ACTS 4304

SYLLABUS

FALL 2020

Short Term Actuarial Mathematics I

BRIEF DESCRIPTION: The purpose of this class is to develop the student's knowledge of the severity, frequency and aggregate risk models and the application of those models to insurance and other financial risks. Property/Casualty Insurance coverages, health insurance, loss reserving, ratemaking, coverage modifications and risk measures will be discussed. This class covers parts of SOA Exam STAM and CAS Exams MAS I, MAS II and 5. Prerequisite: <u>STAT 4352</u> with the grade C- or higher.

The class meets on T/TH 11:30 am - 12:45 pm in room SCI 1.210 (new Sciences Building).

INSTRUCTOR: Natalia A. Humphreys

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Office Hours: By appointment (In-person, BlackBoard Collaborate, MS Teams, or WebEx).

INSTRUCTIONAL MODE: <u>Traditional Classroom/Laboratory Course</u> (i.e., face-to-face) – The instructor and students are present in the classroom/laboratory each class meeting according to the class schedule.

COURSE PLATFORM: This course will be delivered in a classroom on UT Dallas Campus. Lectures will be posted on e-Learning. BlackBoard Collaborate might be used for off-Campus delivery of the material (e.g. mandated change of modality due to a change in the environment).

EXPECTATIONS: All occupants of rooms used for classroom and laboratory instruction must wear face coverings and maintain 6-foot social distancing at all times. Other university requirements may be found at the Academic Continuity page of the <u>UT Dallas COVID-19 web</u> <u>page</u>.

ASYNCHRONOOUS LEARNING GUIDELINES: All courses, regardless of modality, will have **asynchronous** (i.e., not in real time) access to the material presented in class. Should a student select asychronous instruction, please review the <u>guidelines</u>. This webpage will help you understand the difference between the 'online' and 'asynchronous' methods of instructions and prevent you from using these two terms interchangeably.

COVID-19 GUIDELINES AND RESOURCES

The information contained in the following link lists the University's COVID-19 resources for students and instructors of record.

Please see http://go.utdallas.edu/syllabus-policies.

CLASSROOM CONDUCT REQUIREMENTS RELATED TO COVID-19

UT Dallas requires that all students must wear a face covering that covers the nose and mouth in all university buildings and classrooms. To help protect the health and safety of students, instructors, and the University community, students who choose not to wear a face covering may not attend class in person but may attend a course remotely. Anyone attending class in person without a face covering will be asked to put one on or leave. Instructors may end the class if anyone present refuses to appropriately wear a face covering for the duration of class. Students should also be sure they are at least six feet away from their fellow students and faculty, and seated in a seat that is designated to ensure that distance. Students who either refuse to wear face coverings appropriately or to adhere to other social distancing protocols may face disciplinary action for Student Code of Conduct violations. Students who are unable to comply with the university policies including wearing a face covering should consult the Comets United webpage for further instructions.

Students who have tested positive for COVID-19 or may have been exposed should not attend class in person and should instead follow required disclosure notifications as posted on the university's website (see "What should I do if I become sick?" webpage)

LEARNING OUTCOMES:

At the end of the course students will be able to perform the tasks listed below.

- A. Severity Models
 - 1. Calculate the basic distributional quantities:
 - a) Moments
 - b) Percentiles
 - c) Generating functions
 - 2. Describe how changes in parameters affect the distribution.
 - 3. Recognize classes of distributions and their relationships.
 - 4. Apply the following techniques for creating new families of distributions:
 - a. Multiplication by a constant
 - b. Raising to a power
 - c. Exponentiation,
 - d. Mixing
 - 5. Identify the applications in which each distribution is used and reasons why.
 - 6. Apply the distribution to an application, given the parameters.

