

ACSC/STAT 3720, Life Contingencies I  
Winter 2015  
Toby Kenney

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**Course Website:** [www.mathstat.dal.ca/~tkenney/3720/2015/](http://www.mathstat.dal.ca/~tkenney/3720/2015/)

**Office Hours:** Monday 10:30-11:30, Wednesday 10:30-11:30 & Friday 14:30-15:30

**Lectures:** MWF: 09:35-10:25 Chase 319

**Topics:** Survival Models, Life Tables and Selection, Insurance Benefits, Annuities, Premium Calculation, Policy Values

**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

### Course Work and method of assessment

There will be a midterm exam and a final exam. The midterm will be held in class on Friday 27th February, and should cover the material in Chapters 1–5. The content of this exam may be changed, depending on the progress in lectures. The final exam will be scheduled by the Registrar’s Office during the examination period: Monday 13th to Tuesday 28th April.

There will also be (approximately) weekly homework assignments, which must be handed on Thursdays in the lecture. After this, I will put the model solutions on the course website. **No credit can be given for late homework.** The overall homework mark will be made up of an average of the weekly homework marks, with the exception of the worst mark for each student.

The homework sheet will be divided into 2 sections: The *basic questions* section tests the basic concepts covered in the course: everyone should be able to do all these questions. The *standard questions* section has questions where the concepts covered in the course can be applied to more realistic situations, or questions which involve a stronger theoretical insight; these questions are mostly straightforward, though there may be the occasional tricky question included. There may also be some *bonus questions* which are either more challenging, or else raise interesting or important issues that are not central to this course.

Sometimes a question will be started on one sheet, but continued on the following sheet, after the relevant material has been covered. In this case, the full question will be given on the earlier sheet, but the parts that should only be attempted with the later sheet are clearly marked, and are repeated on the later sheet. For some questions, I may occasionally give out a hint, rather than a complete model solution. Revised answers to these questions may then be submitted with the following week’s homework.

Grades will be determined by performance in the exams and the weekly homeworks. The midterm exam counts for 30%, the final counts for 55%, while the homework counts for the remaining 15%. You must pass the final exam to obtain a passing grade in the course.

### Weekly Readings

Since class time is limited, I will be using it for explaining concepts and going over examples, rather than reading through the textbook. You should therefore read through the relevant sections of the textbook *before* the lecture, in order to gain the full benefit from the lecture. The sections of the textbook that

will be covered each lecture will be listed on the website. This list may be updated from time to time, depending on the progress made in earlier lectures. Here is the current plan.

Week beginning	Monday	Wednesday	Friday
5th January	Introduction and Preliminaries	<b>1 Introduction to Life Insurance</b>	<b>2 Survival Models:</b> 2.2 The future lifetime random variable, 2.3 Force of mortality
12th January	2.4 Actuarial notation, 2.5 Mean and standard deviation of $T_x$ , 2.6 Curtate future lifetime	<b>3 Lifetables and Selection:</b> , 3.2 Life tables, 3.3 Fractional age assumptions	3.4 National life tables, 3.5 Survival models for life insurance policyholders, 3.6 Life insurance underwriting
19th January	3.7 Select and ultimate survival models, 3.8 Notation and formulae for select survival models	3.9 Select life tables, 3.10 Heterogeneity in mortality, 3.11 Mortality trends	<b>4 Insurance Benefits:</b> 4.2 Introduction, 4.3 Assumptions, 4.4 Valuation of insurance benefits: 4.4.1–4.4.3 Whole life insurance
26th January	4.4.4 Recursions, 4.4.5 Term insurance	4.4.6 Pure Endowment, 4.4.7 Endowment Insurance, 4.4.8 Deferred Insurance Benefits	4.5 Relating different cases of whole life insurance, 4.6 Variable insurance benefits, 4.7 Functions for select lives
2nd February	<b>5 Annuities:</b> 5.2 Introduction, 5.3 Review of annuities certain, 5.4 Annual life insurance	5.5 Annuities payable continuously, 5.6 Annuities payable $\frac{1}{m}$ thly	MONROE DAY
9th February	5.7 Comparison of annuities by payment frequency, 5.8 Deferred annuities, 5.9 Guaranteed annuities	5.10 Increasing annuities, 5.11 Evaluating annuity functions, 5.12 Numerical illustrations, 5.13 Functions for select lives	Revision chapters 1–5
16th February	STUDY WEEK		
23rd February	Revision chapters 1–5	Revision chapters 1–5	MIDTERM EXAM
2nd March	<b>6 Premium Calculation:</b> 6.1 Summary, 6.2 Preliminaries, 6.3 Assumptions, 6.4 The present value of the future loss random variable, 6.5 The equivalence principle	6.6 Gross premiums	6.7 Profit
9th March	6.8 The portfolio percentile premium principle, 6.9 Extra risks	<b>7 Policy Values:</b> 7.1 Summary, 7.2 Assumptions, 7.3 Policies with annual cash flows: 7.3.1 The future loss random variable	7.3.2 Policy values for policies with annual cash flows
16th March	7.3.3 Recursive formulae for policy values	7.3.4 Annual profit by source, 7.3.5 Asset shares	7.4 Policy values for policies with cash flows at $\frac{1}{m}$ thly intervals
23rd March	7.5 Policies with continuous cash flows	7.6 Policy alterations	7.7 Retrospective policy values, 7.8 Negative policy values
30th March	7.9 Deferred Acquisition expenses and modified premium reserves payments	Revision	GOOD FRIDAY
6th April	EASTER MONDAY	Revision	Revision

## **Sections of the text covered**

We expect to cover most of the material in Chapters 1–7 in the textbook.

## **Students with disabilities**

Students with disabilities are encouraged to register as quickly as possible at the Student Accessibility Services if they want to receive academic accommodations. To do so, please phone 494-2836, email [access@dal.ca](mailto:access@dal.ca), drop in at the Killam, G28, or visit our website at [www.studentaccessibility.dal.ca](http://www.studentaccessibility.dal.ca).

## **Plagiarism**

Plagiarism is a serious academic offense which may lead to loss of credit, suspension or expulsion from the university. Please read the Policy on Intellectual Honesty contained in the Calendar or on the Dalhousie web site at: <http://www.registrar.dal.ca/calendar/ug/UREG.htm#12>.

## **Dalhousie Writing Centre**

Writing expectations at university are higher than you will have experienced at high school (or if you are entering a master's or PhD program, the expectations are higher than at lower levels). The Writing Centre is a Student Service academic unit that supports your writing development. Make an appointment to discuss your writing. Learning more about the writing process and discipline-specific practices and conventions will allow you to adapt more easily to your field of study.