

MA 412/ST 412 : Long-Term Actuarial Models
Summer 2020 Session I

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Office Hours: By appointment, via Zoom.

Course Description: Actuarial science is the discipline that applies mathematical and statistical methods to assess risk in insurance, finance, and other industries and professions. To become an actuary, one must pass a series of specialized exams on actuarial mathematics. This course covers (some of) the material for SOA Exam MLC: Models for Life Contingencies and SOA Exam FM: Financial Mathematics. Specifically, the course covers survival models, life tables, selection, insurance benefits, annuities, premium calculation, and, time permitting, multiple state models. We will also introduce and review key concepts from probability theory and interest theory, as needed. The material for this class will cover chapters 1-6 and 8 of the textbook, with extra material from other texts as needed.

Prerequisite: MA 241 or MA 231 (Specifically, computing integrals and working with finite and infinite series).

Corequisite: One of MA 421, BUS[ST] 350, ST 301, ST 305, ST 311, ST 361, ST 370, ST 371, ST 380 (Specifically, material on random variables).

Text: Dickson, Hardy, Waters, *Actuarial Mathematics for Life Contingent Risks*, Cambridge University Press, 2nd Edition, ISBN 13: 978-1107044074

Recommended Text: Dickson, Hardy, Waters, *Solution Manual for Actuarial Mathematics for Life Contingent Risks*, Cambridge University Press, 2nd Edition

Recommended Text: Kellison, *The Theory of Interest*, (I will provide scans of the first three chapters on the Moodle site, which is all that is needed for this course. However, this book is used for the SOA Exam FM: Financial Mathematics, and would be useful to have if you plan to take the actuarial exams to become an actuary.)

Course Website: Course announcements, homework assignments, etc. will be posted on Moodle. Your ncsu email address will be used for all communications for the course. Plan to check that email regularly for course announcements, or setup email forwarding to another account you check regularly. Your email is automatically enrolled in the course announcement forum which runs through Moodle.

Course Objectives:

1. State key definitions and formulas in actuarial science.
2. Use actuarial notation and connect it to related notation from probability and statistics.

3. Apply main results in actuarial science of life contingencies to solve freshly encountered problems.

Homework: Homework will be assigned on Moodle weekly and is due at 11:59 PM, see course schedule on Moodle for dates.

1. Students must write up their own solutions. Working with other students is allowed, however, you must first attempt all problems on your own before discussing solutions with other students. Each student must write up their own solutions. Please indicate on your homework any sources that you used in preparing solutions (e.g. any groups members you worked with or discussed the problems with, if another student helped with a solution, or you were aided by reading a particular text).
2. Homework must be submitted as a pdf document through Moodle.
3. Students are welcome to use the solution manual to aid with the book problems. However, please note that the solution manual typically only has sketches of the solutions. A complete solution will involve the addition of many details. Copying solutions directly from the solution manual will negatively affect your homework grade and also likely lead to poor performance on exams. When I grade the homework, I will check the book problems for completeness and to make sure you have filled in missing details. Problems that I write myself will be carefully graded for correctness. Copying solutions from other students or online or from a textbook is not an acceptable source.
4. **Problem/HW Sessions:** (optional) via Zoom see course schedule on Moodle for date and times.

Calculators: There are 6 calculators models that are permitted for the Society of Actuaries actuarial exams, all Texas Instruments, in the following models: BA-35, BA II Plus, BA II Plus Professional, TI-30Xa, TI-30X II (IIS solar or IIB battery), TI-30XS MultiView (or XB battery). If you are serious about becoming an actuary, purchase one of these calculators now and plan to use them on our exams and homework. They are all inexpensive and have a relatively limited functionality (e.g. no integrals). You will need a calculator of some sort and should plan to use it as you watch the lectures, work on homework and quizzes, and for exam days.

Exams: There will be two midterm exams and a final exam. The exams are open book. The exams will be administered through Moodle. The midterm exams are each 75 minutes and the final exam is 180 minutes plus a 15 min buffer to upload exam.

Exam Dates:

- Midterm 1: Friday, May 29 (Ch. 1 - Ch. 3)
- Midterm 2: Friday, June 12 (Ch. 4 & Ch. 5)
- Final Exam: Wednesday, June 17 or Thursday, June 18 (Ch.1 - Ch. 6)

Exam makeups: Due to the pace of the summer session, exam makeups are not an option. Students with excused absences their final exam grade will replace the missed exam.

If you are struggling with the material: Bottom line: I want you to succeed. Send me an email and come to office hours. You are responsible for 1) knowing when you're confused 2) doing something about it. Don't wait until the night before a test or the hour before homework is due to ask questions.

Note: I respond to emails frequently throughout the normal workday, 9 AM - 5 PM. If you send an email after 7 PM you will receive a response the next business day.

Grade Distribution: As follows:

Component	Percent Value
Homework	20%
Midterm 1	20%
Midterm 2	20%
Final Exam	40%

Letter Grade Distribution: Letter grades will be based on percent values as follows:

A+	100 - 95	A	94.99 - 90	A-	89.99 - 85
B+	84.99 - 80	B	79.99 - 75	B-	74.99 - 70
C+	69.99 - 65	C	64.99 - 61	C-	60.99 - 60
		D-F	< 60		

Cheating: Short version: don't do it. You will get a zero on the assignment, be referred for disciplinary action.

Long version: student code of conduct, available at <https://studentconduct.dasa.ncsu.edu/academic-integrity-overview/>.

Students with disabilities: Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Services Office and notify me: see <http://www.ncsu.edu/dso/>.

Counseling Center: It is important to take care of your mental health. The NCSU counseling center at 2815 Cates Ave is open Mondays through Fridays 8am to 5pm. There is a 24/7 emergency hotline at 919-515-2423. If you or a friend is struggling, don't hesitate to reach out.