Implementation of Visco-Elasticity with deal.ii

Workshop

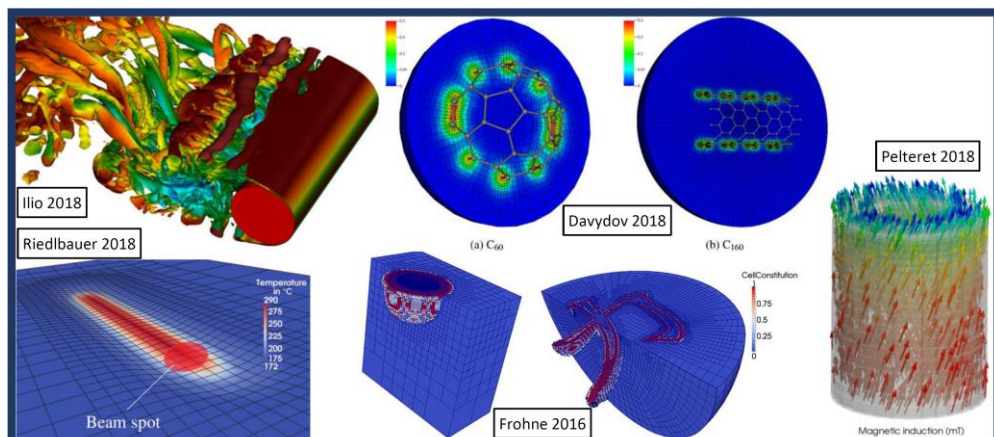**at IIT Delhi, Chair of Applied Mechanics: 25.02 – 01.03.2019**

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Simulation has become an essential tool for scientists and engineers to predict the behavior or response of systems and applications of interest and has therefore entered the curriculum of almost all natural and engineering sciences. In engineering the Finite Element method is among the most used numerical tools to solve partial differential equations (PDEs). PDEs are mathematical models to describe physical phenomena and processes, for which an analytical solution cannot be found.

In this workshop we will first motivate and introduce the basic aspects of modelling inelastic material behavior, give a short in introduction into time integration concepts and derive the theory of three-dimensional viscoelasticity. In this context, we also consider the basics of nonlinear Continuum Mechanics and will subsequently derive the governing equations for the Finite Element-based solution.

In the second port of the workshop, we will focus on the solution of a viscoelastic problem by means of an academic example. For that purpose the open-source C++ FE library deal.ii is introduced. The basic concepts and steps of the FE implementation will be developed interactively, which includes grid generation, handling of degrees of freedom, sparsity patterns, boundary conditions, assembly and solution of sparse linear systems and postprocessing.

Various applications using deal.ii

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