STAT:4561
Statistics for Risk Modeling II
Course Syllabus
Spring 2023

University of Iowa

MWF, 14 SH
2:30 p.m. – 3:20 p.m.

Department of Statistics &
Actuarial Science

1   Contact Information

- **Instructor:** Professor Ambrose Lo

  ▷ *Office:* 368 SH

  ▷ *Phone:* (319) 335-1915

  ▷ *Email:* ambrose-lo@uiowa.edu
  (Note: Please include "STAT:4561" in your email subject. Questions about the course material, as far as possible, should be discussed during office hours.)

  ▷ *Personal homepage:* `https://sites.google.com/site/ambroseloyp`
  (Feel free to visit it from time to time for latest updates on my courses and study manuals!)

  ▷ *Office hours:*
Wednesday and Friday	:	3:30 p.m. – 4:30 p.m.
Thursday	:	2:30 p.m. – 3:30 p.m.

  (Students are free to drop by during these hours to discuss questions about the course material or concerns. I am also available by appointment if you are unable to attend my office hours. Unless otherwise announced, office hours are held in person.)

- **Grader:** Mr. Zhenhan Fang

  ▷ *Office:* 366 SH

  ▷ *Email:* zhenhan-fang@uiowa.edu

- **Departmental Executive Officer (Chair):** Professor Kung-Sik Chan

  ▷ *Office:* 241 SH

  ▷ *Email:* kung-sik-chan@uiowa.edu

2 Course Description

Prerequisite: C+ or above in STAT:4560 (Statistics for Risk Modeling I)

This course is a continuation of STAT:4560 you took in Fall 2022 and covers the material of the second half of the **Statistics for Risk Modeling (SRM) Exam** offered by the Society of Actuaries (SOA). Specifically, it covers the following three exam topics:

- Topic 3: Time Series Models (10-15% of SRM)

- Topic 4: Decision Trees (20-25% of SRM)

- Topic 5: Unsupervised Learning Techniques (10-15% of SRM)

For all of these analytic techniques, we will cover their conceptual foundations and practical implementations on real or simulated data by means of the R programming language to give you some hands-on data analysis experience. This is an important way to put the theory we learn in the course into practice.

3 University-Earned Credit Program

In Fall 2021, the SOA initiated the University-Earned Credit (UEC) program, which allows university students in selected Centers of Actuarial Excellence (CAE) to earn credit for SOA exams by attaining a required score on coursework effective from Fall 2022.

For universities in the US, the UEC pass mark is $\boxed{85\%}$.

The University of Iowa is an SOA-recognized university authorized to administer courses for UEC. The following table shows which SOA exams can be fulfilled by UEC and the corresponding UI course(s): (Exam P is not part of the UEC program.)

SOA Exam	UI Course(s)
FM (Financial Mathematics)	ACTS:3080
FAM (Fundamentals of Actuarial Mathematics)	ACTS:4130, ACTS:4150
ALTAM (Advanced Long-Term Actuarial Mathematics)	ACTS:4280
SRM (Statistics for Risk Modeling)	STAT:4560, STAT:4561

The important message is:

If you do well in each of STAT:4560 and STAT:4561, then you will be able to earn credit for Exam SRM *without actually taking the exam*.

Information for students in UEC programs can be found here:

https://www.soa.org/4a5b20/globalassets/assets/files/edu/edu-uec-program-candidate-info.pdf

Should you become eligible for the UEC, the SOA will reach out to you through the email address associated with your SOA account and provide the UEC Candidate Application link and instructions.

4 Textbook

The text of this course is

> *ACTEX Study Manual for SOA Exam SRM* (2022, 7th edition, 2nd printing), by Feng, R., Linders, D., **Lo, A. (yours truly)**, ACTEX Learning.

