Bachelor Thesis
(Bakkalaureatsarbeit)

on the topic

"Some Benchmark Problems in Fluid Mechanics"

- **Title:** Some Benchmark Problems in Fluid Mechanics

- **Supervisor:** o.Univ.-Prof. Dr. Ulrich Langer

- **Student:** Daniel Temesvari

- **Abstract:** The flow of incompressible Newtonian fluids can mathematically be described by the Navier-Stokes equations, which can be derived from the mass and impulse conservation and the constitutive law. Initial and boundary conditions complete the mathematical model. In general, this mathematical model can not be solved analytically. Therefore, the fluid simulation is based on numerical methods. However, there are some important special cases where the Navier-Stokes equations can be solved analytically under appropriate assumptions. These special settings can be served as benchmarks for testing CFD codes. In this thesis, such benchmarks will be derived from the Navier-Stokes equations.

- **Road Map for the Bachelor Thesis:**

  1. Introduction
  2. Preliminaries (Euler- and Lagrange descriptions, Transport theorem etc.)
  3. Derivation of the Navier-Stokes Equations
  4. Benchmark problems
  5. Conclusions
  6. References

- **Literature:** Lectures and Seminars (Proseminar) on Mathematical Models in Engineering

- **Additional Literature:** [1]

References

[1] M. Feistauer. *Mathematical Methods in Fluid Dynamics.* Longman Scientific & Technical, 1993.