ACT3230 – A01 (3 CH)
Actuarial Models 2
Winter 2021
Virtual Classroom, TR 10:00 am – 11:15 am

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INSTRUCTOR

Name: Hong Li
Office: Virtual Office:
https://us02web.zoom.us/j/9647664442?pwd=YlNIMDg2R3IraTQ4aGhRM2Jocjdndz09
Phone: 204-474-9529
Email: li.hong@umanitoba.ca
Office hours: (on-line) 11:30am – 13:00 pm, every Tuesday and Thursday. Zoom link:

COURSE DESCRIPTION

This course is on actuarial aspect of life contingent insurance. In this course, students will learn to
generalize and apply the theory of life contingencies they have learned to some specific models that are
important in contemporary actuarial practice, including reserve calculation, multiple state models,
pension benefit, and profit testing.

This course is accredited under the Canadian Institute of Actuaries (CIA) University Accreditation
Program (UAP). Achievement of the minimum required grades in accredited courses may provide credit
for preliminary exams. Please note that a combination of courses may be required to achieve exam
credit. At the University of Manitoba, details of required courses and grades can be found here:
https://www.cia-ica.ca/membership/university-accreditation-program---home/accredited/manitoba
COURSE OBJECTIVES

This course, together with the antecedent course ACT 3130, covers most learning objectives of the Long-Term Actuarial Mathematics Exam (LTAM) by the Society of Actuaries (SOA).

COURSE FORMAT AND ONLINE ACCESS

This course will be conducted “live” via videoconferencing using Zoom and will not involve in-person instruction. Classes will be during the scheduled class time.

Zoom Link: https://us02web.zoom.us/j/9647664442?pwd=YlNlMDg2R3IraTQ4aGhRM2Jocjdndz09. To join the class from your computer, install Zoom Client for Meetings from zoom.us/download. To join from your smartphone, install the Zoom app. Detailed instructions are available here.

For recording attendance and class participation, you will be expected to have your camera and microphone on during class time and exams. You are expected to leave your camera on for the duration of the class. Have your microphone muted and unmute yourself only when you speak.

Please note that all classes will be recorded and the video recordings are likely to be shared with other students.

COURSE MATERIALS

- The following materials are required:
  3. The supporting study notes from the SOA (available at SOA’s website https://www.soa.org/Education/Exam-Req/edu-exam-ltam-detail.aspx).

- Copies of the textbook and the study manual are available in the management library on a reserve basis.

- Practice questions will be posted on D2L.

- Please respect copyright laws. Photocopying textbooks or other reading material is a violation of copyright laws and is unethical, unless permission to copy has been obtained.

As classes will be delivered synchronously via videoconferencing, a device enabled with a camera and microphone is required. Further, you are expected to be in a location with a reliable Internet connection that is strong enough for streaming video.
For quizzes/exams, which will be administered via the Respondus Lockdown browser, you will need a device (computer or iPad; smartphone will not work) with one of the following operating systems:

- Windows 10, 8, or 7 (note: will not work with Windows 10S)
- Mac OS 10.15 to 10.12, OS X 10.11, or OSX 10.10
- iOS: 11.0+ (iPad only)

You will need the Chrome browser. Other browsers such as Safari may not work.

**ASSESSMENT OF LEARNING**

Assessment of this course includes two in-class tests and one final exam, each 75 minutes. Below is the schedule and the weight of each component:

- **Test 1 (February 11 during class time; via UM Learn)** - 25%
- **Test 2 (March 18 during class time; via UM Learn)** - 25%
- **Final Exam (per Final Exam Schedule; via UM Learn)** - 50%

The **Grading Scale** for this course is as follows.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100</td>
<td>A+</td>
</tr>
<tr>
<td>80 – 89.9</td>
<td>A</td>
</tr>
<tr>
<td>75 – 79.9</td>
<td>B+</td>
</tr>
<tr>
<td>70 - 74.9</td>
<td>B</td>
</tr>
<tr>
<td>65 - 69.9</td>
<td>C+</td>
</tr>
<tr>
<td>60 - 64.9</td>
<td>C</td>
</tr>
<tr>
<td>50 – 59.99</td>
<td>D</td>
</tr>
<tr>
<td>Below 50</td>
<td>F</td>
</tr>
</tbody>
</table>

- All exams are cumulative.
- Success in the course and on the Society of Actuaries Exam LTAM will depend on working a large number of exercises. Each student should work as many exercises as possible. This course is hard. Do not get behind. It is very important to read ahead of each lecture.

