



MÉTHODES NUMÉRIQUES POUR LES EDP

NUMERICAL METHODS FOR PDES

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| Lecturers : 16.0 | TC : 0.0 | PW : 0.0 | Autonomy : 0.0 | Study : 12.0 | Project : 0.0 | Language : FR

Objectives

We will present the most common methods to approximate solutions to partial differential equations. Rather than giving an exhaustive list of the most efficient methods used in industrial codes, we will describe the mathematical foundations for the setting and the analysis of the principal methods. Some of them will be implemented with Matlab.

Keywords : Numerical methods. Scientific computing. Partial differential equations.

Programme

Chapter 1. Basics on the theory of linear PDEs, and finite difference methods.
Chapter 2. Finite element methods for elliptic problems
Chapter 3. Numerical approximation for scalar conservation laws

Learning outcomes

- To identify the nature of a PDE and the main difficulties for its numerical approximation
- To learn the main categories of numerical methods
- To identify the behavior of the methods and their limitations
- To be able to implement the main methods for simple problems

Independent study

Objectifs : Implementation of numerical methods on simple but typical examples

Méthodes :

Core texts

A. Ern, J.-L. Guermond, *ELEMENTS FINIS : THEORIE, APPLICATIONS, MISE EN ŒUVRE. MATHEMATIQUES ET APPLICATIONS*, Springer, 2002
B. Despres, F. Dubois *SYSTEMES HYPERBOLIQUES DE LOIS DE CONSERVATION : APPLICATION A LA DYNAMIQUE DES GAZ.*, Ecole Polytechnique, 2005

Assessment

Evaluation = 60% knowledge + 40% know-how
Knowledge = 100% final exam
Know-how = 100% continuous assessment