- 7. Calculate various measures of tail weight and interpret the results to compare the tail weights.
- 8. Identify and describe two extreme value distributions.
- B. Frequency Models for the Poisson, Mixed Poisson, Binomial, Negative Binomial, Geometric distribution and mixtures thereof:
 - 1. Describe how changes in parameters affect the distribution,
 - 2. Calculate moments,
 - 3. Identify the applications for which each distribution is used and reasons why,
 - 4. Apply the distribution to an application given the parameters.
 - 5. Apply the zero-truncated or zero-modified distribution to an application given the parameters.
- C. Aggregate Models
 - 1. Compute relevant parameters and statistics for collective risk models.
 - 2. Evaluate compound models for aggregate claims.
 - 3. Compute aggregate claims distributions.
- D. For severity, frequency and aggregate models
 - 1. Evaluate the impacts of coverage modifications:
 - a) Deductibles
 - b) Limits
 - c) Coinsurance
 - 2. Calculate Loss Elimination Ratios.
 - 3. Evaluate effects of inflation on losses.
- E. Risk Measures: Calculate VaR, and TVaR and explain their use and limitations.
- F. Insurance and Reinsurance Coverages
 - 1. Describe different types of short-term insurance coverage including auto, homeowners, liability, health, disability, and dental.
 - 2. Describe the types of policy limits and coverage modifications for short-term insurance.
 - 3. Describe the operation of basic forms of proportional and excess of loss reinsurance.
 - 4. Derive the distribution of claim amounts paid by the insurer and reinsurer under various forms of reinsurance.
- G. Pricing and Reserving for Short-Term Insurance Coverages
 - 1. Explain the role of rating factors and exposure.
 - 2. Describe the different forms of experience rating.
 - 3. Describe and apply techniques for estimating unpaid losses from a run-off triangle, using the following methods:

- a) Chain ladder
- b) Average cost per claim
- c) Bornhuetter Ferguson
- 4. Describe the underlying statistical models for the methods in 3.
- 5. Calculate premiums using the pure premium and loss ratio methods.

TEXTBOOK (required): ASM Study Manual for Exam STAM, recent addition, Abraham Weishaus.

ADDITIONAL TEXTS (not required, but useful):

- 1. <u>Probability and Statistics for Actuaries</u> (Preliminary Edition), 2020, Natalia Humphreys and Yuly Koshevnik.
- 2. Loss Models: From Data to Decisions, (Fourth Edition), 2012, Klugman, S.A., Panjer, H.H. and Willmot, G.E.
- 3. Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance, (Fouth Edition), 2015, Robert L. Brown, W. Scott Lennox
- 4. Individual Health Insurance (Second Edition), 2015, by Bluhm and Leida

Topic	Topic Name	Topic	Topic Name
Number		Number	_
1	Parametric Distributions	11	Loss Elimination Ratio
2	Mixtures and Splices	12	Increased Limits Factors and
			Increased Deductible Relativities
3	Property/Casualty Insurance	13	Reinsurance
	Coverages		
4	Health Insurance	14	Risk Measures and Tail Weight
5	Loss Reserving: Basic Methods	15	Other Topics in Severity Coverage
			Modifications
6	Loss Reserving: Other Methods	16	Bonuses
7	Ratemaking: Preliminary Calculations	17	Discrete Distributions
8	Ratemaking: Rate Changes and	18	Poisson/Gamma
	Individual Risk Rating Plans		
9	Policy Limits	19	Frequency – Exposure and Coverage
			Modifications
10	Deductibles	20	Aggregate Loss Models: Compound
			Variance

MATERIAL COVERED:

TABLES: http://www.soa.org/files/pdf/edu-2009-fall-exam-c-table.pdf

Exam STAM information:

https://www.soa.org/Education/Exam-Req/edu-exam-stam-detail.aspx

98-100	A+
94-97	А
90-93	A-
85-89	B+
80-84	В
75-79	B-
70-74	C+
65-69	С
60-64	C-
55-59	D+
50-54	D
45-49	D-
0-44	F

GRADING: Your grade will be based on your participation, homework, two midterms and a final exam. It will be assigned based on the following grade scale and weights:

DATES: Homework – weekly or biweekly;

Midterm I – Tuesday, September 22, 2020, 11:30 am - 12:45 pm, SCI 1.210, closed-book exam;

Midterm II – Thursday, November 5, 2020, 11:30 am - 12:45 pm, SCI 1.210, closed-book exam;

Final – Tuesday, December 8, 2020, 11:00 am - 1:45 pm, online, closed-book exam.