For exams, we will be using university-approved Respondus Monitor, which will require you to have your camera and microphone on for the entire duration of the exam. As the software detects any unusual movements, please sit in a location where there are no people/pets or other moving objects in the camera’s view during the exam.

**Special Exam Requirement during Remote Teaching (Please read carefully!):**
- All exams will be taken via Academic GOAL.
- All exams must be taken with Respondus LockDown/Monitor via UM Learn.
- Any exam without complete record of Respondus LockDown/Monitor will receive zero mark.

**MISSED EXAM AND LATE SUBMISSION POLICY**

If you have to miss an exam for medical reasons, please try your best to inform me by email before the exam.

In addition to the university’s list of acceptable reasons for missing an exam, the Asper School has an approved list of events for which you may be eligible for an accommodation if you have to miss the midterm (not the final exam). Please consult the list to see if your reason qualifies.

If a student fails to attend any test, marks for that test will be equally distributed to the remaining test and the final exam.

If you are given a makeup exam, I cannot guarantee that the difficulty level of the makeup exam will be the same as the one the rest of the class got.

Do not make travel plans before the Final Exam. I cannot let you take the exam earlier/later because you made bookings for an earlier date. In the event you have to miss the Final Exam for a valid reason, a request for a deferred exam must be made at your home Faculty’s Undergraduate Program Office (b_comm@umanitoba.ca, if you are an Asper student). Applying for a deferred exam does not guarantee your request will be granted.

**ATTENDANCE POLICY**

You are allowed a maximum of 4 unexcused absences. This does not include excused absences due to:

a) medical and/or compassionate reason
b) participation in an inter-university, provincial, inter-provincial, national, or international scholastic or athletic event
c) religious obligations
d) qualification for accommodation under one of the Asper approved list of events

No reason other than the above is considered a valid excuse. For an absence to be considered excused, valid documentation will be required. Simply informing me that you won’t be in class on a particular day is not considered an excused absence.

If you have over 4 unexcused absences, it will result in an automatic F grade in the course, as per the Asper School’s Debarment Policy. There will be no exceptions to this rule. If you feel you will have over 4 unexcused absences, you are strongly encouraged to VW if possible.

Attendance will be taken daily starting Feb 1. Joining the class over 15 minutes late or leaving more than 15 minutes early (without the instructor’s prior approval) will be considered absent for that class.
You will be required to turn on your camera for the purpose of attendance. A screenshot will be taken as a record of the attendance.

**ELECTRONIC DEVICE POLICY**

Using a computer, tablet, or smartphone with a camera/mic is necessary for this course.

Although this is course is taught in a remote teaching format, we will observe the protocols that would be expected during in-person classes. Avoid making or taking calls on your cellphone while class is in progress. No frivolous posting of messages in the Chat area during class. Please do not video/audio record class lectures or take pictures of the screen without the instructor’s permission.

**OUT-OF-CLASS COMMUNICATION**

PowerPoint files, assignment/project guidelines, other class-related files, and intermediate grades will be posted on UM Learn. Any announcements outside of class will be sent by e-mail from UM Learn. It is your responsibility to check your UofM e-mail account frequently so that you don’t miss these communications from me. UM Learn will also be used to submit your individual assignment and the group project.

**REFERENCING STYLE FOR WRITTEN WORK**

For the citations in the assignments and group project, you may use APA, MLA, or Chicago style. However, use only one of these styles throughout your written work and use it consistently.

**TENTATIVE CLASS SCHEDULE**

Week 1: Introduction to reserve.  
Required reading:  
Actuarial Mathematics for Life Contingent Risks, Chapter 7.1 – 7.3.3.

