1. BASIC INFORMATION

Course	Mechanical and Graphic Design
Degree program	Degree in Aerospace Engineering of Aircraft
School	Arquitectura, Ingeniería y Diseño
Year	Third course
ECTS	6 ECTS
Credit type	Degree Requirements
Language(s)	English
Delivery mode	Face-to-face
Semester	Second
Academic year	2025 / 2026
Coordinating professor	Carlos Ávila
Professors	Daniel de la Peña / Carlos Ávila

2. PRESENTATION

This course belongs to the "Motopropulsion II" module:
• Mechanical and Graphic Design 6 ECTS (third 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:

- CE26: Applied knowledge of: aerodynamics, mechanics, and thermodynamics, flight mechanics, engineering of aircrafts (fixed and rotatory wings), and theory of structures.

- 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 following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CT1, CT2, CE26, CE25	LO25
CB1, CB4, CE26	LO20
CB4, CT1, CT14, CE26	LO21
CE26, CE25	LO22

4. CONTENT

The content of the subject is divided in several topics, attending to the ones involved in the mechanical design loop of aerospace industry:

- Graphic design. Advanced graphic computing. Curves and design surfaces
- Mechanical design. Design methods Thermal-structural analysis.
- Applications in the field of aeronautical design. Optimization of weight and volume
- Application to Satellite Design (Satellite mechanical design)
- Fundamentals of ME

5. TEACHING-LEARNING METHODOLOGIES

The types of teaching-learning methodologies used are indicated below:

- The teaching methodology is project-based.
- 1.- Each topic will be started with a theoretical presentation and small learning exercises to be performed during the class, under the supervision of the teacher.
- 2.- There will be learning activities, with a practical aerospace focus, to be developed by the students every week. The teacher will help the students in the development of this activities.
- 3.- There will be a monthly report, to be presented by every student during the class. The content of the monthly report will include the different small projects developed during the month. The teacher will advice the students with the objective of improve their presentation and reporting skills.

6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Total time	Use of AI
Type of educational activity	Number of hours	
Lecture-based class	20	Allowed
Integration of team work	60	Allowed
Self-study	50	Allowed
Mentoring, academic monitoring and assessment	20	Allowed
TOTAL	**150**	

7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

Assessment system	Weight	Use of IA
Exam, test and other type of assessment.	30-35%	Not allowed
Reports, articles and informs.	15-30%	Promoted or assessed
Alternative system of assessment	15-30%	Not allowed
Conferences, company-tour visit and experiences in situ	10%	promoted
Transversal skills (rubric)	10-15%	-

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

7.1. First exam period (Ordinary Call)

To pass the course in the first exam period, you must obtain:

- A final course grade of at least 5 out of 10 (weighted average).
- In any case, you will need to obtain a grade of at 4.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.
- 50% attendance

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

- The weighted mean if its value is less than or equal to 4.
- Equal to 4 if the value of the weighted mean is greater than 4.

The grade in the first exam period will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of those that are part of the weighted average.

7.2. Second exam period (extraordinary call)

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 4.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

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

- The weighted mean if its value is less than or equal to 4.
- Equal to 4 if the value of the weighted mean is greater than 4.

The grade in this second call will be considered as NP (Not Presented) when the student has not delivered any evaluable activity of those that are part of the weighted average.

8. SCHEDULE

This section indicates the (tentative) schedule with delivery dates for evaluable activities of the subject:

Asseassable Activity	Due date
Monthly Report February	28th February
Monthly Report March	28th March

Monthly Report April	28th April
Monthly Report May	28th May
Integrating Project	15th June
Final exam	End of semester

This schedule may be modified (both in dates and in the type of activities) for logistical reasons based on the teaching development of the subject. Any modification will be notified to the student in a timely manner through the Virtual Campus.

