



Wintersemester 2022/23

Dresdner Mathematisches Seminar

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TU Dresden, Fakultät Mathematik, Institut für Analysis

Hilbert Complexes and PDEs

We present a simple way to solve linear PDEs using basic tools from linear functional analysis, so called FA-ToolBox. In this talk we focus on time-independent problems arising, e.g., in electro-magnetics, elasticity or general relativity. Hilbert complexes, adjoints, regular decompositions, and compact embeddings of certain domains of definition of unbounded linear operators will play a crucial role to prove comprehensive solution theories together with all kinds of applications such as Friedrichs-Poincare type estimates, eigenvector expansions, div-curl lemmas, Hodge-Helmholtz decompositions, variational formulations, inf-sup lemmas, index of Dirac type operators, abstract trace spaces (quotient spaces/annihilators) and corresponding trace Hilbert complexes, ...

Our approach comprises bounded weak Lipschitz domains and mixed boundary conditions for which all presented Hilbert complexes are closed and even compact. Higher Sobolev order results are also shown. We shall point out connections and applications to algebra such a cohomology groups as well as to theoretical numerics such as construction of finite elements or a posteriori error estimation for, e.g., FEM, BEM, or DEC.

In this lecture, among others, the most prominent examples of Hilbert complexes are the well-known de Rham complex for vector fields or differential forms, the elasticity complex, and the biharmonic complex.

Mittwoch (!), 14.12.2022, 17:00 Uhr – Willers-Bau, Raum C 129

Leitung: Prof. Dr. Ralph Chill

Vor dem Vortrag findet **ab 16:30 Uhr** ein gemeinsames **Kaffee-/Teetrinken** vor Hörsaal **WIL C 307 (!)** statt.

Bereich Mathematik und Naturwissenschaften

Fakultät Mathematik