Experimental Aerodynamics

Academic Year: (2021 / 2022) **Review date: 09-06-2021**

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

Coordinating teacher: IANIRO , ANDREA

Type: Compulsory ECTS Credits : 3.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Students are expected to have a basic knowledge of aerodynamics and fluid mechanics.

OBJECTIVES

The goal of this course is that the student acquires knowledge about experimental methods in aerodynamics and about the methodology for the design of an experiment.

CB6: Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

CB8: That students are able to integrate knowledge and to face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.

CG6: Ability to analyze and solve aerospace problems in new or unknown environments, within wide and complex contexts.

CG9: Competence in all those areas related to airport, aeronautical or space technologies that, by their nature, are not exclusive to other branches of engineering.

CEA3: Understanding and mastery of the laws of External Aerodynamics in the different flight regimes, and their application to Numerical and Experimental Aerodynamics.

CEB2: Adequate knowledge of Advanced Fluid Mechanics, with special emphasis on Experimental and Numerical Techniques used in Fluid Mechanics.

Link to document

DESCRIPTION OF CONTENTS: PROGRAMME

Theoretical fundamentals of experimental aerodynamics: Buckingham pi theorem, fundamental equations and non dimensional numbers.
Statistical data characterization and elements of data processing
Experimental facilities and wind tunnel testing
Aim and principles of flow visualization
Flow pressure measurements
Temperature and heat-flux measurements
Density-based methods
Thermal Anemometry
Laser Anemometry
Volumetric Velocimetry
Measurement of wall shear stresses
Force and moments measurements

LEARNING ACTIVITIES AND METHODOLOGY

Theory sessions.
Problem sessions working individually and in groups.
Lab-sessions and homeworks

ASSESSMENT SYSTEM

1) to have a MINIMUM mark of 4.0/10 in the end-of-term exam;
2) to have a minimum overall mark of 5.0/10 (weighting 25% the end-of-term exam mark and 75% the

mark of the continuous evaluation).

% end-of-term-examination:	25
% of continuous assessment (assigments, laboratory, practicals…):	75

BASIC BIBLIOGRAPHY

- Alexander J. Smits, T. T. Lim Flow Visualization:Techniques and Examples, ICP, 2012
- Stefano Discetti, Andrea Ianiro Experimental Aerodynamics, CRC Press , 2017