

Numerical Methods for Partial Differential Equations

Prof. R. Hiptmair, SAM, ETH Zurich

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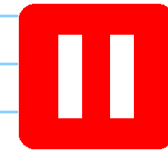
This Course is an Experiment !

▷ Flipped classroom

Videos

Tablet notes

Lecture notes



Homework : $\approx$ 5h

Communication : **No Emails !**
→ Moodle fora

②

Overview

- 1) 2nd-Order Scalar Linear Elliptic BVPs [2w]
→ An important class of mathematical
- 2) The Finite Element Method (FEM) [3w]
→ Algorithms & Code (LehtFEM++ → Github)
- 3) FEM: Convergence & Accuracy [1-2w]
- [4] Beyond FEM]
- [5] Non-linear elliptic BVPs]
- 6) Linear evolution problems [2w]
- [7 Convection-diffusion BVP] [1w]
- 8) Conservation Laws [2-3w]
- [9] Stokes Equation]

Prerequisites

- Bilinear form ?
 $b : V \times W \rightarrow \mathbb{R}$ linear in each argument
- Norm ?
spd blf $\Rightarrow$ norms
- Differential operators : grad, div, curl, Δ
- Gauss theorem : $\Omega \subset \mathbb{R}^d$
$$\int_{\Omega} \operatorname{div} \underline{f} \, dx = \int_{\partial \Omega} \underline{f} \cdot \underline{n} \, dS$$
- Multi-d integration & differentiation :
 $\operatorname{grad} \{ x \in \mathbb{R}^d \rightarrow \|x\| \} (x) = \frac{x}{\|x\|} \quad x \neq 0$
 $\quad \quad \quad \uparrow$
 $\quad \quad \quad = (x^T x)^{1/2}$

