

# An Introduction to Asymptotic Homogenization

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## Abstract

Real world physical systems are usually multiscale in nature. They are characterized by strong heterogeneities, geometrical complexity, and different constituents which can interplay among several hierarchical levels of organization. From a modeling viewpoint, it is necessary to have a comprehensive understanding of the real world phenomena formulating qualitative and quantitative predictions (via analytical and numerical tools) to pursue validation against appropriate experimental data.

The asymptotic homogenization technique exploits the sharp length scale separation that exists in multiscale systems and a power series representation of the fields to provide macroscale systems of partial differential equations, as the derived models encode the role of the microstructure in their coefficients (hydraulic conductivities, diffusivities, elastic stiffness, etc.). In the course, we will introduce the technique via a very simple set of basic examples. We will follow a direct approach widely explored in the literature which is well suited to introduce asymptotic homogenization to students or scientists coming across this topic for the first time.

## PhD course

28 Nov 2024 from 9.30 to 13.30 – Aula 22  
5 Dec 2024 from 9.30 to 13.30 – Aula 22  
12 Dec 2024 from 9.30 to 13.30 – Aula 23  
19 Dec 2024 from 9.30 to 13.30 – Aula 23  
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