

# MAI0106: Numerical Methods for Initial Boundary Value Problems

## Why should I take this course?

- It provides advanced knowledge of the numerical treatment of Initial Boundary Value Problems (IBVP's).
- The ambitious student will reach a research level in scientific computing related to IBVP's
- The ambitious student will be able to assess the validity of other researchers computational efforts related to IBVP's.
- Application oriented students using IBVP's will be able to distinguish between numerical errors and physical events.

## Aim

To provide advanced knowledge in analysis and methodology for initial boundary value problems (IBVP's). The focus is on the underlying principles and theoretical understanding of the techniques.

## Content

Fundamental properties for initial boundary value problems (IBVP's). The concepts of well-posedness for the IBVP. The crucial role of boundary conditions. Effects of uncertainty in data for the IBVP. Fundamental properties for numerical methods applied to the IBVP: consistency, convergence, stability, efficiency. Methods for analysis of finite difference schemes for IBVP's. Higher order approximations. Methods for complex geometries: multi-block methods, unstructured finite volume methods, discontinuous Galerkin methods.

## Details

**Time:** Start 10th of November 13.15-15.00 in in R42, C-building, 18 Lectures, 2-3 times a week.

**Lecturer:** Jan Nordström, MAI, <http://www.mai.liu.se/~janno11/>

**Instruction:** Lectures and compulsory assignments.

**Examination:** There will be 6 mandatory problems to be done as home work. No exam in class.

**Course homepage:** <http://www.mai.liu.se/~janno11/kurser/MAI0106/>

**Literature:** Bertil Gustafsson: High order difference methods for time-dependent PDE. ISBN 978-3-540-74992-9 e-ISBN 978-3-540-74993-6 DOI 10.1007/978-3-540-74993-6 Springer Series in Computational Mathematics ISSN 0179-3632. © 2008 Springer-Verlag Berlin Heidelberg.