analysis UA2. Graphic Design. Advanced computer graphics. Design curves and surfaces.
LO20 LO21	Activity 2	Mentoring, academic monitoring and assessment Integration of team work	
LO21 LO25	Activity 3	Self study	UA1. Basics of the mechanic design of aircrafts and satellites. Optimization of weight and volume. Thermal-structural analysis
	Activity 4	Integration of team work	UA0. CATIA v5. UA1. Basics of the mechanic design of aircrafts and satellites. Optimization of weight and volume. Thermal-structural analysis UA2. Graphic Design. Advanced computer graphics. Design curves and surfaces.
	Activity 5	Lecture-based class Mentoring, academic monitoring and assessment	

When you access the course on the *Virtual Campus*, you'll find a description of the activities you have to complete, as well as the deadline and assessment procedure for each one.

4. MONITORING AND ASSESSMENT

The following table shows the assessable activities, their respective assessment criteria, and the weight each activity carries towards the final course grade.

Assessable activity	Assessment criteria	Weight (%)
Activity 1 Integrating project	<ul style="list-style-type: none"> • Appropriate hypothesis has been considered. • Correct results are obtained for several cases, which are coherent with the hypothesis considered. • The results are analyzed and conclusions extracted. • Studies of state of the art are included • Students cooperate to accomplish previous criteria. 	35%
Activity 2 Presentation of the project	<ul style="list-style-type: none"> • Explanation is clear and concise • Presentation contents are correct • Presentation time is adjusting to required duration • Student can answer the questions of audience • Students cooperate to accomplish previous criteria. 	10%
Activity 3 Practises with mechanical & termical solver	<ul style="list-style-type: none"> • Correct process to finish the practice is followed • Correct results are obtained. • The results are analyzed. 	5%
Activity 4 Practices with CATIA/other graphic design software	<ul style="list-style-type: none"> • Correct process to finish the practice is followed • Correct results are obtained. • The results are analyzed. 	20%
Activity 5 Exam	<ul style="list-style-type: none"> • Correct process to finish the practice is followed • Correct results are obtained. • The results are analyzed. 	30%

When you access the course on the *Campus Virtual*, you'll find a description of the activities you have to complete, as well as the deadline and assessment procedure for each one.

a) **First exam period**

- **Continuous assessment activities:**

- Realization of different tasks, problems and practical exercises, individually (item 2): 20%

- Realization of the project by collaborative groups (items 4, 5, and 6): 45% (30% final report, 5% intermediate documents, and 10% final presentation).

- Transversal disciplinary skills (items 3, 5, and 6): 5%.

- **Final exam** of the entire course (item 1): 30% (5% theoretical test and 25% practical exercises)

Minimum marks needed to pass:

- A mark of 5 points out of 10 in the evaluation of each subject part: a) an average of the different problems and practical exercises, b) the project by collaborative groups, and c) the final exam.

In order to be evaluated you must have a minimum of 50% attendance (ATTENDANCE IS VALID ONLY REGISTERED IN THE GRP SYSTEM, and it can be asked for attendance confirmation at the end of some classes by signature sheets of similar procedures).

Failure to meet any of the minimum, and that the weighted average is greater than 3, the final score on the final mark (record) for this session will be 3 out of 10 (Fail), except when the failed part of the subject is the average mark of written exams. In the latest case, the average mark of the exams will be the subject mark up to the extraordinary examination.

b) **Second exam period**

Assessment in the extra session will be the same as in ordinary session.

Those continuous assessment activities undertaken during the ordinary session in which the mark is over 5 are considered finished.

- Assessment activities:
 - Realization of different tasks, problems and practical exercises, individually (item 2): 20%
 - Realization of the project by collaborative groups (items 4, 5, and 6): 45% (30% final report, 5% intermediate documents, and 10% final presentation).
 - Transversal disciplinary skills (items 3, 5, and 6): 5%.
- **Final exam** of the entire course (item 1): 30% (5% theoretical test and 25% practical exercises)

Minimum marks needed to pass:

A mark of 5 points out of 10 in the evaluation of each subject part: a) the different tasks, problems and practical exercises, b) the extraordinary exam, and c) the subject project.

