

May 23 and 24, 2024 - 9:30am-12:30pm

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Mechanical metamaterials: conceptualization, analysis and design

The endless development of physical-mathematical formulations, powerful analytical methods and computational techniques, combined with recent extraordinary advances in high-technology microengineering and high-fidelity manufacturing, are paving the way for the emergence of an entirely new generation of microstructured materials, known as mechanical or acoustic metamaterials. The macroscopic dynamic behavior of mechanical metamaterials can be governed by appropriately designing the topology, compositeness and architecture of the periodic cellular microstructure. Proper optimization of microstructural design can enable extreme or exotic performance to be achieved, unattainable by natural or traditional synthetic materials. Consequently, the advent of mechanical metamaterials opens up completely new and revolutionary possibilities in the customization of functional and tunable systems with fascinating applications in traditional and emerging engineering fields, including shock absorption, noise cancellation, wave focusing, energy harvesting, vibration shielding and sonar invisibility, among many others. The objective of this short course is to provide an updated basic knowledge on mechanical metamaterials, organized in the following topics: 1. Introduction to mechanical metamaterials, 2. Free wave propagation in periodic materials, 3. Mechanisms of formation and manipulation of the frequency band structure, 4. Methods of wave propagation analysis in the time and frequency domain, 5. Mechanical metamaterials for sound insulation and vibration protection, 6. Dynamic phenomena in nonlinear metamaterials.

Program:

https://phd.uniroma1.it/web/mechanical-metamaterials-conceptualization-analysis-and-design_nS6192EN_EN.aspx

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<https://forms.gle/G5sh6M1WKFXMPVK98>