This study manual not only addresses all important topics required in the SRM exam syllabus, but also presents lots of intuition for you to understand the subject matter deeply, and a wide variety of illustrative examples and practice problems for exam preparation. In this course, we will cover the following chapters in the manual:

> Chapter 6: Fundamentals of Time Series Analysis
>
> Chapter 7: Time Series Forecasting
>
> Chapter 8: Decision Trees
>
> Chapter 9: Principal Components Analysis
>
> Chapter 10: Cluster Analysis

These chapters correspond to Topics 3-5 of the SRM syllabus listed above. During lectures, the instructor will provide a framework, cover the main ideas, point out subtleties, and go over representative examples with you. You should put down additional details, work out examples together with the instructor, and take supplementary notes to better understand concepts.

5 Grading System

Your course grade will be based on the following items and weights:

- **Attendance and Attitude:** $\pm\varepsilon\%$

  You may choose to attend or not to attend classes, but everyone needs to be aware that unexcused absences from classes can adversely affect your final grade. It is also impossible for absentees to get a copy of the course material they miss, inquire about announcements made in class, or seek out-of-class help from the instructor. Likewise, your participation, preparedness, and work ethic may affect your final grade (positively or negatively).

- **Weekly Quizzes: 30%**

  There will be a total of twelve 15-minute quizzes held on Fridays. These quizzes are intended to motivate you to study regularly (instead of cramming just before the Midterm and Final Exams!) and will consist of relatively straightforward questions. The two quizzes with the lowest scores will be dropped when it comes to computing the final grade. With this policy, missed quizzes due to illness cannot be made up under any circumstances.

- **Midterm Examination: 30%**

  There will be a 90-minute Midterm Examination to be held in the evening (6:30 p.m. – 8:00 p.m.) of **March 24, 2023 (Friday)**, testing Chapters 8, 9, and 10 of this course. It will consist of short-answer questions similar in style and difficulty to Exam SRM/PA problems and/or end-of-section/chapter problems in the study manual. You will therefore find that problems from released SOA sample/past exams and the study manual are useful in preparing for the Midterm Exam.

- **Final Examination: 40%**

  A two-hour cumulative Final Examination will take place in the week of May 8–12, 2023. Like the Midterm Exam, the Final Exam will comprise short-answer questions similar in style and difficulty to Exam SRM/PA problems and/or end-of-section/chapter problems in the study manual. The exact date and time will be announced by the Registrar in mid-February. Please do not plan your end-of-semester travel plans until the final exam schedule is made public. It is your responsibility to know the date, time, and place of the Final Exam.

Your UEC score will be based on the following weights:[i]

Weekly Quizzes	:	**20%**
Midterm Examination	:	**30%**
Final Examination	:	**50%**

All quizzes and exams in this course are closed-book. The SRM tables will be provided if needed, and you are not allowed to bring your own formula sheets (the same applies to the real SRM exam as well!). Only the six approved models of Texas Instruments calculators listed on `https://www.soa.org/education/exam-req/exam-day-info/edu-id-calculators/` are permitted.

A note on absence from exams. If, because of illness, you are unable to take any exams (not including quizzes) in this course as scheduled, you should inform the course instructor *within 24 hours* after the exam has ended and explain why you are medically unfit to take the exam on the scheduled date. Otherwise, a zero score will be awarded. Approval for absences for other reasons such as mandatory religious obligations, certain University activities, or unavoidable circumstances should be sought well in advance with documentation provided.

Grading scheme. Plus/minus grades will be given in this course. Here is an *approximate* guide:

A+	$[97, 100]$	A	$[93, 97)$	A-	$[90, 93)$
B+	$[87, 90)$	**B**	$[\mathbf{83}, \mathbf{87})$	B-	$[80, 83)$
C+	$[77, 80)$	C	$[73, 77)$	C-	$[70, 73)$
D+	$[67, 70)$	D	$[63, 67)$	D-	$[60, 63)$
F	$[0, 60)$				

These are not completely absolute scales and the instructor reserves the right to adjust the cutoffs, depending on the difficulty of the exams. Note that with this grading scheme you are not "graded on a curve," and so you are not competing with fellow students. Therefore, you are not penalized in any way for working together to better understand concepts and perform better in this course.