9. BIBLIOGRAPHY

Here is the recommended bibliography:

Graphic Design and CATIA

Nader G. Zamani (2017). **CAD Modeling Essential in 3DEXPERIENCE 2016x Using CATIA Applications**. SDC Publications

Sham Tickoo, CADCIM Technologies y Deepak Maini (2006). **CATIA V5R15 for Designers**. CADCIM Technologies

Richard Cozzens (2002). **Advanced CATIA v5 Workbook**. Schroff Development Corporation

Vibrations

Leonard Meirovich. **Elements of vibration analysis**. Mc Graw Hill

M. Roseau. **Vibrations in Mechanical Systems**. Springer-Verlag

Den Hartog. **Mechanical Vibrations**. Dover

Structures

Megson. **Aircraft Structures for Engineer Students**.

Aeroelasticity

P.G. Saffman. **Vortex Dynamics**. Cambridge.

Dowel et all. **A modern Course in Aeroelasticity**.

Bisplinghoff and Ashley. **Principles of Aeroelasticity**.

Computational Fluid Dynamics

Hirsch. **Numerical Computation of Internal and External Flows. Volume 1 and 2**. Wiley

Pope. **Turbulent Flows**. Cambridge

Lincse. **High-Order Methods for Computational Physics**.

Ferziger et all. **Computational Methods for Fluid Dynamics**.

Wilcox. **Turbulence Modeling for CFD**. DCW

A Young. **Boundary Layers**. (Not computational)

Schlichting. **Boundary Layer Theory**. (Not computational)

Batchelor. **An introduction to Fluid Dynamics. Cambridge**. (Not computational)

Heat Transfer

Wark. **Advanced Thermodynamics for engineers**. Mc Graw Hill

Anderson et all**. Computational Fluid Mechanics and Heat Transfer**.

Boley. **Theory of Thermal Stresses**

10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit we offer support to our students throughout their university life to help them reach their academic achievements. Other main actions are the students inclusions with specific educational needs, universal accessibility on the different campuses of the university and equal opportunities.

From this unit we offer to our students:

1. Accompaniment and follow-up by means of counselling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made in terms methodology and assessment for those students with specific educational needs, pursuing an equal opportunities for all students.
3. We offer students different extracurricular resources to develop different competences that will encourage their personal and professional development.
4. Vocational guidance through the provision of tools and counselling to students with vocational doubts or who believe they have made a mistake in their choice of degree.

Students in need of educational support can write to us at:

orientacioneducativa@universidadeuropea.es

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail. Your assessment is necessary for us to improve.

Thank you very much for your participation.

WORK PLAN FOR THE COURSE

HOW TO COMMUNICATE WITH YOUR PROFESSOR

Whenever you have a question about the content or activities, do not 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 is 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.

SCHEDULE ACTIVITIES

This table shows the delivery deadline for each assessable activity in the course, as well as the delivery dates:

Date	Contents	Learning activities /Assessables	Weight of evaluable activity
28th February	CAD	Monthly Report I	17,5
28th March	Vibrations	Monthly Report II	17,5
28th April	Aeroelasticity and Structures	Monthly Report III	17,5
28th May	Thermal Analysis	Monthly Report IV	17,5
End of semester	The whole content of the subject.	Final Exam	30
		Total weight:	100

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

USE OF AI REGULATION

The student must be the author of his/her work/activities.

The use of Artificial Intelligence tools (AI) must be authorized by the teacher in each assignment/activity, indicating in what way it uses is permitted. The teacher will inform in advance in which situations AI tools may be used to improve spelling, grammar and editing in general. The student is responsible for clarifying the information given by the tool and duly declaring the use of any AI tool, according to the guidelines given by the teacher. The final

decision on the authorship of the work and the appropriateness of the reported use of an AI tool rests with the lecturer and those responsible for the degree.

For activities in which no Artificial Intelligence Tools are allowed: In case Professor suspects the use of AI Tools by any student, Professor can perform additional oral proof of knowledge to any student. If student answers do not demonstrate knowledge or disagree with delivered work, a 0 is assigned to the assignment.

