

**ACOUSTIQUE GÉNÉRALE : SOURCES ACOUSTIQUES ET PROPAGATION DU SON****GENERAL ACOUSTICS : ACOUSTICS SOURCES AND SOUND PROPAGATION****Lecturers:** Vincent CLAIR, Didier DRAGNA, Marc JACOB

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

**Objectives**

This advanced course of acoustics is focused on sources of sound and their propagation. The basics of acoustics, such as the linear acoustic equations and the quantitative evaluation of sound, are briefly presented before going further into the description of sources and their radiation in bounded or unbounded spaces. The sound radiated by vibrating structures and the acoustic propagation in inhomogeneous media are also discussed. The objective of the course is to provide the theoretical background required to approach a complex problem of sound generation and/or radiation. This course also provides a basis for students who might be interested in more specialised sub-domains of acoustics.

**Keywords :** Acoustics, sound waves, acoustic sources, acoustic radiation, duct acoustics, sound induced by vibrating structures, propagation in inhomogeneous media.

**Programme**

- I – Equations of linear acoustics (wave equation, acoustic energy, harmonic waves)
- II – Plane and spherical waves, Boundary conditions, Surface impedance
- III – Acoustic levels and spectral analysis (Decibels, power spectral density, weightings)
- IV – Acoustic propagation in ducts (duct modes, cut-off frequency, low frequency models)
- V – Sources (elementary sources, Green's function, source distribution)
- VI – Radiation from vibrating structures (boundary integral equation, Rayleigh integral)
- VII – Acoustic propagation in inhomogeneous media (geometrical and paraxial approximations)
- VIII – Further elaborations (thermo-viscous absorption, diffraction by rigid bodies)

**Learning outcomes**

- Understanding of sound generation and radiation in classical configurations.
- Modelling and resolution of an acoustics problem.
- Communicating with experts in acoustics.
- Acquiring a theoretical basis to approach a specialized domain of acoustics.

**Independent study****Objectifs :**

**Méthodes :** Two practical work sessions: 1) Measurement of the acoustic power of a source in anechoic and reverberant rooms. 2) Duct propagation near a sudden change of section. A special lecture on source localisation with an industrial partner (MicrodB).

**Core texts**

- A. D. Pierce, *ACOUSTICS: AN INTRODUCTION TO ITS PHYSICAL PRINCIPLES AND APPLICATIONS*, The Acoustical Society of America, 1989
- L. E. Kinsler et al. *FUNDAMENTALS OF ACOUSTICS*, John Wiley & Sons, 1982
- D.T. Blackstock *FUNDAMENTALS OF PHYSICAL ACOUSTICS*, John Wiley & Sons, 2000

**Assessment**

Final mark = 50% Knowledge + 50% Know-how  
Knowledge grade = 100% final exam  
Know-how grade = 100% continuous assessment