

**October 24, 2024 - 2:00pm-5:30pm**  
**October 25, 2024 - 9:00am-12:30pm**

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# **Mechanics of heterogeneous materials: From homogenization theory to strain localization phenomena**

The heterogeneous nature of materials like fiber reinforced composites and grains in metallic polycrystals can be used as an asset in the design of optimized microstructures. Averaging methods will be described for stress, strain and energy in order to predict the effective properties. The proposed illustrations deal with elasticity of composites and plasticity of crystals. The concept of representative volume element for random microstructures will be presented. Computational homogenization can be used to predict the failure of materials by strain localization in the form of shear bands. Concepts of loss of uniqueness and loss of ellipticity will be applied to predict shear banding in elastic-plastic dense and porous materials. Finite element simulations of strain localization are characterized by a spurious mesh-dependence of the results. The regularization of these problems requires the introduction of internal lengths in the constitutive model. The strain gradient plasticity theory will be presented and used for this purpose.

Program:

[https://phd.uniroma1.it/web/course---mechanics-of-heterogeneous-materials-from-homogenization-theory-to-strain-localization-phenomena\\_ns6433EN\\_EN.aspx](https://phd.uniroma1.it/web/course---mechanics-of-heterogeneous-materials-from-homogenization-theory-to-strain-localization-phenomena_ns6433EN_EN.aspx)

Registration form:

<https://forms.gle/zrrigmfnvw91LTgc6>