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[i]According to the UEC program requirements, 80% of the grading points for each UEC course must be based on proctored examinations, and the final exam must be cumulative and worth at least 50% of the grading points.

6 Tentative Teaching Schedule

The tentative schedule below will be updated as needed as the semester unfolds.

Teaching Week	Lecture	Date	Topic (Refer to SRM study manual)
1	—	January 16, 2023 (Mon)	(University Holiday)
	1	January 18, 2023 (Wed)	Introduction and course overview
	2	January 20, 2023 (Fri)	Chapter 8
2	3	January 23, 2023 (Mon)	Chapter 8
	4	January 25, 2023 (Wed)	Chapter 8
	5	January 27, 2023 (Fri)	Chapter 8, **Quiz 1**
3	6	January 30, 2023 (Mon)	Chapter 8
	7	February 1, 2023 (Wed)	Chapter 8
	8	February 3, 2023 (Fri)	Chapter 8, **Quiz 2**
4	9	February 6, 2023 (Mon)	Chapter 8
	10	February 8, 2023 (Wed)	Chapter 8
	11	February 10, 2023 (Fri)	Chapter 8, **Quiz 3**
5	12	February 13, 2023 (Mon)	Chapter 8
	13	February 15, 2023 (Wed)	Chapter 8
	14	February 17, 2023 (Fri)	Chapter 8, **Quiz 4**
6	15	February 20, 2023 (Mon)	Chapter 9
	16	February 22, 2023 (Wed)	Chapter 9
	17	February 24, 2023 (Fri)	Chapter 9, **Quiz 5**
7	18	February 27, 2023 (Mon)	Chapter 9
	19	March 1, 2023 (Wed)	Chapter 9
	20	March 3, 2023 (Fri)	Chapter 9, **Quiz 6**
8	21	March 6, 2023 (Mon)	Chapter 10
	22	March 8, 2023 (Wed)	Chapter 10
	23	March 10, 2023 (Fri)	Chapter 10, **Quiz 7**
—	—	March 13, 2023 (Mon)	
	—	March 15, 2023 (Wed)	(Spring Break—No class!)
	—	March 17, 2023 (Fri)	
9	24	March 20, 2023 (Mon)	Chapter 10
	25	March 22, 2023 (Wed)	Chapter 10
	—	March 24, 2023 (Fri)	**(No class. Midterm in evening!)**
10	26	March 27, 2023 (Mon)	Chapter 6
	27	March 29, 2023 (Wed)	Chapter 6
	28	March 31, 2023 (Fri)	Chapter 6, **Quiz 8**
11	29	April 3, 2023 (Mon)	Chapter 6
	30	April 5, 2023 (Wed)	Chapter 6
	31	April 7, 2023 (Fri)	Chapter 6, **Quiz 9**
12	32	April 10, 2023 (Mon)	Chapter 6
	33	April 12, 2023 (Wed)	Chapter 6
	34	April 14, 2023 (Fri)	Chapter 6, **Quiz 10**

13	35	April 17, 2023 (Mon)[ii]	Chapter 7
	36	April 19, 2023 (Wed)	Chapter 7
	37	April 21, 2023 (Fri)	Chapter 7, **Quiz 11**
14	38	April 24, 2023 (Mon)	Chapter 7
	39	April 26, 2023 (Wed)	Chapter 7
	40	April 28, 2023 (Fri)	Chapter 7, **Quiz 12**
15	41	May 1, 2023 (Mon)	Chapter 7
	42	May 3, 2023 (Wed)	Chapter 7
	43	May 5, 2023 (Fri)	Chapter 7 and Final Review
—	—	May 8–12, 2023	**Final Examination**

More about the Instructor ("Shameless" Self-introduction)

