






5.00 credits

30.0 h

Q2

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| 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 | |  |