DALHOUSIE UNIVERSITY
Inspiring Minds

Faculty of Science Course Syllabus
Department of Mathematics and Statistics
Life Contingencies II — ACSC/STAT 4720
Fall 2018

Instructor(s):	Toby Kenney	tkenney@mathstat.dal.ca
Lectures:	MWF 13:35–14:25	Chase 319 (Colloquium Room)
Laboratories:	None	
Tutorials:	None	

Course Description

ACSC 3720 covers the basics of life contingencies in a simple standard situation. In this course we extend this to deal with a number of common additional features that affect life insurance policies. We introduce multiple-state models, mortality improvement models, mortality estimation, pensions, and profit testing.

Course Prerequisites

ACSC/STAT 3720

Course Objectives/Learning Outcomes

- Use multiple-state models for modelling decrements.
- Calculate policy values using multiple state models.
- Read probabilities of decrements from multiple decrement tables.
- Apply fractional age assumptions to multiple decrement tables.
- Calculate the EPV of joint life and last survivor benefits.
- Model joint lives as independent future lifetimes.
- Model joint lives as dependent future lifetimes.
- Model joint lives using a common shock model.

- Apply deterministic mortality scales to calculate relevant survival probabilities and calculate premiums and reserve values for life contingencies.
- Apply the Lee-Carter model to model stochastic mortality improvements.
- Apply the Cairns-Blake-Dowd model.
- Use non-parametric estimators for the distribution of random variables — Kaplan-Meier estimators, Nelson-Aalen estimators, Kernel Density estimators.
- Calculate the variance of non-parametric estimators.
- Compute linear and log-transformed confidence intervals for estimators.
- Use Greenwood's approximation to approximate the variance of the Kaplan-Meier product-limit estimator.
- Compute the bias of an estimator.
- Compute nonparametric estimates of the survival function from incomplete data.
- Use a salary scale to estimate an employees final average salary and career average salary.
- Calculate appropriate contributions for a defined contribution plan to achieve a target salary replacement rate.
- Read various decrement probabilities from a service table.
- Value pension benefits for defined benefit plans.
- Calculate the required contributions for funding a defined benefit plan.
- Perform a profit-testing analysis for a term insurance policy.
- Value the projected cashflows of a portfolio of policies using net present value, internal rate of return, discounted payback period, and profit margin.
- Calculate premiums and reserves for insurance contracts by profit-testing.
- Apply profit testing to multiple state models.

Course Materials

Textbook: "Actuarial Mathematics for Life Contingent Risks" (Second Edition) by David C. M. Dickson, Mary R. Hardy, and Howard R. Waters published by Cambridge University Press, 2013

Additional reading: Society of Actuaries, *LONG-TERM ACTUARIAL MATHEMATICS STUDY NOTE* Available at `https://www.soa.org/Files/Edu/2018/2018-ltam-supplementary-note.pdf`.
Society of Actuaries, *LONG-TERM ACTUARIAL MATHEMATICS STUDY NOTE* Available at `https://www.soa.org/Files/Edu/2018/2018-ltam-loss-models.pdf`.

Course Assessment

Component	**Weight (% of final grade)**	**Date**
Midterm Exam	30	31st October (in class)
Final Exam	55	TBA
Assignments	15	7 assignments, approximately weekly

Other Course Requirements

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+	(90–100)	**B+**	(77–79)	**C+**	(65–69)	**D**	(50–54)
A	(85–89)	**B**	(73–76)	**C**	(60–64)	**D**	< 50
A-	(80–84)	**B-**	(70–72)	**C-**	(55–59)	**D**	(50–54)

Course Policies

Credit cannot be given for late assignments.

ACCOMMODATION POLICY FOR STUDENTS

Students may request accommodation as a result of barriers related to disability, religious obligation, or any characteristic protected under Canadian Human Rights legislation. The full text of Dalhousies Student Accommodation Policy can be accessed here:

`http://www.dal.ca/dept/university_secretariat/policies/academic/student-accommodation-policy-wef-sep--1--2014.html`

Students who require accommodation for classroom participation or the writing of tests and exams should make their request to the Advising and Access Services Centre (AASC) prior to or at the outset of the regular academic year. More information and the Request for Accommodation form are available at www.dal.ca/access

ACADEMIC INTEGRITY

Academic integrity, with its embodied values, is seen as a foundation of Dalhousie University. It is the responsibility of all students to be familiar with behaviours and practices associated with academic integrity. Instructors are required to forward any suspected cases of plagiarism or other forms of academic cheating to the Academic Integrity Officer for their Faculty. The Academic Integrity website (http://academicintegrity.dal.ca) provides students and faculty with information on plagiarism and other forms of academic dishonesty, and has resources to help students succeed honestly. The full text of Dalhousies Policy on Intellectual Honesty and Faculty Discipline Procedures is available here:

http://www.dal.ca/dept/university_secretariat/academic-integrity/academic-policies.html

STUDENT CODE OF CONDUCT

Dalhousie University has a student code of conduct, and it is expected that students will adhere to the code during their participation in lectures and other activities associated with this course. In general: The University treats students as adults free to organize their own personal lives, behaviour and associations subject only to the law, and to University regulations that are necessary to protect

- the integrity and proper functioning of the academic and nonacademic programs and activities of the University or its faculties, schools or departments;
- the peaceful and safe enjoyment of University facilities by other members of the University and the public;
- the freedom of members of the University to participate reasonably in the programs of the University and in activities on the University's premises;
- the property of the University or its members.

The full text of the code can be found here:

http://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

SERVICES AVAILABLE TO STUDENTS

The following campus services are available to help students develop skills in library research, scientific writing, and effective study habits. The services are available to all Dalhousie students and, unless noted otherwise, are free.

Service	Support Provided	Location	Contact
General Academic Advising	Help with - understanding degree requirements and academic regulations - choosing your major - achieving your educational or career goals - dealing with academic or other difficulties	**Killam Library Ground floor** Rm G28 **Bissett Centre for Academic Success**	In person: Killam Library Rm G28 By appointment: - e-mail: advising@dal.ca - Phone: (902) 494-3077 - Book online through MyDal
Dalhousie Libraries	Help to find books and articles for assignments Help with citing sources in the text of your paper and preparation of bibliography	**Killam Library Ground floor** Librarian offices	In person: Service Point (Ground floor) By appointment: Identify your subject librarian (URL below) and contact by email or phone to arrange a time: `http://dal.beta.libguides.com/sb.php?subject_id=34328`
Studying for Success (SFS)	Help to develop essential study skills through small group workshops or one-on-one coaching sessions Match to a tutor for help in course-specific content (for a reasonable fee)	**Killam Library 3rd floor** Coordinator Rm 3104 Study Coaches Rm 3103	To make an appointment: - Visit main office (Killam Library main floor, Rm G28) - Call (902) 494-3077 - email Coordinator at: `sfs@dal.ca` or - Simply drop in to see us during posted office hours All information can be found on our website: `www.dal.ca/sfs`
Writing Centre	Meet with coach/tutor to discuss writing assignments (e.g., lab report, research paper, thesis, poster) - Learn to integrate source material into your own work appropriately - Learn about disciplinary writing from a peer or staff member in your field	**Killam Library Ground floor** Learning Commons & Rm G25	To make an appointment: - Visit the Centre (Rm G25) and book an appointment - Call (902) 494-1963 - email `writingcentre@dal.ca` - Book online through MyDal We are open six days a week See our website: `writingcentre.dal.ca`