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Modeling wave propagation and boundary effects in acoustic metamaterials by a relaxed micromorphic continuum

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Date	**October 24, 2024**
Time	**14:30**
Room	**2F, DICAM, Mesiano**

In this talk, I will show how the relaxed micromorphic model, which I have contributed to pioneer, can be used to describe the dynamical behavior of anisotropic mechanical metamaterials. I will show to which extent the proposed model is able to capture all the main macroscopic dynamical characteristics of the targeted metamaterials, namely, stiffness, anisotropy, dispersion and band-gaps. The simple structure of our material model, which simultaneously lives on a micro-, a meso- and a macroscopic scale, requires only the identification of a limited number of frequency-independent parameters, thus allowing the introduction of pertinent boundary conditions to be imposed at macroscopic metamaterials' boundaries when the model is framed in the context of Variational Principles. With reference to the pertinent interface conditions to be introduced in the framework of micromorphic elasticity, we reached a major breakthrough by proving, for the first time, that the concepts of non-coherent interfaces and microstructure-driven interface forces must necessarily be introduced if one wants to use micromorphic models to correctly describe the static/dynamic response of finite-size metamaterials. These finding provide a milestone for the understanding of metamaterials' modeling at the homogenized scale and cannot be overlooked if one wants to use homogenized models to explore an upscale towards larger scales metamaterials' structures.

I will show how this modelling approach can be applied to the study of the scattering properties of finite-size metamaterials' structures thus opening new perspectives for metastructural engineering design.

The seminar is organized by the Solid and Structural Mechanics Group [D. Bigoni, F. Dal Corso, L. Deseri, D. Misseroni, M.F. Pantano, A. Piccolroaz, N.Pugno, R. Springhetti]