Aerodynamics II

Academic Year: (2021 / 2022) **Review date: 04-06-2021**

Department assigned to the subject: Bioengineering and Aeroespace Engineering Department

Coordinating teacher: GARCIA-VILLALBA NAVARIDAS, MANUEL

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Advanced Mathematics
Fluid Mechanics I and II
Aerodynamics I

OBJECTIVES

Fundamental and applied knowledge of Aerodynamics.
Fundamental and applied knowledge of the principles that allow the prediction of forces and moments on bodies moving through a fluid. In particular, generation of lift, drag and moments on wings (subsonic and supersonic regimes) and fuselage (slender bodies).
Understanding of the basic principles in experimental Aerodynamics: physical similarity, wind tunnels and measurements.

DESCRIPTION OF CONTENTS: PROGRAMME

Incompressible 3D potential flow. Basic solutions. Green's formula

Wings of finite span in incompressible flows. Lifting surface theory. Application to Slender wings. Numerical lifting surface method.

Wings of finite span in supersonic flows. Linearized protential. Supersonic source. Subsonic and supersonic edges. Evvard formulas and integration rules. Global characteristics of supersonic wings.

Wings of finite span in subsonic flows. Prandtl Glauert analogy. Swept wings.

Slender body theory. Problem formulation for revolution bodies. Transversal forces. Longitudinal forces.

Experimental aerodynamics. Similarity principles. Wind tunnel design. Measurement and visualisation techniques.

LEARNING ACTIVITIES AND METHODOLOGY

Theory sessions.
Problem sessions working individually and in groups using specific software
Lab-sessions in computer room and in the wind tunnel.

ASSESSMENT SYSTEM

There are two assignments and one oral presentation during the semester.
Each assignment represents 30% of the total grade.
The oral presentation represents 15% of the total grade.
Final exams correspond to the remaining 25%.
Required minimum mark on final exam: 4/10

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

BASIC BIBLIOGRAPHY

- J. Katz and A. Plotkin Low-Speed Aerodynamics, Cambridge University Press.

ADDITIONAL BIBLIOGRAPHY

- A. Barrero, J. Meseguer and A. Sanz Aerodinámica de altas velocidades, Garceta.
- H. Schlichting, E. Tuckenbrodt. Aerodynamics of the Airplane, Mc Graw Hill., 1979
- J. Bertin, R. Cummings Aerodynamics for Engineers, Pearsong Education International.