

## Kolloquium für Mechanik / Graduiertenkolleg 1483

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Datum: 04.03.2015  
Uhrzeit: 10:00 Uhr  
Ort: Geb. 11.10, Kl. ETI  
<https://www.eti.kit.edu/anfahrt.php>

Titel: **Numerical aspects of strain gradient elasticity**

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### Abstract

The use of strain gradients in material models requires additional effort when boundary value problems are solved numerically with the Finite Element Method (FEM), compared to the usual second-order partial differential equations (PDE) that arise in the case of simple materials. In short, one needs to introduce either the first gradient  $\mathbf{H} = \mathbf{u} \otimes \nabla_0$  as a new field, and enforce  $\mathbf{H} = \mathbf{u} \otimes \nabla_0$  weakly by solving two coupled systems of PDEs with  $C_0$  continuous approximations of  $\mathbf{u}$  and  $\mathbf{H}$  (implicit strain gradient), or construct  $C_1$  continuous approximations of the displacement field  $\mathbf{u}$  (explicit strain gradient). In both cases, additional degrees of freedom are introduced. This requires an extension of standard FE codes, which I shall address in my talk. Specifically, I intend to cover the following points:

- Discussion of the advantages and drawbacks of explicit and implicit strain gradient implementations
  - From the PDEs to the weak form in 3D gradient elasticity
  - Constructing  $C_1$  continuous elements
  - Implementation as user elements into Abaqus
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Alle Interessenten sind herzlich eingeladen.

Prof. Dr.-Ing. Thomas Böhlke