For activities in which Artificial Intelligence Tools are encouraged and evaluated: Use of AI is allowed in the ways explained by the professor. Grading will involve the correct development of the tasks, but also creativity and critical thinking by students. Students shall understand the underlying work done, Professor will be able to perform additional oral proof of knowledge to any student. If student answers do not demonstrate knowledge or disagree with delivered work, a 0 is assigned to the assignment.

DESCRIPTION FOR ASSESSMENT ACTIVITIES

You will find a description of the assessment activities at the Canvas, inside each activity.

RUBRICS FOR ASSESSMENT ACTIVITIES

Report Rubric	5%	10%	20%	30%	20%	5%	10%
	Title	Introduction & Objectives	Materials and Methods	Data Analysis & Discussion	Conclusion	Literature Cited	Report format and quality
Excellent	Clearly describes the content of the current Monthly Report exercise. Uses descriptive words that are associated with the project.	Clear background information based on a thorough literature search. Uses proper "in text" citations. Includes a rationale for the study along with a hypothesis.	Contains a complete list of the analytical principles. Steps taken during the report are easy to follow in a paragraph form. The section is organized in a way that the reader understands the logical flow of the research activity. Proper use of third person and past tense.	Key results are presented in an orderly and logical sequence using both text and illustrative materials (Tables and Figures). All the relevant information obtained in the analytical analysis is included. All calculations are provided in a logical manner using proper units. Numerical results are compared towards analytical ones.	Proper interpretation of analytical and numerical results. Summarizes data used to draw conclusion. Discusses applications or real life situations. Addresses hypothesis and cites sources of errors. Connects the conclusion with the introduction by way of the stated hypothesis and literature cited.	Provides a complete list of the "in text" references provide in the test of the paper. Uses the correct stile (i.e. APA, MLA) for citations.	Monthly report submitted as directed: on time, on quality and on effort. Directions were followed, questions were answered correctly.
Good	Describes the content but the usage of descriptive words is not appropriate.	Contains background information but is not complete. The hypothesis is partially stated.	One or more relevant pieces of information are missing. The section is not very well organized. Use of first person or improper use of verbs in past tense appears in part of the text.	One or more key results are missing. Figures and tables are present but contain minor errors. Analytical and Numerical results are not discussed.	Interpretation of results is presented. However, there is a disconnection between the discussion and the analytical hypothesis identified in the introduction.	Most but not all "in text" references are provided. Some inconsistency on the stile used is evident.	Minor errors in format or procedures were encountered.
Fair	The content is not clearly described. Fair use of descriptive words.	Background information is not complete and lacks proper "in text" citations. The hypothesis is not clearly stated.	Misses several components of the analytical procedures. There is a lack of organization and there is not proper use of grammar standards.	Misses several key results. Figures lack proper identification in the Y and X axis. Tables have missing titles. The text doesn't follow the sequence of the tables and/or figures. Missing Analytical and Numerical results and its discussion.	Misses the interpretation of key results. There is little connection between the discussion and the introduction.	Misses several references or doesn't adhere to the correct stile.	Directions were not explicitly followed.
Poor	No title. Poor description or poor use of descriptive words.	Very little or no background information. No "in text" citations. Unrelated or plagiarized introduction.	Procedural steps are incorrect, illogical, unrelated or plagiarized	Major results are not included. Figures and tables are poorly constructed or not present. There is evidence of plagiarism.	Very poor interpretation of the results. No connection between discussion and introduction. Evidence of plagiarism.	Most references are not included and/or the stile used is incorrect.	Directions were not followed.
Fail	No submission/No effort exhibited.	No submission/No effort exhibited.	No submission/No effort exhibited.	No submission/No effort exhibited.	No submission/No effort exhibited.	No submission/No effort exhibited.	No submission/No effort exhibited.

PLAGIARISM REGULATION

In accordance with the current student disciplinary regulations at Universidad Europea:

- Plagiarism, in full or in part, of intellectual works of any kind, is considered a very serious offense.
- Very serious offenses relating to plagiarism and the use of fraudulent means to pass assessment tests shall result in exclusion from the exams for the relevant period, as well as the inclusion of the offense and its details in the student's academic record.