Week 2: Annual profit by source. Policies with cash flows at 1/mthly intervals. Policy values with continuous cash flows (part 1).  
Required reading:  
Actuarial Mathematics for Life Contingent Risks, Chapter 7.3.4, 7.3.5, 7.4, 7.5.

Week 3: Policy values with continuous cash flows (part 2). Negative policy values. Modified premium reserve.  
Required reading:  
Actuarial Mathematics for Life Contingent Risks, Chapter 7.5, 7.8, 7.9.

Week 4: Introduction to multiple decrement model.  
Required reading:  
Actuarial Mathematics for Life Contingent Risks, Chapter 8.8 – 8.10.1.
Week 5: Constructing a multiple decrement model. Transition at exact ages.
Required reading:
Actuarial Mathematics for Life Contingent Risks, Chapter 8.10.2 – 8.12.
LTAM-21-18 Supplementary Note on Long Term Actuarial Mathematics, Section 3.

Week 6: Markov chain in discrete time and continuous time. Introduction to multiple-state model.
Required reading:

Week 7: Premium and reserve determination in multiple-state model.
Required reading:
Actuarial Mathematics for Life Contingent Risks, Chapter 8.6 – 8.7.

Week 8: Multiple life model (part 1).
Required reading:
Actuarial Mathematics for Life Contingent Risks, Chapter 9.1 – 9.5.

Week 9: Multiple life model (part 2). Introduction to pension mathematics.

Required reading:
Actuarial Mathematics for Life Contingent Risks, Chapter 10.5 – 10.7.
LTAM-21-18 Supplementary Note on Long Term Actuarial Mathematics, Section 6.

Week 11: Profit testing
Actuarial Mathematics for Life Contingent Risks, Chapter 12.

Week 12: Mortality Improvement Modeling.
Required reading:
LTAM-21-18 Supplementary Note on Long Term Actuarial Mathematics, Section 4.

Week 13: Health benefits.
Required reading:
LTAM-21-18 Supplementary Note on Long Term Actuarial Mathematics, Section 1, 2, 5.

IMPORTANT DATES

- February 11 : Test 1
- March 18 : Test 2
- March 31 : Winter Term Voluntary Withdrawal (VW) Deadline
The Asper School of Business is proudly accredited by AACSB. Accreditation requires a process of continuous improvement of the School and our students. Part of “student improvement” is ensuring that students graduate with the knowledge and skills they need to succeed in their careers. To do so, the Asper School has set the learning goals and objectives listed below for the Undergraduate Program. The checked goal(s) and objective(s) will be addressed in this course and done so by means of the items listed next to the checkmark.

<table>
<thead>
<tr>
<th>Goals and Objectives in the Undergraduate Program</th>
<th>Goals and Objectives Addressed in this</th>
<th>Course Item(s) Relevant to these Goals and Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1 Quantitative Reasoning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Determine which quantitative analysis technique is appropriate for solving a specific problem.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Use the appropriate quantitative method in a technically correct way to solve a business problem.</td>
<td></td>
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<tr>
<td>C. Analyze quantitative output and arrive at a conclusion.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2 Written Communication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Use correct English grammar and mechanics in their written work.</td>
<td>✓</td>
<td>Group project and exams</td>
</tr>
<tr>
<td>B. Communicate in a coherent and logical manner</td>
<td>✓</td>
<td>Group project and exams</td>
</tr>
<tr>
<td>C. Present ideas in a clear and organized fashion.</td>
<td>✓</td>
<td>Group project and exams</td>
</tr>
<tr>
<td><strong>3 Ethical Thinking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Identify ethical issues in a problem or case situation</td>
<td>✓</td>
<td>Throughout course</td>
</tr>
<tr>
<td>B. Identify the stakeholders in the situation.</td>
<td>✓</td>
<td>Throughout course</td>
</tr>
<tr>
<td>C. Analyze the consequences of alternatives from an ethical standpoint.</td>
<td>✓</td>
<td>Throughout course</td>
</tr>
<tr>
<td>D. Discuss the ethical implications of the decision.</td>
<td>✓</td>
<td>Throughout course</td>
</tr>
<tr>
<td><strong>4 Core Business Knowledge</strong></td>
<td>✓</td>
<td>Entire course</td>
</tr>
</tbody>
</table>
ACADEMIC INTEGRITY POLICY

The online format of class delivery does not lower the Asper School’s academic integrity standards. The same high levels of academic integrity are expected this term as they are in previous terms.

