

## **ACT247 – Introductory Life Contingencies**

### **Vital Statistics:**

Instructor: Professor V. Zhang

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Office: 6<sup>th</sup> floor, SS Room 6027A

Office Hours (Tentative):

Thursdays (January 4, 11, 18): 1:30 – 3:30pm

Thursdays (January 25 to March 29): 3:30-5:30pm

Lectures: Thursdays, 11am-1pm

Lecture location: SS 2102

Tutorials: Tuesdays, 10-11am

Tutorial Location: TBD (will be posted on Blackboard)

Blackboard: <http://portal.utoronto.ca>

### **Course Book:**

The main course book we will use for this course is “Broverman MLC Study Guide 2016 Volume 1 Part A”. The manual is available at the ALICOS copy center at College St. and St. George St (203A College St).

We introduce a character Sussie Lin and follow her “layman to expert” journey of understanding life insurance and annuities. The course materials have been sorted to follow the many turns of her story (see below for coursebook Section number related to each week’s lecture). Every week I will post on portal lecture highlights as well as the exact readings from Broverman manual that are relevant to that week’s lecture. So please pay special attention to the course portal, and join us for the journey!

A useful reference book (on Course Reserve at Robarts library):

Actuarial Mathematics, by Newton Bowers, et al.

### **Calculator:**

You need one of the following SOA-approved calculators: battery or solar-powered Texas Instruments BA-35 model calculator, the BA II Plus, the BA II Plus Professional, the TI-30Xa or TI-30X II (IIS solar or IIB battery), or TI-30X MultiView (XS Solar or XB Battery)

### **Evaluation:**

5% In-class pop quiz using Poll Everywhere (starting from Week 2)

5% Excel Homework (assigned at the end of Lecture 11)

25% Term Test 1 (Tentative date: January 30, during tutorial)

25% Term Test 2 (Tentative date: March 6, during tutorial)

40% Final Exam

**Bonus points opportunities** (to be applied to final course mark):

In-class questions using Poll Everywhere (up to 3% bonus points): For each question that is answered correctly, you are awarded 0.5 point. You can earn up to 3% bonus points throughout the course (note I may only post the total bonus points at semester's end).

**Please ensure that you log into your Poll Everywhere account before answering the quiz/bonus questions!** That is the only way that your answers will be registered by the system. If you do not log in before answering the questions, your answers will be lost and we will not be able to award course marks to you.

### **Estimated Weekly Schedule of Topics:**

#### **Lecture 1 – January 4: (section 2)**

- Introducing Susie Lin, whose journey of understanding life insurance we will follow intently throughout the course
- Types of life insurance
- How to conduct a cost/benefit analysis for different life insurance?
  - o Introduce time-until-death variable  $T_x$ , survival function
- Poll Everywhere test run

**First tutorial will be on Tuesday, January 9<sup>th</sup>.**

#### **Lecture 2 – January 11: (section 2, 3)**

- Survival function - continued
- What did Benjamin Gompertz discover two hundred years ago?
  - o Force of mortality
- Linking force of mortality with survival function

#### **Lecture 3 - January 18: (section 6, 5)**

- Parametric survival models: what's the implication for Sussie if those were her survival models?
- Sussie's life expectancy (and other statistics – variance, percentile, etc)

#### **Lecture 4 – January 25: (section 12, 13)**

- Cost of different types of insurance – continuous case
- Different definitions of insurance cost
- Recursive relationships

**Tutorial January 30 – Term test 1 (55 minutes, 10:05-11am) - See portal announcement for Test Rooms**

#### **Lecture 5 – February 1: (section 4, 5)**

- Life table
- Curtate time-until-death variable  $K_x$
- Sussie's life expectancy using  $K_x$  (and other statistics)
- Linking life table with survival functions

**Tutorial February 6 – Term test 1 review with TA**

**Lecture 6 – February 8: (section 9, 10, 11,13)**

- Cost of different types of insurance – discrete case
- Recursive relationships

**Lecture 7 – February 15: (Section 7, 13)**

- Life insurance with varying benefits – discrete case
- Relationships between continuous and discrete case of life insurance pricing

**February 22: Reading week, no class. (No tutorial on February 20.)**

**Lecture 8 – March 1: (Section 8, 13)**

- Select life table
- Cost of group insurance

**Tutorial March 6 – Term Test 2 (55 minutes, 10:05-11:05am) - See portal announcement for Test Rooms**

**Lecture 9 – March 8: (Section 16, 17)**

- Sussie's legacy – annuities introduction; different types of annuities
- Cost of different types of annuities – continuous case

**Tutorial March 13 – Term Test 2 Review with TA**

**March 14: Last day to drop class.**

**Lecture 10 – March 15: (Section 16, 17)**

- Cost of different types of annuities – continuous case (Continued)
- Recursive relationship

**Lecture 11 – March 22: (Section 14, 15, 13)**

- Cost of different types of annuities – discrete case
- Monthly payment insurance and annuities
- Homework assignment

**Lecture 12 – March 29: (Section 13, 17, 15)**

- Homework recap
- Theoretically prove formula for monthly payment insurance (Sec 13) and annuities (Sec 17)
- Annuities with varying benefits
  - o A mini-case on loan and mortgage insurance
- Loose ends

**NO tutorial in the last week.**

**Final Exam – Date TBA, will be announced on portal**

### Missed Assignments or Exams

- There is **no** make-up for in-class quiz or bonus questions.
- There is **no** make-up for homework project.
- There are **no** make-up term tests. However, if you have to miss one term test, *and* you can provide me with one of the following: a UofT Verification of Illness or injury form ([www.illnessverification.utoronto.ca](http://www.illnessverification.utoronto.ca)), or an Accessibility Services letter, or a letter from your college registrar about personal matters interfering with your studies, **within one day after the term test**, your missed term test weight will be shifted to the final exam (i.e. if you missed a 25% term test, your final exam will be worth 65%). You cannot miss both term tests (i.e. if you miss both, you will lose the 25% for the second term test). In the extremely rare case that you have good reasons to miss both term tests, you will be required to make up the second term test by doing an oral exam with the Instructor.
- There will be **ONE** make-up final exam arranged by Faculty of Arts and Science directly.

### Canadian Institute of Actuaries (CIA)'s University Accreditation Program (UAP)

ACT247 is an accredited course under the UAP program. You may apply for a credit for Exam MLC if you achieve the minimum grades for the following three courses: ACT247, ACT348, ACT455. The minimum grade required for ACT247 is 70. For detailed information on UAP, please visit the following webpages:

- University Accreditation Program description (<http://www.cia-ica.ca/membership/university-accreditation-program---home>)
- List of accredited courses offered by University of Toronto: <http://www.cia-ica.ca/membership/university-accreditation-program---home/accredited/toronto>
- How to apply for CIA exemptions: <http://www.cia-ica.ca/membership/university-accreditation-program---home/information-for-candidates/obtaining-uap-credits>

Note: The CIA will grant credits to students for SOA/CAS examinations based on the achievement of the minimum Grade towards Associateship (ACIA) and Fellowship (FCIA) in the CIA. At the time of this agreement, CIA credits are recognized by the following actuarial organizations towards their respective designations:

Casualty Actuarial Society (CAS): ACAS, FCAS  
UK Institute and Faculty of Actuaries (IFoA): FIA, AIA  
Institute of Actuaries of Australia (IAA): AIAA, FIAA  
Actuarial Society of South Africa (ASSA): AMASSA, FASSA  
American Academy of Actuaries (AAA): MAAA

The CIA does not guarantee that credits granted to students under the CIA UAP will be recognized by any other actuarial organizations towards their actuarial designations.