

# Mathematics of Life Contingencies 1, MATH 3280 3.00 F

<http://edfurman.info.yorku.ca/teaching/math3280>

Lecture time and location	13:30-14:30	zoom
Tutorial time and location	16:30-17:30	zoom
Instructor name and contacts	Ed Furman	<a href="mailto:efurman@yorku.ca">efurman@yorku.ca</a>
Office hours and location	14:30 - 15:30 MW	zoom
TA name and contacts	Guanfu Qiao	<a href="mailto:guanfu@my.yorku.ca">guanfu@my.yorku.ca</a>

**Brief course description.** This is a probabilistic introduction to the mathematics of life contingencies. The course develops the theoretical basis for modelling the future lifetime of insureds, financial entities, system components, among other objects, with an emphasis on life insurance. Topics include, e.g., life tables, life statuses, life distributions, dependence, multi-state models. The course, along with MATH 3281 3.00 and MATH 4430 3.00 (MATH 4431 3.00), ensures an adequate preparation for the LTAM exam of the Society of Actuaries.

**Prerequisites.** MATH 2280 3.00 and MATH 2131 3.00.

**Topics.** The subjects to be covered include but are not limited to:

- International actuarial notation (I.A.N.) and its relation to the general notions of elementary probability theory.
- Select and ultimate life tables. Approximation techniques.
- Analytic laws of mortality.
- General life statuses (e.g., single life, joint life and last survivor).
- Multivariate survival distributions and the notion of dependence.
- Multiple decrement models,
- Multi-state models.

**Learning objectives.** Students who complete this course will:

- Demonstrate understanding and appropriate use of the I.A.N.
- Understand the quantitative foundation for modeling future lifetime of an individual, a group of individuals, a general insurance product.
- Be able to employ the existing life tables of e.g. Statistics Canada with any number of sources of decrement, and to construct new ones.
- Understand the implications of dependence among phenomena under consideration on the probability of death/survival.
- Build on the fundamental notions of pricing, if taking MATH 3281 3.00
- Be adequately prepared to write the life contingencies exam of the Society of Actuaries (Exam LTAM), if the student passes the sequence MATH 3280 3.00, MATH 3281 3.00 and MATH 4230 3.00 (or MATH 4231 3.00).

## Required reading:

Lecture notes (check the website mentioned above regularly).

## Recommended reading:

- [1.] Bowers, N. L., Hickman, J. C., Nesbitt, C. J., Jones, D. A. and Gerber, H. U. (1997). *Actuarial mathematics*, 2nd edition, Society of Actuaries, Itasca, Illinois.
- [2.] Dickson, C.M., Hardy, M.R. and Waters, H.R. (2013). *Actuarial mathematics for life contingent risks*. Cambridge University Press, 2nd Edition.

**Evaluation.** The marking scheme involves:

- One midterm test (tentatively on Oct, 23): 20%
- Quizzes (weekly): 15%
- Home assignments (weekly): 10%
- Final exam (TBA): 55%

**Academic honesty.** Please, thoroughly familiarize yourself with the policy of the University Senate on academic honesty, found at <https://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>