It is critical to the reputation of the Asper School of Business and of our degrees that everyone associated with our faculty behave with the highest academic integrity. As the faculty that helps create business and government leaders, we have a special obligation to ensure that our ethical standards are beyond reproach. Any dishonesty in our academic transactions violates this trust. The University of Manitoba General Calendar addresses the issue of academic dishonesty under the heading “Plagiarism and Cheating.” Specifically, acts of academic dishonesty include, but are not limited to:

- using the exact words of a published or unpublished author without quotation marks and without referencing the source of these words (includes Chat messages posted during class)
- duplicating a table, graph or diagram, in whole or in part, without referencing the source
- paraphrasing the conceptual framework, research design, interpretation, or any other ideas of another person, whether written or verbal (e.g., personal communications, ideas from a verbal presentation) without referencing the source
- copying the answers of another student in any test, examination, or take-home assignment
- providing answers to another student in any test, examination, or take-home assignment or obtaining answers or other unauthorized help from anyone else
- taking any unauthorized materials into an examination or term test (crib notes), regardless of whether those are used during the exam
- recording exam questions using any method, regardless of whether those are shared with others
- sharing exam questions with those who are yet to take the exam, including future students or attempting to sell exam questions
- impersonating another student or allowing another person to impersonate oneself for the purpose of attendance, earning class participation marks, submitting academic work, or writing any test or examination
- stealing or mutilating library materials
- accessing test prior to the time and date of the sitting
- changing name or answer(s) on a test after that test has been graded and returned
- submitting the same paper or portions thereof for more than one assignment, without discussions with the instructors involved

Group Projects and Group Work

Many courses in the Asper School of Business require group projects. Students should be aware that group projects are subject to the same rules regarding academic integrity. All group members should exercise special care to ensure that the group project does not violate the policy on Academic Integrity. Should a violation occur, group members are jointly accountable unless the violation can be attributed to specific individuals.

Some courses, while not requiring group projects, encourage students to work together in groups before submitting individual assignments. If it’s unclear whether it is allowed, students are encouraged to seek clarification from the instructor to avoid violating the academic integrity policy.

In the Asper School of Business, all suspected cases of academic dishonesty in undergraduate courses are reported to the Dean's office and follow the approved disciplinary process. See following table for typical penalties for academic dishonesty in the Asper School.
Typical Penalties for Academic Dishonesty in the Asper School

If the student is from another Faculty and the academic dishonesty is committed in an Asper course, the student’s Faculty could match or add penalties beyond the Asper School’s.

F-DISC on transcript indicates the F is for disciplinary reasons.

<table>
<thead>
<tr>
<th>ACADEMIC DISHONESTY</th>
<th>PENALTY</th>
</tr>
</thead>
</table>
| Cheating on exam (copying from or providing answers to another student) | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Sharing exam questions electronically during exam | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Possession of unauthorized material during exam (e.g., cheat notes) | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Altering answer on returned exam and asking for re-grading | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Plagiarism on assignment | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Submitting paper bought online | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Inappropriate Collaboration (collaborating with individuals not explicitly authorized by instructor) | F-DISC in course  
Suspension from taking Asper courses for 1 year  
Notation of academic dishonesty in transcript |
| Group member had knowledge of inappropriate collaboration or plagiarism and played along | F-DISC in course  
Notation of academic dishonesty in transcript |
| Signing Attendance Sheet for classmate | F-DISC in course  
Notation of academic dishonesty in transcript |
| Attempting to sell exam | F-DISC in course  
Suspension from taking Asper courses for 18 months  
Notation of academic dishonesty in transcript |
STUDENT SERVICES AND SUPPORTS

The University of Manitoba provides many different services that can enhance learning and provide support for a variety of academic and personal concerns. You are encouraged to visit the below websites to learn more about these services and supports. If you have any questions or concerns, please do not hesitate to contact your instructor or the Undergraduate Program Office.

