

# Numerical methods applied to standard telluric hazard problems



## Présentation

### Objectifs

This course aims at providing a wide introduction to numerical methods applied to standard telluric hazard problems, including both fluid and solid materials.

Referring to concrete examples, both fundamental input and hands-on exercises (TD/TP) with Matlab programming language will enable the students to understand, implement and use the most popular, widely used, numerical tools.

### Heures d'enseignement

CM	Cours Magistral	15h
TD	Travaux Dirigés	15h

### Plan du cours

- 1) Fundamentals on partial derivative equations
  - Introduction : from a physical problem to a numerical scheme (example)
  - Elliptic systems - Examples
  - Hyperbolic systems - Examples
  - TP : Numerical methods for solving linear scalar advection equation
- 2) Finite Difference Method
  - Fundamentals
  - Notion of stability and convergence
  - TP : Numerical modeling of mudflows
- 3) Discrete Element Methods
  - Fundamental aspects of particle methods
  - Smooth Particle Hydrodynamics Method

- TP : DEM applied to rockfall modeling

#### 4) Finite Element Method:

- Boundary value problems in one space dimension
- From a continuous to a discretized formulation
- TP : Developing a finite element method engine for modeling landslide triggering

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## Compétences visées

At the end of the course, the students will be able to:

- understand basic numerical schemes for classical governing equations
- carry out a numerical analysis of the schemes in terms of stability and convergence
- design, develop and use discrete element methods and finite element methods
- implement the schemes in Matlab programming language

## Infos pratiques

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### Lieux

› Le Bourget-du-Lac (73)