



ACOUSTIQUE ET ONDES DANS LES FLUIDES

ACOUSTICS AND WAVES IN FLUIDS

Lecturers: **Didier DRAGNA, Gilles ROBERT**

| Lecturers : 20.0 | TC : 24.0 | PW : 4.0 | Autonomy : 0.0 | Study : 0.0 | Project : 0.0 | Language : FR

Objectives

Have the basic knowledge in acoustics and wave propagation in fluids

Keywords : Acoustics, Sound, Noise, Waves, Dispersion relation, Phase and group velocities

Programme

I Acoustics

1. Sound waves as linear perturbations of fluid mechanics equations.
2. Sound perception : deciBels, weighting curves.
3. Wave propagation equations ; acoustic energy and intensity. Description in the frequency domain ; Helmholtz equation.
4. Plane and spherical waves ; characteristic impedance; near field, far field.
5. Reflection of waves at interfaces. Notion of impedance,
6. Sound radiation from vibrating structures. Integral formulation.

Learning outcomes

- Basic calculations in acoustics (sound pressure levels, source power, dB, ...)
- Knowledge of elementary sources (plane and spherical)
- Know the basics about the dB scale, the characterization of noise pollution and its perception
- Master the general techniques to analyse linear propagation of waves in fluids: dispersion relation, high-frequency approximation

Independent study

Objectifs : Analysis and design of a muffler.

Méthodes : Analysis of the problem leading to the formalization of the specifications
Proposal of a design for the muffler based on analytical developments.
Discussion of the limits of the proposed solution and prospects for improvement

Core texts

- A. D. Pierce, *ACOUSTICS, AN INTRODUCTION TO ITS PHYSICAL PRINCIPLES AND APPLICATIONS*, Springer, 2019
J. Lighthill *WAVES IN FLUIDS*, Cambridge University Press, 1978
G. B. Whitham *LINEAR AND NONLINEAR WAVES*, Wiley, 1974

Assessment

Final mark = 0.6* Exam + 0.4* (BE + TP)
BE = report on the work done on the muffler design
TP = report on the TP on acoustic materials