EPFL

MATH-431 | **Theory of stochastic calculus**

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Cursus	Sem.	Type
Ing.-math	MA1, MA3	Opt.
Mathématicien	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Introduction to the mathematical theory of stochastic calculus: construction of stochastic Ito integral, proof of Ito formula, introduction to stochastic differential equations, Girsanov theorem and Feynman-Kac formula.

Content

- Construction of Brownian motion
- Continuous time martingales
- Ito's theory of integration
- Ito's formula with proof
- Existence and uniqueness theorem for solutions of stochastic differential equations
- Girsanov theorem and Feynman-Kac formula

Keywords

stochastic calculus, Ito's integral, stochastic differential equations, Girsanov theorem, Feynman-Kac formula

Learning Prerequisites

Required courses

- Bachelor programme of the Mathematics section
- Swiss school programme up to "Maturité"

Recommended courses

Advanced Probability

Important concepts to start the course

Advanced Probability, Probability and analysis course in the Bachelor programme of the Mathematics section

Learning Outcomes

By the end of the course, the student must be able to:

- Demonstrate mastery of the course material

- Demonstrate mastery of the problems related to the exercices sessions
- Demonstrate mastery of the prerequisites
- Demonstrate the capability of using these notions in other contexts

Transversal skills

- Use a work methodology appropriate to the task.

Teaching methods

Ex lecture and exercises

Expected student activities

Attend lecture regularly, solve the exercises and write down the solutions, study the previous course material before the next course, go over the material before the exam.

Assessment methods

Written exam
In the case of Article 3 paragraph 5 of the Section Regulations, the teacher decides on the form of the examination he communicates to the students concerned.

Resources

Virtual desktop infrastructure (VDI)
No

Bibliography

- J. Michael Steele, Stochastic Calculus and Financial Applications. Springer (2001)
- B. Oksendal, Stochastic Differential Equations (6th edition). Springer (2003)

Ressources en bibliothèque

- Stochastic calculus and financial applications / Steele
- Stochastic Differential Equations / Øksendal

Moodle Link

- https://go.epfl.ch/MATH-431

Prerequisite for

- martingales in financial mathematics
- stochastic control