

5.00 credits

30.0 h + 22.5 h

Q2

Teacher(s)	Chevalier Philippe ;Lété Quentin ;
Language :	English > French-friendly
Place of the course	Louvain-la-Neuve
Prerequisites	A probability course and a background in mathematical modelling
Main themes	Introduction to stochastic models in operations research. Study of renewal processes, Markov chains, Markov Processes, Markov Decision Processes. Applications to inventory models, queuing models, branching processes, random walks, etc.
Learning outcomes	
Evaluation methods	Students will be evaluated through a written exam based on the objectives of the course. The exam consists in exercices applying the concepts viewed in the course. Many examples of questions of previous exams are solved during the exercice sessions. The students will complete a project based on one of the chapters of the course. This project is done in groups and counts for 25% of the grade. This project cannot be done again for the session in September.
Teaching methods	The course consists in weekly lectures and 11 exercice sessions. A project will have to be done during the semester to deepen the learning and apply some of the concepts of the class.
Content	• Poisson processes and their properties • Markov chains with a finite number of states • Renewal processes and stopping rules • Markov chains with an infinite number of states • The notion of reveribility • Markov processes • Birth and death processes • Queueing theory and networks of queues • Fluid models for queues • Various applications, such as inventory management, replacement, reliability and job shop modeling. • Markov decision processes and Reinforcement learning
Bibliography	Lecture recommandée : "Stochastic Processes: Theory for applications" de R. Gallager, 2013, disponible en ligne : http://www.rle.mit.edu/rgallager/notes.htm "Reinforcement Learning: An Introduction" de R. Sutton et A. Barto, disponible en ligne : http://incompleteideas.net/book/RLbook2020.pdf
Faculty or entity in charge	MAP

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 Computer Science and Engineering	INFO2M	5		
Master [120] in Computer Science	SINF2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Physics	PHYS2M	5		
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Data Science: Information Technology	DATI2M	5		