Multiscale modelling and simulation of materials and structures

Modélisation multi-échelles des matériaux et des structures

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### Outline

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**TP:** 😊 bibliography project + homework
😊😊 computational project + homework
😊😊 practical work 2 ×
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Part I ... VS

General concepts

- Motivations & examples.
- Scale separation
  Representative Volume Element (RVE)
- General strategy
  - Microstructure
  - Localisation
  - Homogenisation
- Multiscale methods: main ideas.
- Discussion.
Outline

Part II ... VS
Variational homogenisation
- Basics + details.
- Application: composites.

Part III ... TL
Volume averaging method
- Basics + details.
- Application: transport.

Part IV ... VS
Eshelby-type homogenisation
- Basics.
- Application: poroelasticity.

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Asymptotic homogenisation
- Basics.
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What will you be able to do after these lectures?

▶ understand the “classical” and “state-of-the-art” theories and modelling approaches for mechanics of heterogeneous media
▶ follow the current scientific literature on modelling of heterogeneous media
▶ understand the principles and theories employed in specialised computer tools
▶ formulate and solve a mechanical problem for the analysis of a heterogeneous medium

▶ fill the gap between material and structure: smart design
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