AEROSPACE ENGINEERING (LM52)

(Brindisi - Università degli Studi)

Teaching CERTIFICATION OF AEROSPACE STRUCTURES

GenCod A005861

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 9.0

Teaching hours Front activity hours: 81.0

For enrolled in 2019/2020

Taught in 2020/2021

Course year 2

Language ENGLISH

Curriculum DESIGN

Location Brindisi

Semester First 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 aerospace 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:

- main European and American standard;
- main experimental methods for the evaluation of material characteristics of aerospace materials;
- main experimental methods for measuring displacements, strain and stresses on aerospace components;
- main 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 several applications in laboratories of the experimental techniques described. Some seminars on particular subjects will be planned.

ASSESSMENT TYPE

The examination will consist in an oral test. Students will discuss the subjects of the course, demonstrating the knowledge of standard, of 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 (CAI). Notes on the main experimental techniques for the measurement of displacement, deformation and stress. Strain gauge techniques. Electrical strain gauges (ER). Sensitivity to deformation. Transversal 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 circuit. Application of ER technique to composite materials and aerospace structures. Optical techniques. Moiré techniques (intrinsic, interferometric, shadow and projection moiré). Holographic Interferometry. Speckle interferometry. Digital Images Correlation. Non-Destructive Testing techniques. Laboratory tests: Tensile test on a specimen made of metallic and/or composite material, impact test, ultrasonic inspection etc. Applications of optical techniques to the strength evaluation of aerospace structures.

REFERENCE TEXT BOOKS

1. Society for Exper. Mech.: 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. Standard and class notes.
4. In Italian: Ajovalasit A.: Estensimetri elettrici a resistenza. Aracne Editrice, Roma, 2006.
5. In Italian: Ajovalasit A.: Fotomeccanica. Aracne Editrice, Roma, 2006