

**Abstract:**

A crash-course in Homogenization Methods and Multiscale Modelling: Formal Asymptotics (Part 1)

This mini-course wants to provide a quick and elementary introduction to the main issues of the theory of mathematical homogenization. My aim is twofold:

(1) I want to underline the main mathematical problems arising when dealing with (partial) differential equations with oscillating coefficients and then give a glimpse on a possible way on how to handle them rigorously.

(2) With a view on real-world applications, I will explain the potential impact of the methodology in modelling chemically-reactive flows in media with microstructures (e.g. porous media).

I envisage two parts: In Part 1 I will be handling formal asymptotics for a linear elliptic PDE with non-homogeneous boundary conditions, while in Part 2 I will present the two-scale convergence approach to the homogenization of a linear elliptic PDE with homogeneous boundary conditions.

As reference material, I will use chapter 2 (Part 1) and chapter 4 (Part 2) from my lecture notes

A. Muntean, V. Chalupecky, Homogenization Method and Multiscale Modeling, Lecture notes at the Institute for Mathematics and Industry, Kyushu University, Japan, 2011.

<http://gcoe-mi.jp/english/temp/publish/9672af5811a73a0353f7b9b331c7a7c2.pdf>