

Seminar series of the Graduate School GRK 2078

Referee: **Prof. Dr. Ing. habil. Philipp Junker**
Leibniz University Hannover

Dates: Tuesday, February 7, 2023

Time: 14:00-15:00

Location: Building 10.23, 3rd floor, seminar room 308.1
Please note that you can also participate in the event online

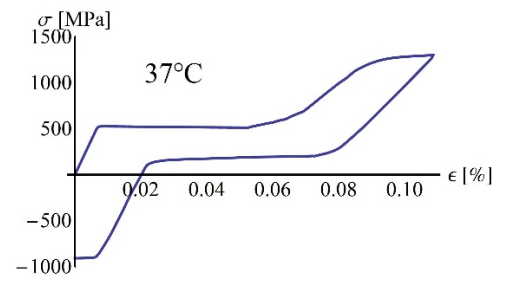
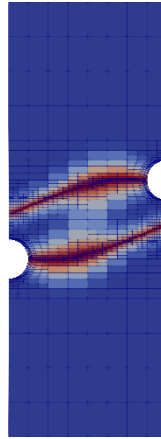
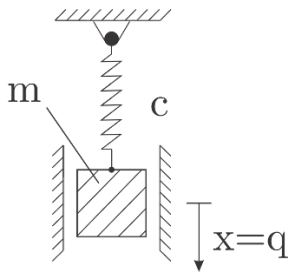
Title: **Material modeling using Hamilton's principle: damage processes and phase transformations**

Abstract

Material modeling in combination with numerical simulations enable us to better understand how construction parts will behave under specific loading conditions. This is particularly true when complex and coupled processes in the evolution of microstructure take place. Consequently, these digital predictions provide an important tool for the designing of engineering components.

For the derivation of material models, several general procedures are available, each of which with specific benefits. In this talk, an extended Hamilton principle will be presented as fundamental modeling strategy from which all governing equations for thermo-mechanically coupled materials with dissipative microstructure evolution result. We start with the modeling of a harmonic oscillator by means of energetic quantities which serves as example of a simple mechanical system. We then relate these findings to deformable bodies with microstructure evolution by rigorously making use of the first and second law of thermodynamics.

Material modelling based on the extended Hamilton principle will be employed for two different examples: first, we discuss how damage processes can be described. A robust and fast algorithmic treatment for this damage model results in computation times which are close to purely (hyper-)elastic simulations. Second, we investigate phase transformations in solids and analyze how this model behaves in a thermo-mechanically coupled context.



You are cordially invited to take part in the event.

Prof. Dr.-Ing. Thomas Böhlke
(Spokesperson of GRK 2078)