Numerical methods applied to standard telluric hazard problems

ECTS
4 crédits

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	21h

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

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

Lieux

› Le Bourget-du-Lac (73)