<table>
<thead>
<tr>
<th>For Information on...</th>
<th>...follow this link</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tech-related issues with UM Learn or videoconferencing</td>
<td>Information Services &amp; Technology</td>
</tr>
<tr>
<td>Admission, Registration, Tuition Fees, Important Dates, Final Exams, Graduation, and Transcripts</td>
<td>Registrar’s Office</td>
</tr>
<tr>
<td>Academic policies &amp; procedures, regulations, Faculty-specific information, degree and major requirements</td>
<td>Academic Calendar</td>
</tr>
<tr>
<td>Help with research needs such as books, journals, sources of data, how to cite, and writing</td>
<td>Library Resources</td>
</tr>
<tr>
<td>Tutors, workshops, and resources to help you improve your learning, writing, time management, and test-taking skills</td>
<td>Writing and Learning Support</td>
</tr>
<tr>
<td>Support and advocacy for students with disabilities to help them in their academic work and progress</td>
<td>Student Accessibility Services</td>
</tr>
<tr>
<td>Copyright-related questions and resources to help you avoid plagiarism or intellectual property violations</td>
<td>Copyright Office</td>
</tr>
<tr>
<td>Student discipline bylaws, policies and procedures on academic integrity and misconduct, appeal procedures</td>
<td>Academic Integrity</td>
</tr>
<tr>
<td>Policies &amp; procedures with respect to student discipline or misconduct, including academic integrity violations</td>
<td>Student Discipline</td>
</tr>
<tr>
<td>Students’ rights &amp; responsibilities, policies &amp; procedures, and support services for academic or discipline concerns</td>
<td>Student Advocacy</td>
</tr>
<tr>
<td>Your rights and responsibilities as a student, in both academic and non-academic contexts</td>
<td>Your rights and responsibilities</td>
</tr>
<tr>
<td>Medical services for any physical or mental health issues</td>
<td>University Health Service</td>
</tr>
<tr>
<td>Information on health topics, including physical/mental health, alcohol/substance use harms, and sexual assault</td>
<td>Health and Wellness</td>
</tr>
<tr>
<td>Any aspect of mental health, including anxiety, stress, depression, help with relationships or other life concerns, crisis services, and counselling.</td>
<td>Student Counselling Centre</td>
</tr>
<tr>
<td>Support services available for help regarding any aspect of student and campus life, especially safety issues</td>
<td>Student Support Case Management</td>
</tr>
<tr>
<td>Resources available on campus, for environmental, mental, physical, socio-cultural, and spiritual well-being</td>
<td>Live Well @ UofM</td>
</tr>
<tr>
<td>Help with any concerns of harassment, discrimination, or sexual assault</td>
<td>Respectful Work and Learning Environment</td>
</tr>
<tr>
<td>Concerns involving violence or threats, protocols for reporting, and how the university addresses them</td>
<td>Violent or Threatening Behaviour</td>
</tr>
</tbody>
</table>
ABOUT THE INSTRUCTOR

Dr. Hong Li, FSA, ACIA, is an Assistant Professor in the Warren Centre of Actuarial Studies and Research in the Asper School of Business, and the Accreditation Actuary of the University Accreditation Program of the Canadian Institute of Actuaries. Dr. Li is also the University of Manitoba’s main contact person in regard to the CAE designation of the Society of Actuaries. Dr. Li received his Ph.D. from the Department of Econometrics and Operations Research, Tilburg University in 2015. His current research includes data analytics with insurance applications, with special focuses on mortality modeling and forecasting, longevity risk management, and the design of agriculture, automobile, and health insurance. Dr. Li has publications in international leading actuarial science and demography journals such as Journal of Risk and Insurance, Demography, ASTIN Bulletin, Scandinavian Actuarial Journal, Insurance: Mathematics and Economics, and the North American Actuarial Journal.