5. BIBLIOGRAPHY

- The mechanical design process (1992). David G. Ullman. Mc. Graw Hill International Editions.
- Elements of spacecraft design (2002). Charles D. Brown. AIAA Education Series.
- Aircraft design: a conceptual approach (2006). Daniel P. Raymer. AIAA Education Series.
- Airframe Structural Design; Michael Chun-Yung Niu; Practical Design Information and Data on Aircraft Structures. Conmilit, 2006.
- Fundamentals of graphics communication (2011). Bertoline, Wiebe, Hartman, Ross. McGraw-Hill Higher Education - USA

6. How to communicate with your professor

Whenever you have a question about the content or activities, don't forget to post it to your course forum so that your classmates can read it.

You might not be the only one with the same question!

If you have a question that you only want to ask your professor, you can send him/her a private message from the *Campus Virtual*. And if you need to discuss something in more detail, you can arrange an advisory session with your professor.

It's a good idea to check the course forum on a regular basis and read the messages posted by your classmates and professors, as this can be another way to learn.

7. Study recommendations

When you study at university, you need to plan and be consistent from the first week. It's very useful to exchange experiences and opinions with professors and other students, as this will help you develop core competencies such as flexibility, negotiating skills, teamwork, and, of course, critical thinking.

To help you, we recommend using a general method of study based on the following points:

- Study systematically and at a steady pace.
- Attend class and regularly check the course forum on the *Campus Virtual* so that you keep up to date with what's happening.
- Participate actively in the course by sharing your opinions, doubts and experiences relating to the topics covered and/or suggesting new topics of interest for discussion.
- Read the messages posted by your classmates and/or professors.

Active participation in physical and virtual classroom activities is of special interest and academic value. You can participate in many different ways: asking questions, giving your opinion, doing all the activities your professor suggests, taking part in collaborative activities, helping your classmates, etc. This way of working requires effort, but it will help you get better results as you develop your competencies.

Teaching Activity described in the syllabus	Adapted activity in distance learning
Integrating Project (Project by collaborative groups): final report + intermediate reports + final presentation face-to-face in the class. (45%)	Integrating Project (Project by collaborative groups): final report + intermediate reports + final presentation online (45%)
Tasks, problems & exercises individually (to be done during the class, or at home, and presented by the end of the month) (20%)	Tasks, problems & exercises individually (to be done during the class, or at home, and presented by the end of the month) (20%)
Final exam: theoretical test + practical exercises (10%)	Practical exercises to be done real time online (10%)
Transversal disciplinary skills (5%)	Transversal disciplinary skills (5%)

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Final Exam: theoretical test + practical activities	Description of new activity	Practical exercises to be done real time online.
Content to be assessed	Numerical and simplified model-based analysis of: structural, mechanical, aeroelastic, thermal.		
Learning Outcomes to be assessed <i>(Please check Syllabus of the course/module)</i>	<p>To perform numerical simulations of the different steps of the mechanical design loop on aerospace industry. design models with specific software.</p> <p>To conduct conceptual studies by simplifying real industrial problems into comprehensive analytical models.</p> <p>To report and present in a professional fashion engineering results.</p>		
Duration	2hours	Approximate duration	2 hours
Weight in evaluation	30%	Weight in evaluation	30%
Please note:			

Evaluation Activity that was planned in the Syllabus for face to face instruction		NEW virtual evaluation activity (adapted)	
Description of original face to face evaluation activity	Integrating Project Final Presentation	Description of new activity	Integrating Project Final Presentation: Online Presentation with "Aula Virtual"
Content to be assessed	Design of an UAV: graphic modelization and mechanical numerical study.		
Learning Outcomes to be assessed <i>(Please check Syllabus of the course/module)</i>	<p>To develop design models with specific software.</p> <p>To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules</p> <p>From a series of requirements, and prior information, to conceptualize an engineering problem, proposes an approach to solve it, and obtain the better solution. All this related to the competencies of this module</p> <p>To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it.</p>		
Duration	15min per group	Approximate duration	15min per group
Weight in evaluation	10%	Weight in evaluation	10%
Please note:			