



LES MÉTAMATÉRIAUX MÉCANIQUES

MECHANICAL METAMATERIALS

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| Lecturers : 6 | TC : 6 | PW : 0.0 | Autonomy : 0.0 | Study : 0.0 | Project : 20 | Language : MI

Objectives

Metamaterials appears as artificial materials incorporating an internal structuring allowing them to adopt unparalleled wave behavior at the large scale. In the case of acoustics, they give rise to very important applications in engineering fields as sound insulation, vibroacoustics, stealth in underwater acoustics, the realization of more efficient transducers.

Today, associated technologies present a very important development potential and already arouse the interest of many industries.

The main objective of this course is to give general training to the students of Ecole Centrale de Lyon on the

Keywords : Waves, Vibrations, Acoustics, Smart Materials, optimization, Vibroacoustic treatments

Programme

1. Waves flow: basis
2. Modelization
 - a) Analytical and semi-analytique SAFE
 - b) WFE : Wave Finite Elements
 - c) Shift Cell Operator for coupled and damped problem
 - d) ExpansionPWE
3. Structural design based on Bragg and resonnant band gap :

Learning outcomes

- Understanding of physical behavior of metamaterials
- Use of associated design numerical methodolgy
- know-how to use them on specific classical problem through a mini-project

Independent study

Objectifs : Apply to a concrete case the methods introduced in the course covering the entire field of knowledge while promoting creativity in design choices

Méhodes : The used pedagogical method is based on the realization of mini projects of 14 hours in groups of 6 students. Each group will benefit from 8 hours of supervision for precising the problem and proposing methodologies. A final restitution of the results will be made in front of all the class.

Core texts

Assessment

- 1/3 by using a QCM
- 1/3 coming from project evaluation
- 1/3 made by the class evaluation of the final restitution