ACT 348: Advanced Life Contingencies (Fall 2024)

Instructor & TA Information:

Name	Role	Contact
Basil Singer	Instructor	basil.singer@utoronto.ca
Sebastian Calcetero	TA	sebastian.calcetero@mail.utoronto.ca

Class times:

- **Lectures:** Mondays 03:10PM to 05:00PM, NL6.
- **Office hours:** Wednesdays 11:00AM to 12:00PM, online.

High level description

Determination of benefit premium and benefit reserves for life insurance and annuities; analysis of insurance loss random variables; theory of life contingencies for multiple lives.

Course outcomes:

By the end of the course, you will be able to:

- Understand how premiums are calculated and how to leverage the equivalence principle.
- Calculate benefit reserves via various approaches, such as the prospective and retrospective approaches, and modifications.
- Recognize and apply recursive relationships across various reserves.
- Apply multiple life functions under various models.

Textbook: S. Broverman, Actuarial Science Coursebook for [ACT247H + ACT348H 2022-23] Edition.

Course tentative outline:

(1) Week 1: Part 1 – ACT 247 review (2024-09-08**sun** → 2024-09-14**sat):**

a. Foundations.
b. Life tables & parametric survival models.
c. Life insurance products.
d. Life annuity products.

(2) Weeks 2 & 3: Part 2 – Premiums (2024-09-15**sun** → 2024-09-28**sat):**

a. Loss-at-issue random variable & function.
b. Equivalence principle premiums.
c. Policy expenses.

(3) Week 4: Midterm 1 (2024-09-29**sun** → 2024-9-05**sat).**

(4) Week 5: Part 3 – Reserves (2024-10-13**sun** → 2024-10-19**sat):**

a. Introduction.
b. Prospective form of net reserves.
c. Additional reserves representation.

(5) Week 6: Thanksgiving (2024-10-06**sun** → 2024-10-12**sat).**

(6) Week 7: Part 3 – Reserves (2024-10-20**sun** → 2024-10-26**sat).**

d. Reserves on additional policy types.
e. Expense augmented reserves.
f. Recursive relationships for reserves.

(7) Week 8: Reading Week (2024-10-27**sun** → 2024-11-02**sat).**

(8) Week 9: Part 3 – Reserves (2024-11-03**sun** → 2024-11-09**sat):**

g. Modified reserves.
h. Policy profit.

(9) Week 10: Midterm 2 (2024-11-10**sun**→ 2024-11-16**sat).**

(10) Weeks 11, 12, & 13: Part 4 – Multiple life (2024-11-17**sun** → 2024-12-07**sat):**

a. Joint life status.
b. Last survivor status
c. Common shock model.
d. Multiple life insurances & annuities.
e. Contingent probabilities and insurances.

Course Grading:

1) Closed book in-person written tests (100%):
   Standard weights:
   a. Midterm 1 [M1] (Parts 1 & 2): 25% (on 2024-09-30mon 03:15PM to 104:45PM).
   b. Midterm 2 [M2] (Parts 1, 2, & 3): 25% (on 2024-11-11mon 03:15PM to 04:45PM).
   c. Final [F] (Parts 1, 2, & 3): 50% (date and time TBD).
   The final grade follows the following formula:
   $$\max(0.25 \times M1 + 0.25 \times M2 + 0.5 \times F, 0.25 \times M1 + 0.75 \times F, 0.25 \times M2 + 0.75 \times F, F)$$
   In the formula above, the standard weights get allocated to the final for midterms excluded.

Materials allowed:

- A4 cheat sheets (number will be based on number of parts covered in the exam).
- Calculator.
- To be provided by examiner: ltam-standard-ultimate-life-table.

All final grades are rounded up to the nearest percentage. For grades that are within 2% short of 50%, 63%, 70%, and 80% will be rounded up to the closest grade. No other exceptions will be granted, and the student will need to apply to the department for a deferral.

Calculator: A calculator is essential for working exercises, tests, and the final exam. The Texas Instruments BA II PLUS calculator is one of the calculators allowed on the Society of Actuaries examinations; it has the financial functions that would be needed for this course and is recommended. All non-programmable calculators are allowed.

Academic integrity: Three key principles are held in this course: fairness and transparency from the instructor, and a solid work ethic from the student. Anyone caught cheating or complicit of cheating (e.g., copying assignments, solving individual-based assessment problems in groups) will have their test grade zeroed and will be reported to the department.

Canadian Institute of Actuaries' University Accreditation Program (UAP):

UAP has moved away from the course-by-course accreditation and is now based on a program accreditation method. Under the new credentialing pathway, to obtain ACIA (Associate of CIA) professional credential, students need to:

1. Complete a degree from an actuarial program (ACT Specialist or Major) at University of Toronto and pass a list of mandatory courses. No minimum course grade or GPA is required. The full list of UofT's 16 mandatory courses are: ACT240, ACT245, ACT247, ACT348, ACT349, ACT370, ACT451, ACT452, ACT466, STA237/STA257, STA238/STA261, STA302, STA314, ECO101, ECO102, MGT201/RSM219;
2. Complete the ACIA Modules;
3. Complete an open-book ACIA Capstone Exam

For further information on ACIA modules and Capstone Exam, please email education@cia-ica.ca.

Textbook purchase information:

You may purchase the coursebook on the UofT Bookstore (physical copy only available).