Universidad Europea
LAUREATE INTERNATIONAL UNIVERSITIES

Course Syllabus

Aircraft Design

Year: 2018/2019
Code: 9966001402
Coordinating profesor: Raúl Carlos Llamas Sandín
Degree program: Degree in Aerospace Engineering of Aircraft
School: Arquitectura, Ingeniería y Diseño
Languages: English

The mission of Universidad Europea de Madrid is to offer its students a holistic education, helping them become leaders and professionals capable of responding effectively to the needs of today's global world, adding value within their career fields, and contributing to social advancement through their entrepreneurial spirit and ethical integrity. We also strive to create and transfer knowledge through applied research, thus making our own contribution to progress and putting ourselves at the forefront of intellectual, scientific, and technological development.

Contents

1. Basic information on the course/module

ECTS	6
Credit type	Degree requirements
Language	English
Delivery mode	Face to face
Trimester/Semester	First semester

2. Presentation of the course/module

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

- Aeronautical Structures and Vibration 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)

The subject of Aircraft Design covers several aspects of the design of flight vehicles regarding aerodynamics, propulsion, controls and structure. Additionally, it elaborates on topics related to computer-aided design of aircraft, systems and subsystems of aircraft, and helicopters.

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.

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.
- CT17: Addressing the issues and challenges related to their area of expertise with flexibility, initiative, innovation, and dynamism (entrepreneurial profile).
- CT19: Working in interdisciplinary teams, providing the most efficient on the basis of cooperation, assuming their role within the team, establishing good relationships and exchanging information (Teamwork).

Specific competencies:

- CE24: Adequate knowledge and applied to Engineering of: aircraft systems, and automatic flight control systems of aerospace vehicles
- 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.

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:

- LO27: To design diverse parts and elements of aerospace vehicles.
- 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, CT17, CT19, CE25, CE26	LO27
CB1	LO20
CT17, CE24, CE26	LO21
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
LO20. To conduct studies by integrating the technologies and engineering procedures which are developed in the competencies of this modules	Activity 1	Mentoring, academic monitoring and assessment	Market study, technical assessment of competition and solution proposal
	Activity 2	Self-study	Respond to a series of short questions covering all aspects of the subject
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 LO27: To design diverse parts and elements of aerospace vehicles.	Activity 3	Integration of team work	Large aircraft design as part of a team
	Activity 4	Mentoring, academic monitoring and assessment	Conceptual design of a small aircraft working individually
LO22. To transfer some parts of an engineering problem to the laboratory, and utilize this resource as support to resolve it	Activity 5	Self-study	Generation of a computational model of a given aircraft using OpenVSP

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 3	**The following technical competencies are evaluated:** - Capacity to integrate the skills learned during the degree and the Aircraft Design course into the design of an aircraft component. - Capacity to communicate technically in oral form (in a presentation to the lecturer and the rest of the class) and in written form in a report or presentation. - Creativity and technical innovation, showing that the student has gone beyond the contents presented in class The group project presentations will be done in two sessions; one 4 weeks after the start of the course and the final one at the last day of the course. Prior to the first session the student will upload to Blackboard a preliminary technical report with his or her component configuration and design decisions. Prior to the last session the final report will be uploaded into Blackboard.	25%
Activity 4	**The following competencies are evaluated:** - Capacity to integrate the skills learned during the degree and the Aircraft Design course into the design of a complete aircraft. - Capacity to communicate in writing and graphically (aircraft and component drawings, 3D model – CAD or equivalent)	25%

	- Creativity and technical innovation, showing that the student has gone beyond the contents presented in class Four weeks after the start of the course the student will upload to Blackboard the general arrangement of his or her aircraft and the justification of the configuration selected. A week before the end of the lectures the student will upload the final report (as a full technical report).	
Activity 2	Competencies pertaining to aircraft design will be evaluated. The content in scope for the exam will be clearly identified during master classes and in the educational material.	30%
Activity 5	Self-study of the modelling tool "NASA Open VSP" 3D model of an aircraft assigned to each student	10%
Activity 1	Study of the market for a type of aircraft specified in class Technical report writing with research conclusions on market opportunities, technical solutions and student's proposal to cover the niche	10%

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.

4.1. First exam period

The following activities and tests comprise the ordinary evaluation of this subject:

Evaluation activities (and weights):

- Aircraft geometry design exercise 10%

- Report on aircraft market niche 10%

- Group design project: First deliverable 5%, final deliverable 20%

- Individual design project: First deliverable 5%, final deliverable 20%

- Final exam: 30%

Minimum requirements to pass:

- 5 out of 10 in final exam
- 5 out of 10 in the group design project
- 5 out of 10 in the individual design project
- 50% attendance

4.2. Second exam period

Evaluation activities for the second exam period are:

- Deliver a Technical Report on a Specific Project (50%). An authoring check will be performed for the individual evaluation of the students.
- Final written exam (50%)

Minimum requirements to pass:

- 5 out of 10 in final exam
- 5 out of 10 in the specific project

5. Bibliography

Here is the recommended bibliography:

Basic bibliography

1 “Understanding Aircraft Structures”, J. Cutler, Fourth Edition, Blackwell, 2006

2 “Civil Jet Aircraft Design”, L.R.Jenkinson, P.Simpkin, D.Rhodes, Elsevier, 1999

3 “Aircraft Design, a conceptual approach”, D.P.Raymer, Fourth edition, AIAA, 2006

4 “Lessons learned in aircraft design”, J. Roskam, Darcorp, 2007

5 “The design of the aeroplane”, D. Stinton, Blackwell, 2001

6 “Airframe structural design”, M. Niu, Second edition, Adaso, 2006

7 “Synthesis of subsonic Airplane Design”, E.Torembeek, Delft, 2010

8 “General aviation aircraft design”, Gudmundsson, Snorri, 2014

9 “AERODYNAMIC DESIGN OF TRANSPORT AIRCRAFT”, Ed Obert, Delft University of Technology, 2009

Additional bibliography;

10 “Airplane Design Parts I through VIII”, J.Roskam, Darcorp, 2003

11 “Evolution of the Airliner”, R.Whitford, Crowood, 2007

12 “Advanced Aircraft Design: Conceptual Design, Technology and Optimization of Subsonic Civil Airplanes”,

E.Torembeek, Wiley, 2013

13 “Twenty-First-Century Jet: The Making and Marketing of the Boeing 777”, K. Sabbagh, Scribner, 1996

14 “Wide-Body: The Triumph of the 747”, C.Irving

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.