Micromechanics and Homogenization Principles

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Competencies:
Successful participants of this course are able to apply fundamental concepts of micromechanics to determine effective properties of multiphase elastic solids such as composite materials. They understand the theoretical foundations as well as the advantages and shortcomings of classical micromechanics techniques. The students are also familiar with advanced homogenization principles - both analytical and numerical in nature - that incorporate the influence of micro-defects (inclusions, cavities, cracks) and inelastic behavior. They have further acquired first experience with numerical implementation of these modeling concepts through simple programming examples.

Content:
* Micromechanics techniques for computing effective elastic properties of composite media
* Fundamental Eshelby solutions, inclusions, inhomogeneities
* Dilute distribution, Mori-Tanaka, and self-consistent approaches
* Energetic bounds on effective properties
* General averaging theorems, Hill-Mandel Principle, periodic homogenization, asymptotic expansions
* Direct numerical homogenization schemes, including the FE2-method
* Strength and failure, localization
* Numerical examples (programming in Matlab/Mathematica/Python)

Pre-requisites: Continuum Mechanics

Lectures (KKB-1075, 11:00 - 12:30):
16.10., 23.10., 30.10., 06.11., 13.11., 27.11., 04.12., 11.12.2019,
08.01., 15.01., 22.01., 29.01., 05.02.2020

Exercises (WEI-0120, 7:30 - 9:00):
23.10., 06.11., 04.12., 21.12.2019, 15.01., 29.01.2020

https://tu-freiberg.de/fakultat/imfd/studium-und-lehre/lehrveranstaltungen/micromechanics-and-homogenization-principles