



5.00 credits

30.0 h

Q1

Teacher(s)	Vrins Frédéric ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	<p>Mathematics, informatics, probability and statistics at Bachelor level. In particular, the corresponding UCL courses are</p> <ul style="list-style-type: none"> • Mons : MQANT1110 (Mathématiques de Gestion I), MQANT1113 (Statistiques et Probabilité), MQANT1109 (Informatique de gestion) • LLN : LINGE1114 (Analyse), LINGE1113 (Probabilité), LINGE1225 (algorithmique et programmation en économie et gestion) <p>In addition, this course is reserved for students with a bachelor's degree in business engineering or students with equivalent quantitative method skills</p>
Main themes	<ol style="list-style-type: none"> 1. Part I: Basic probability concepts (probability space, sigma-fields, random variables, distribution, statistics and sampling via Monte Carlo). 2. Part II : Stochastic processes and related concepts. 3. Part III : random walks and Brownian motion. 4. Part IV : stochastic calculus (stochastic integrals, stochastic differential equation, Ito's lemma, Girsanov theorem)
Learning outcomes	<p>At the end of this learning unit, the student is able to :</p> <p><i>During their programme, students of the LSM Master's in management or Master's in Business engineering will have developed the following capabilities'</i></p> <ol style="list-style-type: none"> 2.2. Master highly specific knowledge in one or two areas of management : advanced and current research-based knowledge and methods. 2.4. Activate and apply the acquired knowledge accordingly to solve a problem. 1 3.1. Conduct a clear, structured, analytical reasoning by applying, and eventually adapting, scientifically based conceptual frameworks and models, to define and analyze a problem. 3.5. Produce, through analysis and diagnosis, implementable solutions in context and identify priorities for action. 6.1. Work in a team : Join in and collaborate with team members. Be open and take into consideration the different points of view and ways of thinking, manage differences and conflicts constructively, accept diversity.

Evaluation methods	<p>Continuous evaluation (projects with implementation in R)</p> <ul style="list-style-type: none"> • Date: <i>Will be specified later</i> • Type of evaluation: <i>Report + oral presentation (teamwork, 20% of final grade) and assessment of individual contribution during the exam session (10% of final grade, see below)</i> • Comments: <i>No</i> <p>Evaluation week</p> <ul style="list-style-type: none"> • Oral: <i>No</i> • Written: <i>No</i> • Unavailability or comments: <i>No</i> <p>Examination session</p> <ul style="list-style-type: none"> • Oral: <i>Yes</i> • Written: <i>No</i> • Comments: The final examination is made of two parts : <ul style="list-style-type: none"> • <i>1h preparation of questions (exercises + theory) followed by a 10 to 15 min discussion with the professor (60% of final grade)</i> • <i>10 min discussion with the teaching assistant to assess the individual contribution of the student in the group project (10% of final grade). <u>Attention</u> : the grade of the project(s) (i.e. both the group and individual contributions to the project, being worth 30% of the final grade) will be set to 0 for the students who would not show up at this individual evaluation.</i>
Teaching methods	<p>Ex-cathedra courses enriched with exercises on R and group and/or individual projects. Students will be asked to prepare some courses before joining the classes. The main objective of the projects is to make the concepts more concrete and to facilitate the learning processes.</p>
Content	<p>Fundamental mathematical concepts to understand the behavior of systems whose behavior features randomness with applications in finance. These skills will be extensively used in LLSMS2226 (credit and interest rates risk)</p>
Bibliography	<ul style="list-style-type: none"> • Slides, reference books et code R • Hassler, Stochastic Processes and Calculus: an elementary introductions with applications, Springer 2016 • Mikosh, M. Elementary Stochastic Calculus (with Finance in view), Wolrd Scientific, 1998. • Joshi, M. : Concepts and Practice of Mathematical Finance, Cambridge University Press, 2003. • Shreve, S. : Stochastic calculus for Finance I & II, Springer 2004.
Faculty or entity in charge	CLSM

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] : Business Engineering	INGM2M	5		
Master [120] in Economics: General	ECON2M	5		
Master [120] : Business Engineering	INGE2M	5		