

SHORT COURSE ON:

Mechanics of Bi-stable Elastic Metamaterials

Alfredo Huespe

21-22, November, 2023, from 15:00 to 17:00
PEM/COPPE – G-205 - CT

The course offers an overview of the mechanical description of elastic metamaterials displaying bi-stable mechanisms at the microscale. The focus is on examining the energetic landscape conditions that give rise to the hysteresis effect and energy dissipation, particularly when observing the limit behavior of the microarchitecture.

As a motivation for the topic, the course begins with a brief overview of some mechanical and acoustic applications of metamaterials.

The course primary focus involves a discussion of jump conditions across surfaces (phase boundaries) encountered in mechanical systems with non-convex energies. The analysis assesses 1D springs, chains of 1D springs, and the continuum response of mechanical systems characterized by non-convex energies. Another part of the course discusses the mechanical description of the apparent responses of metamaterials with microscopic bi-stability. This aspect of the problem involves introducing a constitutive equation, typically a standard generalized model with an internal variable, to define the apparent or effective metamaterial response observed at the macroscale. The course also shows specific lattices with bi-stability experiencing arbitrary loading directions, which do not necessarily align with the lattice direction.



Alfredo Huespe's short bio:

Alfredo Huespe is a researcher at CIMEC (Centro de Investigaciones en Mecánica Computacional), Conicet, National University of Litoral, Argentina. His research interests centered around Computational Fracture Mechanics, with more than 20 years of experience, and Computational Design of Mechanical and Acoustic Metamaterials. His recent research line points to the Analysis of Metamaterials with Bistable Mechanisms at the Microscale.

Bibliography that follows the course: :

The course will be supported by an extensive bibliography, including works by Rohan Abeyaratne, James K. Knowles, B. Fedelich, Giovanni Zanzotto, G. Puglisi, Lev Truskinovsky, Robert V. Kohn, and Allen C. Pipkin.

Registration and Contact Details:

For this course, registration is not required. If you need additional information, please feel free to contact Prof. Fernando Duda (duda@mecanica.coppe.ufrj.br).