

205208 - Experimental Aerodynamics

Coordinating unit:	205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering		
Teaching unit:	748 - FIS - Department of Physics		
Academic year:	2019		
Degree:	BACHELOR'S DEGREE IN AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Optional) BACHELOR'S DEGREE IN AEROSPACE VEHICLE ENGINEERING (Syllabus 2010). (Teaching unit Optional)		
ECTS credits:	3	Teaching languages:	English

Teaching staff

Coordinator:	Ortega, Enrique
Others:	Flores Le Roux, Roberto Maurice

Opening hours

Timetable:	To be defined
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Prior skills

This course requires background knowledge of aerodynamics. Therefore, it is strongly recommended students take a basic course in aerodynamics previously.

Teaching methodology

The course Experimental Aerodynamics is divided into theoretical and laboratory sessions. The theoretical sessions aim to provide students with the basic concepts behind typical experimental procedures applied in low-speed aerodynamics. The main objective of the labs is to exemplify the application of experimental techniques and actual laboratory work by means of simple aerodynamic experiments.

The students will conduct the labs in an autonomous manner, working in small groups under the supervision of the professors. 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 professors (two 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. This will be defined during the course.

The grades obtained in the written reports and oral presentations will be taken into account in calculating the final grade for the subject (see Grading System).

Learning objectives of the subject

The main objective of the course is to provide students an overview of the most typical experimental procedures applied in low-speed aerodynamics. 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 the tests, and to develop their ability to generate and critically analyze experimental data. In addition, the different topics covered during the course are intended to help strengthen and expand previous knowledge acquired in the field of fluid mechanics and aerodynamics.



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Study load

Total learning time: 75h	Hours large group:	30h	40.00%
	Hours medium group:	0h	0.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	45h	60.00%

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Content

<p>Module 1</p>	<p>Learning time: 15h Theory classes: 6h Self study : 9h</p>
<p>Description: Introduction to experimental aerodynamics. Fluid governing equations, similarity requirements and scale effects. Basic aspects of instrumentation. Errors and uncertainties in measurements. Overview of low-speed wind tunnels: constructive and operation features.</p> <p>Related activities: Laboratory experiments to be determined.</p>	
<p>Module 2</p>	<p>Learning time: 30h Theory classes: 12h Self study : 18h</p>
<p>Description: Pressure and temperature measurements: basic instrumentation and applications. Other typical measurements in fluid flows: velocity, volumetric flow, boundary layers and turbulence. Application of pitot-static probes and hot-wire techniques. Flow visualization techniques: overview and typical applications.</p> <p>Related activities: Laboratory experiments to be determined.</p>	
<p>Module 3</p>	<p>Learning time: 30h Theory classes: 12h Self study : 18h</p>
<p>Description: Measurement of aerodynamic forces, basic principles and typical instrumentation. Wind tunnel interference effects and its correction: model-support interference and classic boundary corrections.</p> <p>Related activities: Laboratory experiments to be determined.</p> <p>Specific objectives: .</p>	

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Qualification system

The course will be graded according to:

$$NF = 0.30*N_WR1 + 0.30*N_WR2 + 0.40*N_OP$$

where:

-NF is the final grade of the course.

-N_WR1 and N_WR2 are the grades obtained in the written laboratory reports. There will be two mandatory lab reports performed and submitted in small groups (lab teams).

-N_OP is the grade obtained in an oral presentation about a selected topic in the subject.

Students having a grade NF 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 that corresponding to the original test, the latter is preserved.

Bibliography

Basic:

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

Complementary:

Goldstein, R.J. (ed.). Fluid mechanics measurements. 2nd ed. New York: Taylor & Francis, 1996. ISBN 156032306X.