Professor Ambrose Lo, PhD, FSA, CERA, is currently Associate Professor of Actuarial Science with tenure at the Department of Statistics and Actuarial Science, The University of Iowa. He earned his B.S. in Actuarial Science (first class honors) and PhD in Actuarial Science from The University of Hong Kong in 2010 and 2014, respectively, and attained his Fellowship of the Society of Actuaries (FSA) in 2013. He joined The University of Iowa as Assistant Professor of Actuarial Science in August 2014, and was tenured and promoted to Associate Professor in July 2019. His research interests lie in dependence structures, quantitative risk management as well as optimal (re)insurance. His research papers have been published in top-tier actuarial journals, such as *ASTIN Bulletin: The Journal of the International Actuarial Association*, *Insurance: Mathematics and Economics*, and *Scandinavian Actuarial Journal*.

Besides dedicating himself to actuarial research, Ambrose attaches equal importance to teaching and education, through which he nurtures the next generation of actuaries and serves the actuarial profession. He has taught courses on financial derivatives, mathematical finance, life contingencies, and statistics for risk modeling. In addition to coauthoring the *ACTEX Study Manual for SOA Exam SRM*, he is also the sole author of the *ACTEX Study Manual for CAS Exam MAS-I*, *ACTEX Study Manual for SOA Exam PA*, and the textbook *Derivative Pricing: A Problem-Based Primer* (2018) published by Chapman & Hall/CRC Press, and, most recently, his *Study Manual for Exam FAM-L*. Although helping students pass actuarial exams is an important goal of his teaching, inculcating students with a thorough understanding of the subject and concrete problem-solving skills is always his top priority. In recognition of his exemplary teaching, Ambrose has received a number of awards and honors ever since he was a graduate student, including the 2012 Excellent Teaching Assistant Award from the Faculty of Science, The University of Hong Kong, public recognition in the *Daily Iowan* as a faculty member "making a positive difference in students' lives during their time at The University of Iowa" for seven years in a row (2016 to 2022), and the 2019-2020 Collegiate Teaching Award from the College of Liberal Arts and Sciences, The University of Iowa.

[ii]Drop date for undergraduate students

Additional Information from The College of Liberal Arts and Sciences

Course ICON site: To access the course site, log into [Iowa Courses Online (ICON)](https://icon.uiowa.edu/index.shtml) https://icon.uiowa.edu/index.shtml using your Hawk ID and password.

Course Home
For Undergraduate Courses: The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the add and drop deadlines, the "second-grade only" option (SGO), academic misconduct policies, and other undergraduate policies and procedures. Other UI colleges may have different policies.
For Graduate Courses: The College of Liberal Arts and Sciences (CLAS) is the home of this course, and CLAS governs the policies and procedures for its courses. Graduate students, however, must adhere to the [academic deadlines set by the Graduate College](#).

Academic Honesty and Misconduct
All students in CLAS courses are expected to abide by the [CLAS Code of Academic Honesty](#). Undergraduate academic misconduct must be reported by instructors to CLAS according to [these procedures](#). Graduate academic misconduct must be reported to the Graduate College according to Section F of the [Graduate College Manual](#).

Student Complaints
Students with a complaint about a grade or a related matter should first discuss the situation with the instructor and/or the course supervisor (if applicable), and finally with the Director or Chair of the school, department, or program offering the course.

Undergraduate students should contact [CLAS Undergraduate Programs](#) for support when the matter is not resolved at the previous level. Graduate students should contact the CLAS [Associate Dean for Graduate Education and Outreach and Engagement](#) when additional support is needed.

Communication: UI Email
Students are responsible for all official correspondences sent to their UI email address (uiowa.edu) and must use this address for any communication with instructors or staff in the UI community.

University Policies
[Accommodations for Students with Disabilities](#)
[Basic Needs and Support for Students](#)
[Classroom Expectations](#)
[Exam Make-up Owing to Absence](#)
[Free Speech and Expression](#)
[Mental Health](#)
[Military Service Obligations](#)
[Non-discrimination](#)
[Religious Holy Days](#)
[Sexual Harassment/Misconduct and Supportive Measures](#)
[Sharing of Class Recordings](#)