Prof. Jože Korelc
Prof. Korelc is currently Head of the Division of Structures at the Faculty of Civil and Geodetic Engineering, University of Ljubljana, and Vice-President of the Scientific Computing Committee of ECCOMAS. He is also a primal developer of the commercial software systems AceGen and AceFEM for on-demand numerical code generation and finite element analysis. His research examines an interdisciplinary approach to computational mechanics as synthesis of classical numerical methods and symbolic-algebraic systems. He has published numerous articles on finite element technology for solid and contact problems, material modelling, sensitivity analysis, automatic code generation and the use of symbolic methods in engineering.

Registration
It would be highly appreciated if you register yourself for the lectures via e-mail to schulte@ikm.uni-hannover.de

Contact
Graduate School MUSIC
Leibniz Universität Hannover
Appelstraße 11A
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Location
The lectures will take place at the CAD-Pool (room-nr. A147) at building nr. 3403, Appelstr. 11, 30167 Hannover (see the blue arrow). The campus is served by two underground lines, line 4 to Garbsen and line 5 to Stöcken getting off at the stop Appelstraße.

Short Course on Automation of Computational Modelling

Prof. Jože Korelc
University of Ljubljana

06-07 December 2012
Leibniz Universität Hannover, Germany
Short Course on Automation of Computational Modelling

Many advances in the reliability, generality and interdisciplinary nature of new computational methods developed in recent years can be attributed to a holistic approach to computational modelling, in which advanced software tools and techniques are combined with advanced numerical methods. The holistic approach is playing nowadays a central role in the process that leads to the goal of complete automation of computational modelling.

The automated generation of computational models has been explored by researchers from the fields of mathematics, computer science and computational mechanics, resulting in a variety of approaches (e.g. object-oriented, domain specific languages and hybrid symbolic-numeric methods) and available software tools (e.g. symbolic and algebraic systems, automatic differentiation tools, problem solving environments and numerical libraries). Automation can address all steps of a finite element solution procedure from the strong form of a boundary-value problem to the visualization of results, or it can be applied only to the automation of selected steps in a whole procedure. The course will first address the broad area of advanced software technologies for scientific computing. It will be demonstrated that an efficient automation can be achieved using the automatic differentiation technique combined with the symbolic problem description, automatic code generation and code optimization. The main objective of the course is to provide theoretical background as well as practical training for automatic generation of finite element codes using Mathematica based code generation system AceGen (www.fgg.uni-lj.si/symech). Participants will get insight into the mathematical formulation of a problem, its symbolic description with symbolic code generator AceGen, methods for verification of the model and the generated code and a final implementation in the finite element environment AceFEM. The advantages of using automatic differentiation technique and symbolic description of computational models will be demonstrated on several examples including: hyper-elasticty, finite strain plasticity, thermo-mechanical-hydrous coupled problems and multi-scale analysis.

Lectures

All lectures will be given in English. Students will be encouraged to try to use symbolic approach on their specific field of research. All the participants will get students AceGen/AceFEM license and lecture notes.

06.12.2012, 09:00 – 12:00

06.12.2012, 14:00 – 18:00
AceFEM: hybrid symbolic-numeric finite element environment. Examples of automation of the nonlinear finite element method: general formulation of direct and sensitivity analysis of coupled path-dependent problems; problem definition; element formulation; elasticity; finite strain plasticity.

07.12.2012, 09:00 – 13:00