



**Politecnico
di Torino**

Dipartimento
di Ingegneria Meccanica
e Aerospaziale

PhD Course

3rd and 4th of October 2024

Experimental techniques for scaled model testing

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Abstract

The course deals with the preparation of experimental setups meant for the study of full scaled models. By starting with the approach to address a usually difficult problem, the course will then continue presenting the salient aspects of measurement techniques for velocity and pressure quantification. Few details on how to optimize the setup and the measurement techniques together for specific applications in aeroacoustics will be discussed.

Program

Day 1: Fundamentals of measurement techniques and setup preparation, 6h

Lecture 1: 2h

Experimental testing in large scale models, the challenges and the requirements
Full scale-models versus component, why?
Reynolds scaling aspects and wind-tunnel choice.
The parameters to select, rotating versus stationary objects.

Lecture 2: 2h

Acoustic measurements: microphone applications for hydrodynamic and far-field pressures
What is a microphone and how do we use it to isolate far field acoustic pressure?
Can we adapt a microphone to measure wall pressure fluctuations?
Pressure measurements, in-field versus wind-tunnel measurements, what are the challenges?

Lecture 3: 2h

Laser velocimetry: spatial vs. temporal resolution, how to trade off for large scale application
Particle image velocimetry, how does it work and what can we do with it?
How can we use laser velocimetry information for visualization or for integral quantities.
Advanced techniques for saving on costs and increasing high-dynamic spatial resolution.

Day 2: Applications and exercise for setup preparation, 6h

Lecture 4: 2h

Applications in aeroacoustics
Wind-energy and propeller applications in wind-tunnels.
Drone measurements and full-scale 3D visualization.
In-field applications for wind-turbine noise.

Group exercise: 4h

2h Analysis of component setup: propeller and pylon interaction
Simulation of model preparation and experimental measurement setup
2h Analysis of full-scale setup: maneuvering drone
Simulation of model preparation and experimental measurement setup