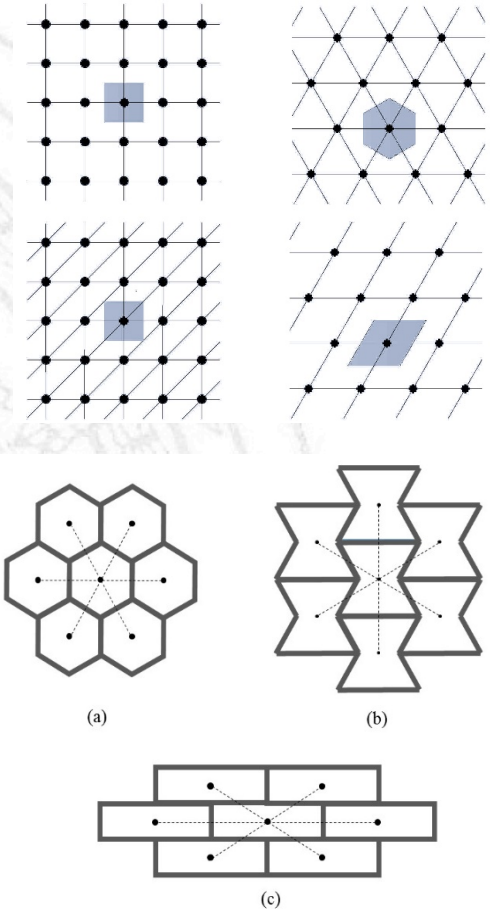
Università degli Studi di Pavia
Computational Mechanics & Advanced Materials Group - DICAr

3D@UniPV
Virtual Modeling and Additive Manufacturing for Advanced Materials

SEMINAR

THE INFLUENCE OF CELL MORPHOLOGY ON BULK ACOUSTIC WAVE PROPAGATION IN PERIODIC COMPOSITE MATERIALS



The propagation of elastic waves in composites may be strongly affected by periodic arrangements of scatterers. The periodicity of the material microstructure may lead to destructive interferences inducing attenuation of the amplitude of the travelling waves for some bands of frequencies called acoustic wave spectral gap or band gaps.

Although several studies on periodic composite materials exhibiting exotic acoustic properties, called acoustic metamaterials, have been carried out in the last twenty years, several issues seem to be still open among which: the formulation of suitably simplified mechanical models; the understanding of the influence of the morphology of the cell arrangement on the acoustic behavior; the optimal design of the microstructure and many others.

The talk will be focused on the wide class of lattice materials, as assemblies of elastic ligaments connecting nodal masses and/or rigid blocks connected by elastic interfaces. Some issues will be considered in order to understood their mechanical properties within a general framework useful to the design of innovative smart acoustic materials, possibly to be produced through advanced manufacturing techniques.

A unified approach to obtain the Floquet-Bloch spectrum will be presented, based on a Lagrangian formulation that allows to grasp the influence of the constitutive parameters and the role of the cell topology. Moreover, a high frequency homogenization/continualization technique will be presented to obtain an accurate description of the dispersion surfaces in the frequency spectrum in the first Brillouin zone for a wide range of wavelengths.

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February 2nd, 11:30am
DICAr – Hydraulic
Meeting Room (ground floor)
Via Ferrata, 3 – Pavia