Advanced aircraft design and certification I

Academic Year: (2019 / 2020) **Review date: 08-05-2020**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: FAJARDO PEÑA, PABLO

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students are expected to have some knowledge of theory of elasticity, aerospace structures and aircraft design.

OBJECTIVES

Good knowledge of advanced structural analysis, with emphasis on finite element modeling

Good knowledge of aircraft certification process, and in particular the airframe certification test program

DESCRIPTION OF CONTENTS: PROGRAMME

The course is divided in two different parts: Finite element theory and aircraft certification processes.

1. Finite elements
- Introduction to FEA. Review of elasticity.
- The finite element analysis process
- The finite element formulation
- Types of elements and properties
- Numerical integration
- Properties of the solution. Error estimation.
- Modeling for dynamic analysis and vibrations

2. Aircraft certification processes
2.1. General Overview
2.2. Airworthiness Authorities and their Regulations: ICAO, Europe, USA, Spain, Militay AA
2.3. EASA Part 21
2.4. Certification Specifications.
2.5. Type Certification
- Type Certificate
- Changes to Type Certificate
- Supplemental Type Certificate
- Certification Process
- Qualification vs Certification

2.6. Continuous Airworthiness.
- Modification of In service Aircrafts
- Part M
- Part 145

2.7. Airframe certification.
- Airframe Certification Plan
- Certification Test Program

2.8. Certification Documentation.

LEARNING ACTIVITIES AND METHODOLOGY

Theory sessions.
Problem sessions working individually and in groups.
Lab-sessions with mathematical software.

ASSESSMENT SYSTEM

End-of-term exam (60%)
Lab sessions, projects with oral presentation, etc (40%)

The two blocks are weighted a 50% of the final grade. The following requirements have to be met in order to pass the subject:

1) to have a MINIMUM mark of 4.0/10 in the end-of-term exam (having a minimum of 2.5 in each part);
2) to have a minimum overall mark of 5.0/10 (weighing 60% the end-of-term exam mark and 40% the mark of the continuous evaluation).

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- Filippo De Florio Airworthiness. An introduction to Aircraft Certification. , BH, 2006
- K.J. Bathe Finite Element Procedures , Klaus-Jurgen Bathe, 2007
- Logan, D. L. A first course in the finite element method., Cengage Learning., 2011

ADDITIONAL BIBLIOGRAPHY

- Cook, RD; Malkus, DS; Plesha, ME; Witt, RJ. Concepts and Applications of Finite Element Analysis, John Wiley & Sons, 2002
- Megson, T.H.G Aircraft Structures for Engineering Students, Elsevier, 2013

BASIC ELECTRONIC RESOURCES

- EASA . CS: https://www.easa.europa.eu/document-library/certification-specifications