EPFL

MATH-457   **Numerical approximation of PDE's II**

Picasso Marco

Cursus	Sem.	Type
Computational science and Engineering	MA1, MA3	Opt.
Ing.-math	MA1, MA3	Opt.
Mathematics for teaching	MA1, MA3	Opt.
Mathématicien	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Oral
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

A priori and a posteriori error estimates of numerical methods for elliptic, parabolic and hyperbolic pdes. Adaptive algorithms.

Content

- Elliptic pdes with finite elements:

- Diffusion problems: a posteriori error estimates in the natural H1 norm, in the L2 norm, goal oriented, adaptive algorithms.

- Extensions to Stokes problem, optimal control and nonlinear problems.

- Parabolic pdes:

- The heat equation: functional setting, space and time discretization, a posteriori error estimates, adaptive algorithms.

- Extension to nonlinear problems.

- Hyperbolic pdes: space discretization, a posteriori error estimates for the transport equation and the wave equation.

Learning Prerequisites

Recommended courses

Analysis I and II, Numerical analysis, Introduction to the finite elements methods, Numerical approximation of partial differential equations I

Learning Outcomes

By the end of the course, the student must be able to:
- Expound the methods presented during the course and exercices
- Implement these methods in specific examples

Teaching methods

Ex cathedra lecture and exercises in the classroom

Assessment methods

Oral exam
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.