

**M339J (unique: 52920)**  
**Probability Models with Actuarial Applications**  
Spring 2020  
University of Texas at Austin  
Instructor: Milica Čudina

## First-Day Information Sheet

Welcome to M339J! Here is some information and some ground rules. I will stick to these rules, and I assume you will, too. Read carefully, and let me know as soon as possible if there is anything unclear.

Due to the COVID-19 outbreak, we have to change certain stipulations in this document. Most notably, the assessment design, the grading scheme, and the calculations for the final score have to be altered. All the changes are going to appear in blue. Please, make sure that you familiarize yourselves with them. Thank you!

**Treat this document like a contract.**

### Technicalities

*Lectures:* MWF 12:00noon-12:50pm at PMA (RLM) 5.116

We will have to be meeting virtually via Zoom. You have a link to Zoom in Canvas on the left-hand side of the screen. You will be receiving an invitation from your instructor by email.

*Office Hours:*

Office hours and individual appointments will be held using Zoom. Your dedicated times for your section are Wednesdays 10am-10:50am and Fridays 10am-10:50am. You will receive the necessary invitation to the recurring Zoom meeting by email.

*My e-mail:* mcudina@math.utexas.edu

*Phone numbers:* (512)232-6186 (the instructor's office)  
(512)471-7711 (Department of Mathematics - main office)

Both of the above phone numbers will not be available. Please, contact me by email if you need to.

*REQUIRED text:* “Loss Models: From data to decisions (4<sup>th</sup> Ed)” by Stuart A. Klugman, Harry H. Panjer, Gordon E. Willmot

## About the Course

### A few (serious) introductory remarks

- ◇ *Canvas.* We will be using the *Canvas* course management system to post grades. Do **not** rely on any total grades that *Canvas* might display. Always calculate your own cumulative scores using the guidelines of this syllabus.
- ◇ *Course description.* This course is intended to provide the **mathematical foundations** necessary to prepare for a portion of the SOA exam STAM. The remainder of the STAM curriculum is exhibited in course M349P = M389P (also offered by the Department of Mathematics).  
The material exhibited includes: severity- and frequency-of-loss models, compound models, empirical estimation, maximum-likelihood estimation.

**Due to reduced instruction time, some of the originally scheduled topics will be omitted. Please, consult the table on the next-to-last page of this document and the course website for the topics that will still be covered.**

- ◇ *Learning objectives.*
  - \* The student will develop understanding the stipulations of common insurance contracts useful in every-day life, including coverage modifications (deductibles, limits, coinsurance).
  - \* The student will build up the vocabulary and the techniques indispensable in the workplace for every mathematics major focusing on actuarial science.
  - \* The student will learn to build probabilistic models based on real-life problems with particular focus on short term insurance.
  - \* The student will become competent in choosing appropriate probabilistic models for the applications mentioned above including, but not limited to, parameter value choice.
  - \* The student will become versed in calculating the expected aggregate payments in the presence of coverage modifications for a variety of model choices as the first step towards policy pricing.
- ◇ *Prerequisites.* M362K and M358K (or M378K) with a grade of C- or better. Informally speaking, a thorough understanding of probability and basic statistics will be needed to advance through the varied and very dense material.
- ◇ *Drop dates.* The last drop date for this class is the one announced on the academic calendar of the University of Texas at Austin (see <http://registrar.utexas.edu/calendars/>). This term it is April 6th, 2020.

- **A few words about the assignments and grading**

**Homework.** This is important information: I will not accept homework that does not conform to the guidelines that follow!

Homework will be assigned in class and/or available on the course website. The homework will **not** be posted on *Canvas*. You will hand in your homework via online submission of **typed-up** solutions through Canvas. Your solutions need to be in order and you should number the pages.

The lowest two homework scores will be dropped. The homework assignments and the due dates will be announced as the term progresses.

Having read and understood this updated *First-Day Handout* in its entirety will count as another homework assignment. To get the credit, read this entire document with understanding by Tuesday, March 31st. I will be sending you a Google form through which you will be able to verify that you have read the *First-Day Handout*. The Google form will be due at 11:59pm on Tuesday, March 31st. Not handing in this assignment does **not** exempt you from abiding by this updated *First-Day Handout*.

**Quizzes.** You should **not** expect to have quizzes and in-class assignments to be completed and handed in during our class meetings. Instead, you will have various warm-up and review worksheets to complete at home. They will all be gathered under the category of *Quizzes* when the final scores are calculated. Please, be vigilant in class to learn about how your quizzes are supposed to be submitted and when they are due! You will hand in your quizzes via online submission of **typed-up** solutions through Canvas. Again, your solutions need to be in order and you should number the pages.

