Introduction to the Virtual Element Method and to numerical methods for PDEs on unstructured polytopal meshes

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Timetable: 16 hrs. First lecture on January 21, 2020, 14:30 (dates already fixed see calendar), Torre Archimede, Room 2BC/30.

Course requirements: basic notions of numerical analysis and numerical methods for partial differential equations (Finite Elements, Finite Volumes, Finite Differences).

Examination and grading: brief presentation on a course-pertinent subject and oral examination on the topics covered during the course.

SSD: MAT/08 - Numerical Analysis

Aim: The course aims at introducing the fundamental ideas and results on numerical methods for solving partial differential equations of elliptic and parabolic type, with special emphasis on the Virtual Element method.

Course contents:
- Week 1, Lecture 1: introduction to numerical methods for partial differential equations of elliptic types on unstructured meshes:
  - Polygonal Finite Element method (PFEM);
  - Mimetic Finite Difference (MFD) method;
  - Virtual Element method (VEM);
  - other variants (wG, HHO, HDG, etc).
- Week 1, Lecture 2: the conforming VEM; construction of the basic method, convergence analysis and implementation
- Week 2, Lecture 3: the nonconforming formulation; construction of the basic method, convergence analysis and implementation
- Week 2, Lectures 4: enhanced and serendipity formulations of the virtual element method
- Week 3, Lectures 5 and 6: the mixed formulation of the virtual element method
- Week 4, Lectures 7 and 8: virtual de Rham sequences and applications to electromagnetism and Stokes

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