MATH 6170
Differential Equations

The aim of the course is to develop a practical understanding of basic concepts, results and numerical methods for Partial Differential Equations (PDEs). PDEs appear and have applications in an enormous number of problems. For example, PDEs describe the propagation of sound or heat, the motion of fluids, the description of electric and magnetic fields, as well as the behavior of biological systems like bacterial dynamics or tumor growth.

During the course we will discuss material related to the following topics as time permits:

- ⋆ Elements of Functional Analysis
- ⋆ Second Order Elliptic Equations
- ⋆ Galerkin Finite Element Method for Elliptic problems
- ⋆ Linear Parabolic Equations
- ⋆ Mixed Formulation and Babuska-Brezzi Theory
- ⋆ Mixed Finite Element Methods

References

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[Brezis'11] Brezis, H.; *Functional Analysis, Sobolev Spaces and Partial Differential Equations* Springer-Verlag New York (2011). ISBN 978-0-387-70913-0

[Ciarlet'10] Ciarlet, L.C.; *The Finite Element Method for Elliptic Problems* Classics in Applied Mathematics, SIAM (2002). ISBN 978-0-89871-514-9

[Evans'10] Evans, L.C.; *Partial Differential Equations: Second Edition* Graduate Series in Mathematics, AMS (2010). ISBN 978-0-8218-4974-3

[Gatica'14] Gatica, G.N.; *A Simple Introduction to the Mixed Finite Element Method. Theory and Applications* Springer Briefs in Mathematics (2014). ISBN 978-3-319-03694-6

[Quarteroni'14] Quarteroni, A.; *Numerical Models for Differential Problems* Springer-Verlag Mailand (2014). ISBN 978-88-470-1070-3