The lowest two quiz scores will be dropped. The homework assignments and the due dates will be announced as the term progresses.

The quizzes and the homework will continue to be posted on the course website and your work will continue to be uploadable through Canvas.

**In-Term Exams.** These exams will be administered during regular lecture time and will take place in the same classroom. Each exam will focus mostly on the material covered since the previous exam, but it is quite possible that some of the problems will refer to earlier material. Anybody whose average score in **all three in-term** exams is above 90 will get an automatic A and will not be required to take the final exam. To clarify the last point: If you want to be exempt from the final exam, you **must** take all three in-term exams, and the average score of **all three** of them must be above 90%.

The in-term exams will continue to take place, but will have to be done remotely. You will receive specific instructions for each exam. I will keep a designated 50-minute time slot at our regular class time for the purpose of scheduling, but you will receive a 48-hour window during which you will be able to complete the 50-minute exam when you can and submit your solutions in Canvas. We will practice this feature through an extra-credit assignment before the actual exam(s).

***The Final Exam.*** The final exam is going to be comprehensive. That means that any material covered in class or assigned as reading can (and probably will) appear. According to the registrar's office, our final exam will take place on **Wednesday, May 13<sup>th</sup> (9:00am-12:00noon)**. You should be rechecking this information as the term progresses.

For more information on the **uniform** UT final-examination policy, please consult <http://catalog.utexas.edu/general-information/academic-policies-and-procedures/examinations/>

**Due to extenuating circumstances, there will be no comprehensive final exam.**

A calculator of any kind *should* be brought to the exams; the following are allowed at CAS/SoA exams: Texas Instruments BA-35, BA II Plus, BA II Plus Professional, TI-30Xa, TI-30X II or TI-30XS Multiview.

These are the things you *must not* to bring to the exams:

- i. books, notes, manuals, anything containing solved problems;
- ii. your own STAM Exam tables (you will get a new copy to use during the exam).

**Since you will not be in our regular classroom setting, it is of utmost importance to preserve the integrity of your exam-taking. You are still not allowed to use any written notes, manuals, or any sources containing solved problems. Moreover, it is imperative that you do not communicate with anyone about the exam content prior to the due time of the exam. Finally, consulting the internet it out of bounds.**

Your scores in all of these will be incorporated into your final grade according to the following scheme:

*Homework (total after the two lowest scores are dropped): 10%*

*Quizzes (total after the two lowest scores are dropped): 10%*

*In-term exams (total): 50%*

*The final exam: 30%*

**Since there will be no comprehensive final exam, your final score will be calculated using the following weights:**

***Homework (total with three lowest scores dropped): 25%***

***Quizzes (total with three lowest scores dropped): 25%***

***In-term exams (total): 50%***

In the end, let me caution you that there will be **no make-up in-term exams**, unless you provide me with a written proof that your absence was “legitimate” (e.g., a note from your doctor or your lawyer). In that case you can expect **one and ONLY one** in-term grade dropped and your in-term average calculated based on the remaining two scores. If you miss an in-term exam, you are immediately out of contention for the automatic A based on the in-term average.

**I trust that the way we re-organize the course will be conducive to no late assignment submissions or missed in-term exams. Having said this, if you do experience any technical difficulties in timely assignment submission, let me know and we’ll work to find a solution. As always, and especially in these extreme circumstances, if there are non-academic issues you are facing, feel free to reach out to your instructor.**

The final letter grades will be assigned relative to your numerical score obtained from the above scheme in the following way

*A* : 90 – 100

*B* : 80 – 90

*C* : 65 – 80

*D* : 55 – 65

Your scores are non-negotiable.

I do not “curve” the grades!!!!

- **A few bits of friendly advice**

- ◇ *Please, come prepared to every class meeting* – review your notes, pay attention to the current material, and bring the necessary supplies (most importantly – the calculator of your choosing). **Meaningful** class participation will earn you extra credit **at the sole discretion of your instructor.**
- ◇ *Discuss the course with your colleagues* - In order to be able to participate in class, you first need to build up a vocabulary - and there will be a lot of new vocabulary in the beginning. Who better to practice the new concepts with than your classmates who are in the same situation? I suggest that you try to work on homework assignments in pairs and small groups. Of course, you will be required to write up your own final version (and I urge you to do so - that is the only way you will be able to tell what your individual knowledge is, as opposed to the collective knowledge of your study-group).

