

Guia docent

220350 - 220350 - Laboratoris Aeroespacials

Última modificació: 30/07/2021

Unitat responsable: Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa
Unitat que imparteix: 748 - FIS - Departament de Física.

Titulació: MÀSTER UNIVERSITARI EN ENGINYERIA AERONÀUTICA (Pla 2014). (Assignatura optativa).
MÀSTER UNIVERSITARI EN ENGINYERIA ESPACIAL I AERONÀUTICA (Pla 2016). (Assignatura optativa).

Curs: 2021 **Crèdits ECTS:** 5.0 **Idiomes:** Anglès

PROFESSORAT

Professorat responsable: Enrique Ortega

Altres: Fariñas Gómez, Roberto
Farré Lladós, Josep
Sole Bosquet, Jaume

COMPETÈNCIES DE LA TITULACIÓ A LES QUALS CONTRIBUEIX L'ASSIGNATURA

Específiques:

CEEVEHI3. Aplicar coneixement de tecnologia de materials compostos i capacitat de disseny d'elements basats en aquests materials (competència específica associada a l'especialitat Vehicles Aeroespacials).

CEEVEHI2. Aplicar coneixements adequats de aeroelasticitat i dinàmica estructural d'aeronaus (competència específica associada a l'especialitat Vehicles Aeroespacials).

CEEVEHI1. Aplicar coneixements adequats de aerodinàmica avançada, experimental i computacional (competència específica associada a l'especialitat Vehicles Aeroespacials).

METODOLOGIES DOCENTS

The course Aerospace Laboratory is divided into theoretical and laboratory sessions. The theoretical sessions aim to provide students with the basic concepts behind the typical experimental techniques and procedures. The main objective of the labs is to exemplify the application of experimental techniques and actual laboratory work by means of guided experiments. Under the supervision of the professors, the students will conduct the labs in an autonomous manner, working in small groups. To this end, a laboratory guide will be provided by the professors, specifying the objectives and the procedure to conduct the test. Only for experiments indicated by the faculty (3 or 4 during the course), each group will write a laboratory report according to specific requirements. The submission of these reports is mandatory for all groups. Additionally, students will prepare and give a short oral presentation (about 15 minutes) on a topic of the subject to be defined during the course, and there will also be individual online quizzes on the topics developed. The grades obtained in the written reports, oral presentations and online tests will be taken into account for calculation of the final grade for the subject (see Grading System).

OBJECTIUS D'APRENENTATGE DE L'ASSIGNATURA

Experimental techniques play an essential role in all fields of science and technology. They contribute to the understanding of physical phenomena and facilitate the creation of models for study and analysis. In addition, experimental techniques are vital for the diagnosis, monitoring and control of processes, as well as for product evaluation and certification. The scope of experimental techniques is very extensive and varied, as are the different techniques used.

The main objective of Aerospace Laboratories is to provide students an overview of typical experimental techniques applied in selected fields of aerospace engineering. The course is intended to help the students to acquire an adequate understanding of the principles of operation of the instruments and the methodology to conduct experimental procedures, and to develop their ability to generate and critically analyze experimental data.



HORES TOTS DE DEDICACIÓ DE L'ESTUDIANTAT

Tipus	Hores	Percentatge
Hores aprenentatge autònom	80,0	64.00
Hores grup petit	15,0	12.00
Hores grup gran	30,0	24.00

Dedicació total: 125 h

CONTINGUTS

Module 1: fluid mechanics

Descripció:

Introduction to fluid measurements.

Similarity requirements and scale effects. Uncertainties.

Overview of low-speed wind tunnels: constructive and operation features.

Basic instrumentation: pressure, temperature, data acquisition.

Velocity measurement in fluids: pitot-static probes, hot-wire, turbulence and boundary layers.

Flow visualization techniques: overview and typical applications.

Introduction to Particle Image Velocimetry.

Activitats vinculades:

Laboratory experiments to be determined.

Dedicació: 71h

Grup gran/Teoria: 18h

Grup mitjà/Pràctiques: 7h

Aprenentatge autònom: 46h

Module 2: propulsion

Descripció:

Introduction and general description of turbojet engines.

Test benches and typical instrumentation. Measurement of the relevant operational parameters.

Applications using a small turbojet engine for educational purposes.

Activitats vinculades:

Laboratory experiments to be determined.

Dedicació: 27h

Grup gran/Teoria: 6h

Grup mitjà/Pràctiques: 4h

Aprenentatge autònom: 17h



Module 3: rocketry

Descripció:

Introduction to solid fuel rockets.

Simulation tools: OpenRocket.

ESEIAAT rocket analysis: components, functions, assembly and instrumentation.

Programming application for acquisition and post-processing of video data.

Activitats vinculades:

Laboratory experiments to be determined.

Dedicació: 27h

Grup gran/Teoria: 6h

Grup mitjà/Pràctiques: 4h

Aprenentatge autònom: 17h

SISTEMA DE QUALIFICACIÓ

The course will be graded by means of :

$$FG = 0.5 * G_M1 + 0.25 * G_M2 + 0.25 * G_M3$$

where FG is the final grade of the course and G_M1, M2 and M3 are the individual grades obtained for Module 1, 2 and 3, respectively. These are calculated according to:

G_M1: written lab report (0.3), oral presentation (0.5), individual online quiz (0.2)

G_M2: written lab report (0.8), individual online quiz (0.2)

G_M3: written lab report

Students having a grade FG below 5 may prepare topics chosen by the faculty for oral examination on the date scheduled for the final exam. The final result for the course will be a weighted average of the original (20%) and the second-chance oral examination (80%). If the averaged grade obtained is lower than the previous grade, the latter is preserved.

BIBLIOGRAFIA

Bàsica:

- Barlow, J. B.; Rae, W. H.; Pope, A. Low-speed wind tunnel testing. 3rd ed. New York: John Wiley & Sons, 1999. ISBN 0471557749.

Complementària:

- Goldstein, Richard J. Fluid mechanics measurements. New York: Taylor & Francis, 1996. ISBN 156032306X.