



Due to the COVID-19 crisis, the information below is subject to change, in particular that concerning the teaching mode (presential, distance or in a comodal or hybrid format).

7 credits	45.0 h	Q1
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Teacher(s)	Hainaut Donatien ;
Language :	French
Place of the course	Louvain-la-Neuve
Aims	<p>1 The aim of this course is to present the basic principles of life insurance theory. After a short introduction to life tables, the main kinds of life insurance products are studied in detail regarding premium and reserve calculations. An introduction to modern life products is also presented. At the end of this course the students must be familiar with life calculations and be able to price life products.</p> <p>-----</p> <p><i>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".</i></p>
Evaluation methods	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <p>The evaluation consists in a written exam and the student has at disposal a cheating sheet. The students also work per group on a project and this report counts for 25% of the final mark. If a student does not submit any report, a resit work will be proposed for the session of August. The lecturer keeps the right to orally question the student on her/his exam and report.</p>
Teaching methods	<p><b>Due to the COVID-19 crisis, the information in this section is particularly likely to change.</b></p> <p>The course consists in 15 lectures of 3 hours.</p>
Content	<p>Part 1: Static mortality modeling</p> <ul style="list-style-type: none"> <li>• Introduction on the statistical modeling of duration</li> <li>• Application to the modeling of human lifetime (Makeham)</li> <li>• Estimation of <math>q_x</math> and <math>\mu_x</math> with Kaplan-Meier estimator</li> <li>• Smoothing techniques of raw mortality data (Whittaker-Henderson)</li> <li>• Log-likelihood estimation of static mortality tables</li> </ul> <p>Part 2 : Prospective mortality models</p> <ul style="list-style-type: none"> <li>• Lee-Carter model</li> <li>• Log-Poisson (Brouhns et Denuit) model</li> <li>• Model with cohort effects (Black-Cairns-Dowd)</li> </ul> <p>Part 3 : Experience mortality tables</p> <ul style="list-style-type: none"> <li>• Duration modeling with censorship.</li> <li>• Calibration by log-likelihood of a mortality table with censored data</li> </ul> <p>Part 4 : Evaluation of life and death benefits</p> <ul style="list-style-type: none"> <li>• Life benefits : lump sum benefit, annuities , annuities on 2 heads</li> <li>• death benefits : whole life &amp; temporary insurances, mortgage insurance</li> <li>• Survival annuities</li> <li>• Pricing: commercial &amp; inventory loadings</li> </ul> <p>Part 5 : Provisions &amp; profitability</p> <ul style="list-style-type: none"> <li>• Prospective et rétrospective provisions</li> <li>• Thiele's Equation</li> <li>• Surrender and lapse values</li> <li>• Transformation of contracts</li> <li>• Participating contracts, universal life and unit linked contracts</li> <li>• Embedded Value</li> </ul>
Inline resources	Moodle companion website

Bibliography	Les transparents disponibles sur moodle et se basent principalement sur <ul style="list-style-type: none"><li>• Théorie et pratique de l'assurance vie. Michel Fromenteau et Pierre Petauton. 5ième édition 2017, Dunod.</li><li>• Modélisation statistique des phénomènes de durée. Planchet F. et Thérond P. 2011, Economica.</li><li>• Actuarial Mathematics for Life Contingent Risks. Dickson, D.C.M., Hardy, M.R., Waters, H.R. 2009, Cambridge University Press.</li><li>• Construction de Tables de Mortalité Périodiques et Prospectives. Delwarde, A., Denuit, M. 2005, Economica.</li></ul>
Faculty or entity in charge	LSBA

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Mathematics	<a href="#">MATH2M</a>	7		
Master [120] in Actuarial Science	<a href="#">ACTU2M</a>	7		
Master [120] in Mathematical Engineering	<a href="#">MAP2M</a>	7		