UCL Université catholique de Louvain

LMAT2470

2012-2013

Processus stochastiques (statistique)

5.0 credits	30.0 h	1q

Teacher(s) :	Johannes Jan ;
Language :	Français
Place of the course	Louvain-la-Neuve
Main themes :	Discrete time Martingales (sub-martingales and super-martingales), stationary processes, exchangeable processes, conditionally i.i.d. processes and Markov processes.
Aims :	Presentation of the main discrete time stochastic processes with an introduction to their statistical analysis. *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".*
Content :	Content 1. Discrete time stochastic processes. Generalities, asymptotic, invariant and exchangeable sigma-algebra's. Stopping times and hitting times. 2. Martingales, sub-martingales and super-martingales. Optional stopping theorems, almost sure and in mean convergences. Inverse martingales, strong law of large numbers, 0-1 laws of Kolmogorov and Hewitt-Savage. 3. Stationary processes. Ergodic theorem, almost surely invariant sigma-algebra, almost sure and in mean convergences. Recurrence theorems of Poincaré. 4. Exchangeable processes. Almost surely exchangeable sigma-algebra, De Finetti's theorem, representation of an exchangeable process as a conditionally i.i.d. process. 5. Conditionally i.i.d. processes. Identification and almost sure equality between the invariant and the conditioning sigma-algebra. Optional stopping theorems and hitting times. 6. Conditional Markov processes. Strong Markov property. Homogeneous and stationary Markov processes. Characterization of the invariant sigma-algebra and ergodicity conditions. 7. Regular Markov processes. Stationary initial distribution, ergodicity and Dublin condition. Ergodic theorems for a non-stationary Markov process. Methods The course is given in two hours lectures during 14 weeks.
Other infos :	Prerequisite : The courses MAT1322 Théorie de la mesure and MAT1371 Probabilités are an essential prerequisite. References : 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. Evaluation : Each student receives 5 exercices to solve. He writes up the solutions and orally presents them to the professor. who may ask theoretical questions related to the subject of the proposed exercices.
Cycle and year of study :	> Master [120] in Physics > Master [120] in Statistics: General > Master [120] in Mathematics
Faculty or entity in charge:	MATH