

Academic Year: ( 2017 / 2018 )

Review date: 22-04-2017

Department assigned to the subject: Department of Bioengineering and Aerospace Engineering

Coordinating teacher: FAJARDO PEÑA, PABLO

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

**STUDENTS ARE EXPECTED TO HAVE COMPLETED**

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

**COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.**

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, Military 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 (assignments, laboratory, practicals...):** 40

#### BASIC BIBLIOGRAPHY

- K.J. Bathe Finite Element Procedures , Klaus-Jurgen Bathe, 2007

#### 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