

### Liste d'éléments pédagogiques

## Practical info

Location(s)

**Q** Toulouse





### Partial Derivative Equations & Monte Carlo methods



**ECTS** 

4 crédits

0

Hourly volume 53h

Basic numerical methods

Monte-Carlo A basic course on probabilities.

Practical info

### Objectives

At the end of this module, the student will have understood and be able to explain (main concepts): PDE

- The four fundamentals PDE models, with their solution behaviors

- The Finite Difference discretization method

#### Monte-Carlo

- The fundamental principles of simulating random variables and Monte-Carlo methods.

The student will be able to:

#### PDE

- To model basic fundamental phenomena by employing PDE

- To derive a Finite Difference scheme (consistent, stable, convergent).

#### Monte-Carlo

- Simulate a random variable by different methods, use probabilistic, choose appropriate techniques for variance reduction and error estimation.

### Necessary prerequisites

EDP Differential calculus, analysis, ODE

## Location(s)

Toulouse





### Advanced probability and Monte Carlo methods

# Introducing

**ECTS** 

4 crédits

 $\mathbf{\Omega}$ 



Necessary knowledge:

A basic course on probabilities.

### Objectives

**Objectives:** 

At the end of this module, the student will have understood and be able to explain (main concepts):

- The notion of conditional expectation, the main properties of martingales and their classical use in modelling,

- Stochastic algorithms of Robbins-Monro type.

- The fundamental principles of simulating random variables and Monte-Carlo methods.

The student will be able to:

- To compute a conditional expectation, to show that a random process is a martingale, to use the various theorems (Doob, optional stopping and convergences), in particular for the maximum likelihood estimation.

- Build and study the convergence of stochastic optimization algorithms, apply these methods to different problems (quantile, quantization, *i*)

Simulate a random variable by different methods, use probabilistic, choose appropriate techniques for variance reduction and error estimation

## Practical info

### Location(s)

**Q** Toulouse

### Necessary prerequisites

