

Lecture Course: V5B2 – Selected Topics in Analysis and PDE

Fluid dynamics and non-linear analysis

Lecture on recent trends in the analysis for compressible and incompressible fluids

by Dr. Sebastian Schwarzacher

Abstract:

The lecture is about modern techniques from analysis that are able to handle nonlinearities that arise in the mathematical modeling of fluids or gases. In the first part we will introduce the analytical framework that is necessary in order to show existence and smoothness of solutions to *Stokes equations and Navier Stokes equations* and related incompressible *non Newtonian fluids of power law*.

In a second part we will discuss compressible fluids following the seminal proof of existence of weak solutions to the *compressible Navier Stokes equation* by P. L. Lions.

Literature:

G. P. Galdi: *An Introduction to the Mathematical Theory of the Navier-Stokes Equations, Steady-State Problems*, Springer Monographs in Mathematics, 2011.

O. A. Ladyzhenskaya: *The mathematical theory of viscous incompressible flow*, Gordon and Breach, 1969.

E. Feireisl, T. Karper, M. Pokorný: *Mathematical Theory of Compressible Viscous Fluids: Analysis and Numerics*, Birkhauser-Verlag, Basel, 2016

Key words: Real analysis, Partial differential equations, Functional analysis, Fluid dynamics, Weak solutions, Calculus of variations, Sobolev spaces, Compressible fluids

Requirement: Required are Analysis III and some (basic) theory of weak derivatives. Recommended are preliminary lectures in Partial differential equations or Functional analysis.

Time: to be announced (2SWS)

Room: to be announced

Contact: (auch auf deutsch)

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