AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Teaching CERTIFICATION OF AEROSPACE STRUCTURES

GenCod A005148

Owner professor Carmine PAPPALETTERE

Teaching in italian CERTIFICATION OF AEROSPACE STRUCTURES

Teaching CERTIFICATION OF AEROSPACE STRUCTURES

SSD code ING-IND/14

Reference course AEROSPACE ENGINEERING

Course type Laurea Magistrale

Credits 6.0

Teaching hours Front activity hours: 54.0

For enrolled in 2018/2019

Taught in 2018/2019

Course year 1

Language ENGLISH

Curriculum AEROSPACE ENGINEERING SYSTEMS

Location Brindisi

Semester Second Semester

Exam type Oral

Assessment Final grade

Course timetable https://easyroom.unisalento.it/Orario

BRIEF COURSE DESCRIPTION

The course proposes an experimental approach to the study of the mechanical characteristics of materials and to the measurements of strains and stresses in mechanical components with particular attention to aeronautical structures; the principal techniques and standard for the certification of traditional and innovative materials and structures for aeronautical uses will be examined.

REQUIREMENTS

Basic knowledge of solid mechanics and design of aerospace structures

COURSE AIMS

At the end of the course the student must know:

- the principal European and American standard;
- the principal experimental methods for the evaluation of the material characteristics of aerospace materials
- the principal experimental methods for measuring displacements, strain and stresses on aerospace components
- the principal experimental techniques for non-destructive testing of aerospace structures

TEACHING METHODOLOGY

In addition to traditional class lectures supported by the use of a projector, the course also consists of classes dedicated to applications in laboratories of the experimental techniques described. Some seminars on particular applications will be planned.

ASSESSMENT TYPE

The examination will consist in an oral test in which the student will discuss the subjects of the course, demonstrating the theoretical knowledge of the standard, of the experimental methods and their applications.

FULL SYLLABUS

Load classification, deformation characteristics, generalized Hooke's law, strength criteria.
Standard concerning aeronautical materials. Mechanical tests on conventional and composite materials, metal and polymer foams. Types of tests and test machines. Tensile test. Compression test. Bending test. Fatigue test. Shear test (V-Notched Rail Shear, Compact Specimen, Two Rail Shear). Compression After Impact Test.
Strain gauge techniques. Electrical strain gauges. Sensitivity to deformation. Tranversal sensitivity. Reinforcement effect of the strain gauge on the specimen. Temperature sensitivity. Insulation resistance, power supply, drift and fatigue life of the strain gauge. Configurations of the measurement circuits (quarter bridge, half bridge, full bridge).
Optical techniques. Photoelastic and thermoelastic techniques. Moiré techniques (intrinsic, interferometric, shadow, projection). Holographic Interferometry. Speckle interferometry. Digital Images Correlation.
Brittle coating technique. Other techniques for displacement, strain and stress measurements.
Laboratory tests. Tensile test on a specimen made of metallic material. Applications of optical techniques to the strength of aerospace structures.

REFERENCE TEXT BOOKS

1. Society for Experimental Mechanics: Handbook on Experimental Mechanics. Prentice-Hall, New Jersey, USA, 1987.
2. Dally J.W., Riley W.F.: Experimental Stress Analysis, McGraw Hill, USA, 1987.
3. Ajovalasit A.: Estensimetri elettrici a resistenza. Aracne Editrice, Roma, 2006.
4. Ajovalasit A.: Fotomeccanica. Aracne Editrice, Roma, 2006
5. Bray A., Vicentini V.: Meccanica Sperimentale: misura ed analisi delle sollecitazioni. Levrotto & Bella, Torino, 1975.
6. Class notes.