

ACT 240: Mathematics of Investment and Credit (Fall 2024)

Instructor & TA Information:

Name	Role	Contact
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Class times:

- **Lectures:** Mondays 11:10AM to 01:00PM, EM001.
- **Tutorials:** Fridays 10:00AM to 11:00PM, online.

High level description

Interest, discount and present values, as applied to determine prices and values of annuities, mortgages, bonds, equities; loan repayment schedules and consumer finance payments in general; yield rates on investments given the costs on investments.

Course outcomes:

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

- Distinguish between various types of interest metrics.
- Calculate the present and cumulative values of various types of annuities.
- Understand and apply amortization on loans.
- Valuate and amortize bonds.
- Understand and apply various measures of rate of return of a fund.

Textbook: S. Broverman, Actuarial Science Coursebook for [ACT240H + ACT245H 2019] Edition.

Course tentative outline:

- (1) **Weeks 1, 2 & 3: Part 1 – Interest rate measurement** (2024-09-08sun → 2024-09-28sat):
 - a. Foundation
 - b. Fundamentals of interest rate calculation.
 - c. Nominal rates of interest and discount.
 - d. Force of interest, inflation, and risk of default.
- (2) **Week 4: Midterm 1** (2024-09-29sun → 2024-9-05sat).
- (3) **Week 5: Part 2 – Valuation of annuities** (2024-10-06sun → 2024-10-12sat).

- a. Annuity immediate and annuity due.
- b. Annuity valuation at any time point.

(4) Week 6: Thanksgiving (2024-10-13sun → 2024-10-19sat).

(5) Week 7: Valuation of annuities (2024-10-20sun → 2024-10-26sat).

- c. Annuities with differing interest and payment periods.
- d. Annuity whose payments follow a geometric progression.

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

(7) Weeks 9: Part 2 – Valuation of annuities (2024-11-03sun → 2024-11-09sat):

- e. Annuities whose payments follow an arithmetic progression.

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

(9) Weeks 11, 12, & 13: Part 3 – Loans, bonds, and funds (2024-11-17sun → 2024-12-07sat):

- a. Amortization of a loan
- b. Bond valuation.
- c. Bond amortization & callable bonds
- d. Measures of the rate of return on a fund

Course Grading:

1) In-person written tests (100%):

Standard weights:

- a. Midterm 1 [M1] (Parts 1): 25% (on 2024-09-30mon 11:15AM to 12:45PM).
- b. Midterm 2 [M2] (Parts 1, 2, & 3): 25% (on 2024-11-11mon 11:15AM to 12:45PM).
- c. Final [F] (Parts 1 & 2): 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.

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).