UCL Université catholique de Louvain

LLSMS2225

2016-2017

Elements of stochastic calculus

5.0 credits	30.0 h	1q

Teacher(s) :	Vrins Frédéric ;
Language :	Anglais
Place of the course	Louvain-la-Neuve
Prerequisites :	Mathematics, informatics, probability and statistics at Bachelor level. In particular, the corresponding UCL courses are -- 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)
Main themes :	-- Part I: Basic probability concepts (probability space, sigma-fields, random variables, distribution, statistics and sampling via Monte Carlo). -- Part II : Stochastic processes and related concepts. -- Part III : random walks and Brownian motion. -- Part IV : stochastic calculus (stochastic integrals, stochastic differential equation, Ito's lemma, Girsanov theorem)
Aims :	Model random quantities in a mathematically sound way Check and compute the main properties of discrete and continuous time stochastic processes (expectation, variance, probabilities, ') Sample random variables and paths of stochastic processes (using Euler scheme in continuous time) and to check analytical results using both Monte Carlo and binomial trees techniques To compute the dynamics of a function of one or more stochastic processes by applying Ito's lemma and to explain the effect of a change of measure LSM competency framework : 2.2, 2.4, 3.1, 3.5, 6.1 *The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".*
Evaluation methods :	An oral exam (60%) made of two parts : -- A practical part (test student's skills to apply and use the main concepts) -- A theoretical part (evaluate the understanding depth). Teamworks during the year (25%) and an individual work (15%) that will be discussed during the exam.
Teaching methods :	15 courses of 2h each including programming sessions on R. Students will be asked to prepare some courses. The objective of the group and home works is to make the concepts more concrete.
Content :	Fundamental mathematical concepts to understand the behavior of systems whose behavior features randomness. These skills will be extensively used inLLSMS2226 (derivatives pricing)
Bibliography :	Slides, reference books and R code lectures conseillées : -- 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 & mp; II, Springer 2004.
Faculty or entity in charge:	CLSM

Programmes / formations proposant cette unité d'enseignement (UE)				
Intitulé du programme	Sigle	Credits	Prerequis	Acquis d'apprentissage
Master [120] in Business Engineering	INGE2M	5	-	
Master [120] in Business Engineering	INGM2M	5	-	
Master [120] in Economics: General	ECON2M	5	-	
Master [120] in Management	GEST2M	5	-	