ACTS 4304 SYLLABUS FALL 2022

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: STAT 4352 with the grade C- or higher.

The class meets on T/TH 11:30 am - 12:45 pm in room FN 2.202 (Founders North).

INSTRUCTOR: Natalia A. Humphreys

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

INSTRUCTIONAL MODE: Traditional Classroom/Laboratory Course (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. Some material will be posted on e-Learning.

CLASSROOM SAFETY and COVID-19

To help preserve the University's in-person learning environment, UT Dallas recommends the following:

Adhere to the University's CDC Updated Guidelines issued on July 30, 2021. All Comets are strongly encouraged to wear face coverings indoors regardless of vaccination status. Please note this represents a change in the campus guidance issued on May 20, 2021.

ACCOMMODATIONS FOR STUDENTS WHO MUST ISOLATE OR QUARANTINE DUE TO COVID-19

To keep the UT Dallas community as safe as possible, the University requires students who test positive for COVID-19 or who are close contacts as determined by the campus contact tracing program to isolate or quarantine as applicable. Faculty will be notified by the Dean of Students'

Office if a student in their class has been required to isolate (positive case) or quarantine (exposed).

VERIFYING COVID-19 ISOLATIONS OR QUARANTINES

Students need to self-report COVID-19 positive results or exposures via an online form so that university campus tracers can verify, record, and take necessary campus precautions. When faculty are notified by students rather than by the Dean of Students' Office that the students are isolating or quarantining, the faculty should remind students to self-report via the form; students should not attend class until cleared by campus tracers.

Vaccinations are widely available, free and not billed to health insurance. The vaccine will help protect against the transmission of the virus to others and reduce serious symptoms in those who are vaccinated. You are encouraged to get a COVID-19 vaccine and register your vaccination status through the voluntary vaccine report form.

Proactive Community Testing remains an important part of the university's efforts to protect our community. Tests are fast and free. Please check the Comets United webpage for additional information.

Student Safety remains an important part of the UT Dallas' efforts to protect our community. All students will adhere to the Comet Commitment. Unvaccinated Comets will be expected to complete the mandatory Required Daily Health Screening. Those students who do not comply will be referred to the Office of Community Standards and Conduct for disciplinary action under the Student Code of Conduct – UTSP5003. All students are encouraged to read the Recommendations for Students Returning to Campus issued on August 2, 2021.

Visit Comets United webpage to obtain the latest information on the University's guidance and resources for campus health and safety.

FAQ: check out the FAQs and reach out to your instructor or academic advisor if answers are not included

Student Resources: a variety of resources are available to help students to obtain counseling, health care, and academic support.

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. Probability and Statistics for Actuaries (First 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

MATERIAL COVERED:

Topic Number	Topic Name		Topic Number	Topic Name
1	Parametric Distributions		**11**	Loss Elimination Ratio
2	Mixtures and Splices		**12**	Increased Limits Factors and Increased Deductible Relativities
3	Property/Casualty Insurance Coverages		**13**	Reinsurance
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 Individual Risk Rating Plans		**18**	Poisson/Gamma
9	Policy Limits		**19**	Frequency – Exposure and Coverage Modifications
10	Deductibles		**20**	Aggregate Loss Models: Compound Variance

TABLES:

https://www.soa.org/globalassets/assets/Files/Edu/2019/2019-02-exam-stam-tables.pdf

Exam STAM information:

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

98-100	A+
94-97	A
90-93	A-
85-89	B+
80-84	B
75-79	B-
70-74	C+
65-69	C
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 – Thursday, September 22, 2022, 11:30 am - 12:45 pm, FN 2.202, closed-book exam;

Midterm II – Thursday, November 3, 2022, 11:30 am - 12:45 pm, FN 2.202, closed-book exam;

Final –Tuesday, December 13, 2022, 11:00 am - 1:45 pm, FN 2.202, closed-book exam.

WEIGHTS: Participation in class and the Friday Actuarial Events: 8%, Homework: 15%, Midterms: 25% each, Final: 27%.

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.

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.