Seminar im Rahmen des GRK 2078

Referee:	**Prof. Reinaldo Rodríguez-Ramos** Faculty of Mathematics and Computer Science, University of Havana, Cuba
Date:	Wednesday, December 4, 2019
Time:	17:00 h
Location:	Bldg. 10.23, 3rd Floor, Room 308.1 (KM-Seminar Room)
Title:	**Three scale asymptotic homogenization method for viscoelastic heterogeneous media. Applications.**

Abstract

The study of both naturally occurring and man-made materials requires significant challenges in the modeling procedure and material characterization due to they often present complex heterogeneous structures with hierarchical disposition. The excellent mechanical performance of these materials, such as low relative density, high strength, high heat resistance, among others makes them widely used in the design of durable and sustainable structural components with technological and bioengineering interests. Attractive cases of hierarchical composite materials can be found in the human body tissues. For instance, many researches are focus on the study of the viscoelastic, non-linear hyperelastic and anisotropic behavior of the structural components of the skin. A better understanding of this biological tissue has a real impact on biomedical applications and also inspires modern technology such as flexible instance electronics, soft robotics and prosthetics.
In the scientific literature, there exist several works focusing on the development of micromechanic techniques to predict the macroscopic properties of composite materials. The use of multiscale asymptotic homogenization methods takes advantage of the information available at the smaller scales to calculate the effective properties of the medium at its larger scales. This homogenization procedure requires the solution of a cell problem with data corresponding to the homogenized material properties of the previous steps. Also, the use of more general periodic or stratification functions lets to describe the different length scales of the composite materials.
In the present work, the three-scale Asymptotic Homogenization Method (AHM) is applied to model a non-ageing linear viscoelastic composites material with generalized periodicity and two hierarchical levels of organization. The theoretical aspects of the method are rigorously developed in different books and research articles. The approach aims to generalize the results obtained for linear elasticity by extending them to non-ageing linear viscoelasticity with generalized periodicity at each length scale. We present the analytical solution of the local problems associated with each scale and the calculation of the effective coefficients for a hierarchical laminated composites materials with generalized periodicity, anisotropic components and perfect contact at the interfaces. We conclude with the study of some laminated structures and the application of the current approach in the investigation of the effective viscoelastic properties of the dermis.

Alle Interessenten sind herzlich eingeladen.

Prof. Dr.-Ing. Thomas Böhlke
(Sprecher des GRK 2078)