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Fakultät für Mathematik, Informatik
und Naturwissenschaften
Fachbereich Mathematik

Lothar-Collatz-Kolloquium für Angewandte Mathematik

Donnerstag, den 1. Dezember 2022, um 17:15 Uhr, im Hörsaal 5

Prof. Dr. Malte Peter*
(Universität Augsburg, Institut für Mathematik)

A multiscale approach to reaction-diffusion processes and elasticity in domains with microstructure

Zusammenfassung/Abstract:

Reaction-diffusion processes occur in many materials with microstructure such as biological cells, steel or concrete. The main difficulty in modelling and simulating accurately such processes is to account for the fine microstructure of the material. One method of upscaling multiscale problems, which has proven reliable for obtaining feasible macroscopic models rigorously, is the method of periodic homogenisation.

The correct scaling of certain terms of the system with powers of the homogenisation parameter is an aspect particularly relevant in this context. The scaling arises from geometrical considerations or from the processes themselves. Depending on the particular choice of these scaling powers, different limit behaviours are obtained leading to different systems of equations in the homogenisation limit. This will be discussed in the context of reaction-diffusion systems given in a two-component medium coupled by a Robin condition at the internal interface as well as for the analogous vector-valued problem modelling two elastic materials coupled by a slip-displacement condition.

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Stand: 14.10.2022 (Katrin Kopp)