

Structural Acoustics

ECTS

3

Mots clés

Description du contenu de l'enseignement

Objectifs

This course aims at showing the links between the physical and mechanical source parameters and the radiated noise characteristics. We will give the principles and calculation methods of acoustic fields radiated by vibrating structures:

- modelization of sound sources;
- prediction and measurements of radiated noise (pressure, directivity, power, frequency spectrum and time-domain signature).

The main applications are ground, maritime and air transportation, but also building, energy and musical instrument acoustics.

Contenu

In the first part of the course, we study elementary sound sources

- pulsating sphere and monopole,
- oscillating sphere and dipole
- extended sources and Kirchhoff-Helmholtz integral equation.

In the second part of the course, we examine in detail the basic problem of a baffled vibrating plate in interaction with a fluid. We describe the acoustic field radiated in the so-called subsonic and supersonic domains. Then, we show how the results for a flat baffled plate can be extended to more complex geometries (unbaffled plates, shells, cavities).

The lectures come with guided exercises in the classroom and in the computer room.

Compétences à acquérir

Compétences

Characterize simple sound sources (point sources, piston) in terms of radiated pressure, power, and directivity

Model and describe the pressure field radiated by a vibrating plate in interaction with a fluid

Compétences complémentaires

Using Matlab software for radiated acoustic field calculations.

Modalités d'organisation et de suivi

Coordinateur

Cotté, Benjamin, Maître de conférence, ENSTA ParisTech

Équipe pédagogique

Garcia, Alexandre, Professeur, CNAM

Langue

Anglais

Volume horaire

CM : 15h, TD : 15h

Bibliographie, lectures recommandées

D.T. Blackstock : Fundamentals of Physical Acoustics (2000)

A. Chaigne et J. Kergomard: Acoustique des instruments de musique, 2ème édition (2013)

L. Cremer, M. Heckl and B.A.T. Peterson : Structure-Borne Sound : Structural Vibrations and Sound Radiation at Audio Frequencies (3rd edition, 2005)

A.D. Pierce : Acoustics : An introduction to its physical principles and applications (2nd edition, 1991)

E.G. Williams : Fourier Acoustics : Sound Radiation and Nearfield Acoustical Holography (1999)

Pré-requis obligatoires

Basic knowledge in linear acoustics and structural dynamics

Période et lieu(x) enseignements

Période

B (décembre-février)

Lieu

ENSTA ParisTech

Mode de contrôle des connaissances

1 written (50% of the grade), and 1 computer project (50% of the grade)