WEIGHTS: Participation: 5%, Homework: 15%, Midterms: 25% each, Final: 30%.

CLASS CITIZENSHIP: Assignments should be submitted on **e-Learning** by due date specified in class **before the start** of the class period. Only the grades for the assignments correctly submitted by the due date and time to the e-Learning system and downloaded by the grader from the e-Learning system will be graded and recorded. Late assignments or assignments sent to the instructor or grader via e-mail will not be accepted for **any** reason. If you have a scheduled absence for an official UTD function or obligation, you must upload your paper in **before** the due date.

There will be **no make-up exams** unless accompanied by a note from a doctor, religious or otherwise documented official reason pertained to the University business. Undocumented cases will not be honored.

ONLINE EXAM BEHAVIOR:

Should the State and the University mandate the face-to-face modality classes to change to online testing environment, the **closed-book exam** requirement will remain in place. The following behaviors during the online test are **strictly prohibited**:

- 1. Use of any class notes or texts;
- 2. Use of any website;
- 3. Any cell phone use;
- 4. Any communication with another student or adult regarding any portion of the exam material;
- 5. Transmission of the exam content of any kind (e.g. electronic, verbal, digital).

The following behaviors are required:

- 1. Stop writing at the designated time of the end of the exam.
- **2.** Use the allotted time to scan and submit the exam in the PDF form on the eLearning before the indicated deadline.

IMPORTANT NOTE REGARDING ONLINE EXAM SUBMISSION: It is the student's responsibility to upload the PDF of the exam document **on time**. Only the grades for the exams correctly submitted by the deadline to the e-Learning system and downloaded by the grader from the e-Learning system will be graded and recorded. Late exams or exams sent to the instructor via e-mail will not be accepted for **any** reason.

PROCTORING OF THE ONLINE EXAM:

The Instructor reserves the right to request designation of a **responsible adult** (preferably a parent) who will commit to **proctor** the online exam for 1hr 15 min for two midterms and 2hr 45 min for the Final. A reliable **e-mail** will need to be provided to the Instructor and a commitment to communicate with the Instructor, as well as willingness to cooperate with the University regarding student's testing should be shown. The proctor will have to electronically sign and confirm that after they proctored the student, (s)he indeed fulfilled all the requirements outlined in the section on online exam behavior.

POSTING COURSE MATERIAL: It is **strictly prohibited** to upload, post and/or distribute in any form or fashion ANY course material provided to students in class and via e-Learning. Violation of this policy will constitute academic dishonesty, violation of privacy and copyright infringement and will result in immediate report to the UTD Office of the Academic Affairs.

CALCULATORS: In order to simulate an actuarial exam conditions, an SOA approved exam calculator is recommended: the battery or solar–powered Texas Instruments BA–35 model calculator, the BA II Plus*, the BA II Plus Professional*, the TI–30Xa or TI–30X II* (IIS solar or IIB battery), or TI-30X MultiView (XS Solar or XB Battery).

For additional information please see:

http://www.soa.org/education/exam-req/exam-day-info/edu-calculators.aspx

USE OF CELL PHONES or OTHER ELECTRONIC DEVISES: Unless there is a true emergency, any use of cell phones or other electronic devises unrelated to the course during the class period is **strictly prohibited**. Violators will be asked to stop using the devise immediately. Repeated violations will be reflected in the student's grade.

COMET CREED

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

ACADEMIC SUPPORT RESOURCES:

The information contained in the following link lists the University's academic support resources for all students.

Please see http://go.utdallas.edu/academic-support-resources.

UT DALLAS SYLLABUS POLICIES and PROCEDURES

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

Please note: The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.