

Probability Modeling

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| Course title - Intitulé du cours | Probability Modeling |
| Level / Semester - Niveau / semestre | M1 / S1 |
| School - Composante | Ecole d'Economie de Toulouse |
| Teacher - Enseignant responsable | VOLTCHKOVA EKATERINA |
| Other teacher(s) - Autre(s) enseignant(s) | |
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| Lecture Hours - Volume Horaire CM | 15 |
| TA Hours - Volume horaire TD | 0 |
| TP Hours - Volume horaire TP | 0 |
| Course Language - Langue du cours | Anglais |
| TA and/or TP Language - Langue des TD et/ou TP | |

Teaching staff contacts – Coordonnées de l'équipe pédagogique :

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Course Objectives – Objectifs du cours :

The objective of this course is to recall main notions of probability theory and deepen some important topics such as conditional probability and expectation, in order to prepare the ground for advanced courses in mathematical finance, statistics, and econometrics. In particular, this course prepares students for studying stochastic processes.

At the end of this course, students must :

- Understand the notion of probability measure.
- Use and understand Bayes' formula.
- Understand the notion of conditional expectation with explicit computation in the discrete, continuous and Gaussian variables cases.
- Handle discrete sequences of independent random variables.
- Model simple economic situations using probability tools.

Hereafter is a more detailed description of the course content:

- Sigma-algebras: definition, properties, examples, classes of events, relationship with the information in a random experiment.
- Random variables measurable with respect to a sigma-algebra.
- Conditional probability and expectation w.r.t. an event; a random variable; a sigma-algebra. Application to stochastic processes.

Prerequisites – Pré requis :

Basic notions of the probability theory should be known. A probability refresher course is provided prior to the beginning of the semester and is highly recommended.

Practical information about the sessions – Modalités pratiques de gestion du cours :

Lecture notes with exercises are available on Moodle. It is recommended to work on exercise sheets before the in-class session. The lecture material and exercises are then explained in class, oral participation is encouraged.

There are 10 lectures of 1h30 on a weekly basis. All course materials are available on the Moodle. They are organized in chapters that contain lecture notes and exercises on a particular notion. There is a forum for interaction between class sessions.

Grading system – Modalités d'évaluation :

The evaluation consists of a mid-term homework (50%) and a final written exam (50%). The mid-term project has to be done in groups of 2 or 3 people and submitted on Moodle. The final exam is an individual assessment.