Universitat Autònoma de Barcelona

2018/2019

Numerical integration of partial differential equations

Code: 100121
ECTS Credits: 6

Degree	Type	Year	Semester
2500149 Mathematics	OT	4	0

Contact

Name: Susana Serna Salichs
Email: Susana.Serna@uab.cat

Use of languages

Principal working language: spanish (spa)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: Yes

Prerequisites

This ourse has no theoretical prerequisites, although having studied partial differential equations and / or numerical analysis will help to give context. For the practical part, there is a need of slight familiarity with the use of programming language C for scientific computing.

Objectives and Contextualisation

Partial differential equations (PDEs) are present in most mathematical models of physical processes. As with ordinary differential equations, closed formulas are available for their solution in very few cases. That is why, in almost all applications, numerical methods are required to approximate the solutions.

This course is an introduction to the numerical methods for the approximation of the solution of PDEs. It will focus on the development and analysis of finite difference methods and finite elements for "classical" equations (transport, waves, heat and potential)

Content

1- Hyperbolic equations. The transport equation. The concepts of consistency, stability and convergence. Local truncation error and order of a numerical method. Courant-Friedrichs-Lewy condition.

2-Parabolic equations. Explicit methods and implicit methods. Stability

Stationary problems. The Poisson equation.

3-Elliptic equations. Variational formulation and Euler-Lagrange equation

Galerkin method. Finite element method. Triangulations