1. BASIC INFORMATION

Course	Aeroelasticity and Vibrations
Degree program	Degree in Aerospace Engineering of aircrafts
School	Arquitectura, Ingeniería y Diseño
Year	Fourth
ECTS	6
Credit type	Compulsory
Language(s)	English
Delivery mode	Face to face
Semester	First
Academic year	2024-25
Coordinating professor	Almudena Vega

2. PRESENTATION

This course belongs to the "aerospace vehicles II" module:

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

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- CB3: That students have the ability to gather and interpret relevant data (usually within their field of study) to make judgments that include reflection on relevant social, scientific or ethical.
- CB5: That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy.

Cross-curricular competencies:

- CT12: Knowledge of basic subjects and technologies, enabling the student to learn new methods, theories and technologies, and endowed it with great versatility to adapt to new situations (autonomous learning).
  CT14: Problem Solving with initiative, decision making, creativity, and critical thinking, professionally, and the preparation and defense of arguments (Troubleshooting).
- CT18: Commit to the fulfillment of the tasks (Responsibility).
- CT21: Self-acknowledgement for achieving high levels of performance in one's work, with a positive influence in substantially improving the results (Self Confidence).

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Specific competencies:

- CE20: Adequate knowledge and applied to Engineering: The fracture mechanics approaches continuum and dynamic fatigue of structural instability and aeroelasticity.
- CE22: Adequate and applied knowledge to engineering field: Fluid mechanics fundamentals that describe the flow in all regimes to determine the pressure and force distributions on aircraft.
- 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.
- CE26: Applied knowledge of: aerodynamics, mechanics, and thermodynamics, flight mechanics, engineering of aircrafts (fixed and rotatory wings), and theory of structures.

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

Competencies	Learning outcomes
CB3, CB5, CT12, CT14, CT18, CT21, CE20, CE22, CE25, CE26	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 LO25: To establish models, as input data to the simulators of MEF and CFD

4. CONTENT

- Vibrations
- Static aeroelasticity
- Dynamic aeroelasticity

5. TEACHING-LEARNING METHODOLOGIES

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

- Survey of objectives and interests

- Master class
- Laboratory practices
- Group investigation or group problem solving
- Designs
- Simulation
- Case studies
- Field experiences, conferences, visits to companies and institutions

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	Number of hours
Lecture-based class	20
Integrative Team work	60
Self-study	50
Mentoring, academic monitoring and assessment	20

7. ASSESSMENT

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

Campus-based mode:

Assessment system	Weight
Exam, test and other type of assessment.	30%-35%
Reports, articles and informs.	15%-30%
Alternative system of assessment.	15%-30%
Conferences, company-tour visit and experiences in situ	10%-10%
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

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.

7.2. Second exam period

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.

8. SCHEDULE

This is a tentative planning for the main activities of the subject. Basically every 2 weeks there will be a home assignment that will be due in a given time.

Assessable activities	Deadline
Static Aeroelasticity	4 week
Exam part 1 (units 1)	
Dynamic Aeroelasticity and Vibrations	6 weeks
Exam part 2 (units 1,2)	
Final Exam	

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.

9. BIBLIOGRAPHY

The main reference work for this subject is:

The book that will be followed in the classes is:

- A modern course in Aeroelasticity, Earl H. Dowell

Additional recommended bibliography is:

- Vortex Dynamics, Saffman
- Elements of Vibration Analysis, Leornard Meirovitch

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 of 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.