





5.00 credits

30.0 h

Q2

Teacher(s)	Hainaut Donatien ;
Language :	French > English-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	The courses MAT1322 Measurement Theory and MAT1371 Probability are an absolute prerequisite
Main themes	Processes, martingales et Markov chain in discrete and continuous time. Stopping times. Poisson Process, Brownian motion and Itô calculus
Learning outcomes	<p>At the end of this learning unit, the student is able to :</p> <ul style="list-style-type: none"> • To choose the most adapted process for modeling a random phenomenon. • To analyze the properties of discrete and continuous processes. • To construct martingale processes. 1. • To analyze the stability of a Markov chain. • To use Poisson counting processes, homogeneous and non-homogeneous • To infer the infinitesimal dynamics of a function driven by a Brownian motion, with the help of stochastic calculus.
Evaluation methods	Written exam
Teaching methods	15 lectures of 2 hours
Content	<p>This course is a detailed introduction to stochastic processes in discrete and continuous time:</p> <p>Part I:</p> <ol style="list-style-type: none"> 1. Revision of probability theory 2. Martingales in discrete time 3. Markov Chain in discrete time and with a finite number of states <p>Part II:</p> <ol style="list-style-type: none"> 1. Poisson processes and Poisson measures 2. Continuous Markov process with a finite number of states 3. Brownian motion & Itô's calculus 4. Continuous time martingales 5. Continuous Markov processes with infinite number of state
Inline resources	Lecture notes are available on Moodle
Bibliography	<ul style="list-style-type: none"> • NEVEU, J., Martingales à temps discret, Masson, 1972. • BREIMAN, L., Probability, Addison-Wesley, 1968. • CHOW, Y.S. and M. TEICHER, Probability Theory: Independence, Interchangeability, Martingales, Springer-Verlag, 1987. • CHUNG K.L., A Course in Probability Theory. Harcourt, Brace & World Inc., 1968. • KARLIN S. and H.M. TAYLOR, A First Course in Stochastic Processes, Academic Press, 1975.
Other infos	A first course in probability and statistics : "LMAT1271 Calcul des probabilités et analyse statistique" or equivalent, and eventually "LMAT1371 Théorie des probabilités".
Faculty or entity in charge	MATH

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [60] in Physics	PHYS2M1	5		
Master [120] in Mathematics	MATH2M	5		
Master [120] in Actuarial Science	ACTU2M	5		
Master [120] in Statistics: General	STAT2M	5		
Master [120] in Physics	PHYS2M	5		