MATH 452
Long-Term Actuarial Mathematics 1

Fall 2026

Instructor:

Associate Professor Siyang Tao, Ph.D., ASA

Office Hours: TR 10:40 am-11:30 am

Office: RB 429

765-285-8681

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tao@bsu.edu (the best way to contact me)

Course Info:

Prereq: MATH 267, MATH 320, and MATH 351

Weekly schedule

TR 9am-10:40am

RB 452

Department:

DEO: Professor Dan Rutherford

Phone: 765-285-8640

Office: RB 465

GA Info:

Mr. Braeden Oesterling

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Overview

The objective of this course is to develop a comprehensive understanding of the statistical and probabilistic techniques required for the Society of Actuaries (SOA) Fundamentals of Actuarial Mathematics—Long-Term (FAM-L) exam. The material is organized into six chapters, progressively delving into higher levels of technical complexity:

Chapter 1. Survival Models (3.5 weeks)
Chapter 2. Life Tables and Selection (2 weeks)
Chapter 3. Insurance Benefits (2.5 weeks)
Chapter 4. Life Annuities (2.5 weeks)
Chapter 5. Premiums (1.5 weeks)
Chapter 6. Policy Values (1.5 weeks)

Exam FAM

The FAM exam consists of a short-term portion (FAM-S) and a long-term portion (FAM-L). The exam is 3.5 hours long and contains a total of 34 questions. While the test includes exactly 17 questions from each area, they are presented randomly and are not explicitly labeled by section. Additional information about Exam FAM, including the official syllabus, can be found at this link.

Of the four topics comprising the FAM-L exam syllabus (which accounts for 50% of the total FAM exam), this course will cover:

- Topic 8: Mortality Models (10%–15%)
- Topic 9: Present Value Random Variables for Long-Term Insurance Coverages (12.5%–20%)
- Topic 10: Premium and Policy Value Calculation for Long-Term Insurance Coverages (15%–22.5%)

Combined, these areas account for approximately 95% of the FAM-L material. Topic 7: Long-Term Insurance Coverages and Retirement Financial Security Programs (2.5%–5%) will be assigned for independent study.

Recommended Texts / Study Material

Required Texts

There is no required textbook for this course. Our primary resource will be the comprehensive lecture notes available on Canvas. These notes cover all essential concepts for the SOA Exam FAM-L and are designed to provide a deep understanding of the material. They also include numerous examples and practice problems to help you prepare for the exam. Additionally, I will provide printed copies of all necessary supplementary handouts in class.

Recommended Texts

- *Actuarial Mathematics for Life Contingent Risks (3rd Edition)*, 2020, by D.C.M. Dickson, M.R. Hardy, H.R. Waters, Cambridge University Press.

Grading Scheme

19% Homework: Weekly assignments will be distributed by Tuesday and are due at the beginning of class (9:00 am) the following Tuesday. Solutions will be posted that same day. Your lowest homework score will be dropped from your final grade calculation.

A note on collaboration: While you are encouraged to discuss problems with peers, you must write up your solutions independently.

Note for Fall 2026: Hard-copy submissions are preferred. If you are unable to submit a physical copy, you may submit your assignment via email prior to the 9:00 am deadline.

1% Participation: During the semester, the department will host an Actuarial Science Speaker Series (date and time TBA). Your attendance and active engagement at this event will count toward your participation grade.

10% Quizzes: Four 15-minute, closed-book quizzes will be given in class on Thursdays (see the course schedule on the last page for specific dates). These are designed to encourage consistent review of the course material.

40% Midterm Exams (20% each): Two 100-minute, closed-book written midterm exams will be held in class (9:00 am – 10:40 am) on Thursday, September 24, and Thursday, November 5. These exams primarily feature computational questions styled after SOA Exam FAM problems and lecture note exercises. No homework will be due during midterm weeks.

30% Final Exam: A comprehensive, two-hour, closed-book written examination will be held from 7:30 am to 9:30 am on Friday, December 11. Like the midterms, it will predominantly consist of computational questions similar to SOA Exam FAM problems and lecture note exercises.

(+4%) Bonus: Professional development incentives: Earn a 1% bonus by submitting your resume (first draft due Wednesday, August 26 at 9:00 pm; updated version due Sunday, August 30 at midnight). Additionally, earn 0.5% for each company presentation you attend (up to a maximum of 3% for six presentations). GIS officers will verify attendance.

A plus or minus grading system will be used in this course. Grades will approximately follow the standard scale:

A- [90,93)	A [93, 100]	
B- [80,83)	B [83, 87]	B+ [87,90)
C- [70,73)	C [73, 77]	C+ [77,80)
D- [60,63)	D [63, 67]	D+ [67,70)
F [0,60)		

Curving is at the discretion of the professor. All exams in this course are closed-book. Only calculators listed on Point 9 of the SOA exam rules and regulations/instructions (https://www.soa.org/Files/Edu/edu-rules-reg-instructions.pdf) are permitted.

