



BRUITS D'ORIGINE AÉRODYNAMIQUE

AERODYNAMICALLY GENERATED SOUND

Lecturers: Michel ROGER, Marc JACOB

| Lecturers : 16.0 | TC : 0.0 | PW : 8.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : MI

Objectives

The course is aimed at giving the students a general background in aeroacoustics, the science of aerodynamically generated sound. This includes the physical understanding of underlying mechanisms, their experimental study and associated analytical modeling. Students will be able to address modern problems of engineering interest and to take up international scientific publications. Basic notions of general acoustics and fluid dynamics will be reminded. Many practical case studies will be presented, dealing with aeronautical and ground transports, heating, ventilation and air conditioning, wind turbines and wind-induced noise.

Keywords : Acoustics, aeroacoustics, aerodynamics, propulsion, aerinautics, fluid dynamics

Programme

- 1 - Fundamentals and applications :
- Oscillatory motions in a gas and aerodynamic noise
 - Acoustic analogies, wave equations and solving by the Green's function technique
 - Sound radiation from moving sources
 - Jet noise
 - Tonal noise from self-sustained oscillations
 - Wind noise on mechanical structures (truss, building exo-structures ...)
 - Unsteady aerodynamics and noise from airfoils, high-lift devices

Learning outcomes

- Ability to identify basic aeroacoustic mechanisms in complex systems
- Ability to reduce a basic mechanism to a simple mathematical model
- Ability to understand and identify the acoustic signature of an unsteady flow
- Ability to perform in dimensional analysis

Independent study

Objectifs : This activity is not concerned with framed autonomy activities outside personal work.

Méthodes : This activity is not concerned with framed autonomy activities outside personal work.

Core texts

Goldstein, M.E., *AEROACOUSTICS*, , McGraw-Hill, 1976
Glegg, S. & Devenport, W. *AEROACOUSTICS OF LOW-MACH NUMBER FLOWS*, Academic Press, 2017

Assessment

The evaluation includes:
- an exam of 2h (all documents authorized, English and French versions f),
- reports on a case study and on 2 lab courses.