

Organizer

This workshop is organized by both the Institute of Engineering Mechanics, Chair of Continuum Mechanics, and the Graduiertenkolleg 1483 'Prozessketten in der Fertigung'.

Location

The lectures will be held in a lecture room of Karlsruhe University (TH), the exercises will take place in the Rechenzentrum of Karlsruhe University (TH). The exact location will be announced in due time.

Dates

- Deadline for registration 31.01.2009
- Seminar 06.04.-08.04.2009



Contact

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Registration

Please send all details on

- Name, Firstname, Title
- Organisation
- Address
- Tel.-No./Fax-No.
- E-Mail-Address

latest by

28.02.2009

to our Sekretariat:

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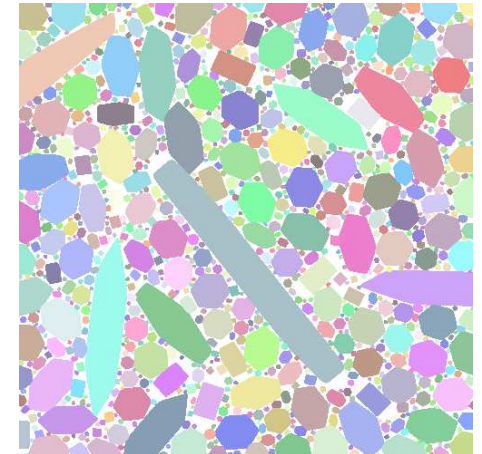
Karlsruhe University (TH)
Institute of Engineering Mechanics
Chair of Continuum Mechanics

Graduiertenkolleg 1483
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Seminar

Methods of Homogenization in Continuum Mechanics



Karlsruhe

06.04.-08.04.2009

Objective of the Seminar

Modern and classic materials display a macroscopic material behavior depending extensively on their nanostructure, microstructure, and mesostructure.

Which mechanisms and size scales are finally relevant for the macroscopic material behavior depends, among others, on the mechanical or physical sizes considered and on the thermomechanical process conduct.

A comprehension of the correlation of both the microstructure and micromechanical behavior, and the macroscopic material behavior is of fundamental interest for a number of questions such as the selection and the design of materials as well as the dimensioning of construction parts.

The objective of the seminar is to give an introduction to the fundamental concepts of homogenization methods mainly exemplified at linear elastic problems. The derivation of all relevant results will be demonstrated on the black board such that for participating in this seminar, there is no precognition in the field of homogenization requested. At the end, the seminar gives an overview as to the methods which can be used for the homogenization of non-linear material properties.

This workshop addresses all students of advanced semesters as well as staff members of the industry, of research centers and universities.

Key Subjects

- Linear elasticity
 - Effective stress and strain measures
 - Effective elastic properties
 - Single inclusion problem
 - Green's functions
 - Maxwell approximation
 - Mori-Tanaka approximation
 - Self-consistent schemes
 - Differential scheme
 - Singular approximation
 - Voigt and Reuss bound
 - Hashin-Shtrikman bounds
 - Higher-order bounds
 - Numerical homogenization schemes
 - Homogenization of nonlinear properties
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Time Table

| | | |
|-------|-----------|------------------|
| Day 1 | Morning | 2 Lectures |
| | Afternoon | 2 Exercises |
| Day 2 | Morning | 2 Lectures |
| | Afternoon | 2 Exercises |
| Day 3 | Morning | 2 Lectures |
| | Afternoon | 2 Exercises |
| | | Final discussion |

Recommended Literature

- Gross, D.; Seelig, Th.: Fracture Mechanics, With an Introduction to Micromechanics, Springer Verlag, 2006.
- Torquato, S.: Random Heterogeneous Materials. Springer Verlag, 2002.
- Nemat-Nasser, S.; Hori, M.: Micromechanics: Overall Properties of Heterogeneous Materials, Elsevier, 1999, 2. Ausgabe.

Requirements

Participation at one of the introductory lectures in Continuum Mechanics, e.g.,

- Advanced Course of Strength of Materials,
- Mathematical methods in strength of materials
- Theory of Plasticity
- Introduction to the Finite Element Method
- Computational Mechanics I