Late Policy

All assignments are due on Tuesday's classes. No late homework will be accepted under any circumstances.

Grading Policy

It is my policy that appropriate evaluation of your academic performance is an integral part of your learning experience. In the absence of mistake, fraud, bad faith or incompetence, I will be the key decision-maker on the assignment of grades. For information on grade appeal, consult the Ball State website.

Academic Integrity/Plagiarism Policy

The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. Please review the University's Academic Integrity Policy.

For Ball State's policies on Academic Integrity, please see the Code of Student Rights and Responsibilities. In particular, the section on the Student Academic Ethics Policy.

Violations

Examples of academic integrity violations include but are not limited to:

- Sharing or allowing others to access your files, whether done with permission or not.
- Use or possession of a file created by someone else.
- Reusing work from another semester, course, or section.
- Fraudulent submission of work.
- Using unauthorized materials during Exams.
- Impersonating someone else or having them impersonate you.
- Making fraudulent or dishonest statements regarding your work.
- Soliciting others to complete work for you.
- Posting course files and resources on study or content sharing websites.
- The Plagiarism Tutorial from UNC Libraries (Links to an external site.) provides you with a great foundation in Academic Integrity.

Make-up Policy

If, for medical reasons, you are unable to take any exam in this course, you should inform the course instructor within 24 hours of the exam, and submit original documentation as soon as possible. Otherwise, a zero score will be awarded. Absence for other reasons will not be allowed, unless approval from the instructor is sought well in advance.

Attendance Policy

You are expected to attend every class session. If you miss a class, you are responsible for obtaining and reviewing any material covered during your absence.

Freedom of Expression

In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's Statement on Freedom of Expression, the resources on Ball State's Freedom of Expression webpage, and Ball State's Beneficence Pledge.

Ball State University Disability Services Statement

If you need course adaptations or accommodations because of a disability, please contact me as soon as possible. Ball State's Disability Services office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or dsd@bsu.edu.

Ball State University Diversity Statement

Ball State University aspires to be a university that attracts and retains a diverse faculty, staff, and student body. We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse as expressed in our Beneficence Pledgeand through university resources found at https://www.bsu.edu/campuslife/multicultural-center.

Canvas Accessibility Statement

Canvas provides a user experience that is easy, simple, and intuitive. Special attention has been paid to making Canvas screen-readable. The Rich Content Editor encourages users to create accessible content pages (i.e. text formatting is accomplished using styles). Canvas is designed to allow limited customization of colors and schemes to be accessible for all users. The National Federation of the Blind granted Canvas the Gold Level Web Certification in 2010.

Link to the Student Academic Ethics Policy

Student Academic Ethics Policy: here

Link to the Code of Student Rights and Responsibilities

Code of Student Rights and Responsibilities: here

Course Withdrawal Statement

The course withdrawal period ends Wednesday, October 28, 2026. Before this date, students can elect to receive a "W" for the course by completing and submitting the proper form. The instructor's permission is not required. For details, see this link as well as Degree Requirements and Time Limits in the current Undergraduate Catalog OR Withdrawal Procedures in the current graduate catalog.

Class Schedule

Week #	Dates	Plan	Tuesday	Thursday
Week 1	Aug. 24 – Aug. 28	Chapter 1		
Week 2	Aug. 31 – Sep. 4	Chapter 1		
Week 3	Sep. 7 – Sep. 11	Chapter 1	Assignment 1	Quiz 1
Week 4	Sep. 14 – Sep. 18	Chapter 1,2	Assignment 2	
Week 5	Sep. 21 – Sep. 25	Chapter 2, Q&A		Midterm 1
Week 6	Sep. 28 – Oct. 2	Chapter 2	Assignment 3	
Week 7	Oct. 5 – Oct. 9	Chapter 3	Assignment 4	Quiz 2
Week 8	Oct. 12 – Oct. 16	Chapter 3	♡	♢
Week 9	Oct. 19 – Oct. 23	Chapter 3,4	Assignment 5,6	Quiz 3
Week 10	Oct. 26 – Oct. 30	Chapter 4	Assignment 7	
Week 11	Nov. 2 – Nov. 6	Chapter 4, Q&A		Midterm 2
Week 12	Nov. 9 – Nov. 13	Chapter 4,5	Assignment 8	
Week 13	Nov. 16 – Nov. 20	Chapter 5	Assignment 9	Quiz 4
Week 14	Nov. 23 – Nov. 27	Chapter 5,6	Assignment 10	♣
Week 15	Nov. 30 – Dec. 4	Chapter 6	Assignment 11	
Week 16	Dec. 7 – Dec. 11	FINAL EXAM (Friday)		

♡ October 13: Fall Break — No class
♢ October 15: Instructor away — No class
♣ November 26: Thanksgiving Holiday — No class