

Fundamental of Aerodynamics

This teaching aims to form students to aerodynamics. Aerodynamics aims to predict the influence of air flows and object shapes on mechanical stresses and heat transfers in applications ranging from airplanes, to land vehicles and to buildings. It is an extremely rich and lively subject in terms of basic and applied research that we approach through a series of 4 lectures and exercise sessions. Students will learn the fundamental laws of incompressible aerodynamics, by sequentially addressing aerodynamic forces, the origin of lift and drag, and finally by establishing the physical models and the mathematical framework that allow to deal with all the problems of interest. The course goes deep into the concepts that may have been covered before, especially in M1. Emphasis is placed on the phenomenology of flows, using numerous illustrations. The lessons are followed by deepening sessions with exercises which aim to provide tools to calculate aerodynamic forces and properties of flows over a set of concrete applications. A final session is devoted to carrying out numerical simulations of the flow around a wing profile, with application to a configuration of tandem and ground effect wings.

Prerequisite: Overall, a basic Master 1 level in applied maths and fluid mechanics is required

Bibliography:

A. Giovannini, C. Airiau, *Aérodynamique Fondamentale*, Cepadues Editions.
J. Anderson, *Fundamental of Aerodynamics*, Mc Graw Hill/

Timing: The Course offered in the second part (nov-feb) of the M2 year.

Credits: 1.5 ECTS

Hours: 16 hours.