**Due to social distancing, it is impossible for you to have your regular study-group meetings. Please, take advantage of the "Discussions" feature in Canvas. Moreover, I have set up Piazza for this course. Let me know as soon as possible if you want to be added to it.**

- ◇ *Don't try to cheat* - This is an unpleasant topic, but unfortunately a necessary one! One is often tempted to stretch the boundaries of mere discussion/collaboration with a fellow student into the territory of pure and simple cheating. In short, everything that you present as your own work (especially the work that is supposed to be graded!) should, in fact, be your own work, and not something copied from an external source. In case that a student is caught in violation of the principles of academic honesty enforced at this university, he/she is immediately reported to the higher authorities and assigned a failing grade in this course. You are expected to have read and understood the current issue of General Information Catalog, published by the Registrars Office, for information about procedures and about what constitutes scholastic dishonesty. Please visit: [http://deanofstudents.utexas.edu/sjs/acint\\_student.php](http://deanofstudents.utexas.edu/sjs/acint_student.php).

**Some might find the virtual-assessment environment tempting. Remember that you are Longhorns!**

- ◇ *Get familiar with the required text* - This is advice that everybody gives, but nobody takes, but do try to take a peak into the material we are going to cover in advance. It will make your journey less stressful, and will save you time and energy in the long run.
- ◇ *Have realistic impressions of your performance* - The grading scheme for this course is described above and I do not intend to stray from it. You are solely responsible for keeping a tally of your scores throughout the semester and entering your results in the grading formula above to avoid any surprises at the end of the semester.
- ◇ *On email and office hours* - Email should be used for brief messages about the organization of and current goings on in the course. As a rule, you should first consult the first-day handout to see if your question is answered here. If there is still any ambiguity, contact the instructor. Your instructor is handling a great number of email messages. You should not expect to have your particular email answered in less than 48 hours. You should not be asking mathematical questions via email, since they are incredibly difficult to answer through a typed message. To get an answer to this type of questions, you should come to office hours and ask in person. When coming to office hours, you should be able to present the mathematical question you have, the route(s) you took in attempting to solve the problem and the obstacles you encountered.

**We will have office hours over Zoom at the times listed above. It would be good for you to again come prepared with questions and use our online time efficiently. If you have a math question, you can take a photo/scan of your work and email it to me as an attachment. Then, I can either respond to you directly or in office hours with your question already available for display. Unfortunately, this mode of communication will mean that I will probably have even more email to respond to. Please, be patient.**

- ◇ *UT mandated notes*

“Counselling and Mental Health Center Student Services Bldg (SSB), 5th Floor Hours:  
M–F 8am–5pm

Phone: 512 471 3515

<http://www.cmhc.utexas.edu>”

“The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471- 6259, 471-6441 TTY or or <http://diversity.utexas.edu/disability/>.”

“Religious holy days sometimes conflict with class and examination schedules. Sections 51.911 and 51.925 of the Texas Education Code relate to absences by students and instructors for observance of religious holy days.

Section 51.911 states that a student who misses an examination, work assignment, or other project due to the observance of a religious holy day must be given an opportunity to

complete the work missed within a reasonable time after the absence, provided that he or she has properly notified each instructor.

It is the policy of The University of Texas at Austin that the student must notify each instructor at least fourteen days prior to the classes scheduled on dates he or she will be absent to observe a religious holy day. For religious holidays that fall within the first two weeks of the semester, the notice should be given on the first day of the semester. The student may not be penalized for these excused absences but the instructor may appropriately respond if the student fails to complete satisfactorily the missed assignment or examination within a reasonable time after the excused absence.”

“This course carries the Quantitative Reasoning flag. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.”

“ Recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, <http://www.utexas.edu/safety/>:

- Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- Link to information regarding emergency evacuation routes and emergency procedures can be found at: <http://www.utexas.edu/emergency/>
- Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class.
- In the event of an evacuation, follow the instruction of faculty or class instructors.
- Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
- Behavior Concerns Advice Line (BCAL): 512-232-5050”

<b>This syllabus is subject to modification. Any changes will be announced in class.</b>
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• A TENTATIVE schedule

WEEK 1	Jan 22nd Jan 24th	Orientation. Reading Assignments. Modelling. Random variables.
WEEK 2	Jan 27th Jan 29th Jan 31st	More on sections 2.1-2. Moments. Modifications.
WEEK 3	Feb 3rd Feb 5th Feb 7th	More modifications. Percentiles. Generating functions. Heavy tails. Risk measures.
WEEK 4	Feb 10th Feb 12th Feb 14th	Parametric distributions. Scale distributions. $k$ -point mixtures.
WEEK 5	Feb 17th Feb 19th Feb 21st	Transformations of distributions. Mixing distributions. <b>In-Term Exam I</b>
WEEK 6	Feb 24th Feb 26th Feb 28th	Mixing distributions[cont'd]. Splicing. Franchise deductibles. Loss elimination ratio.
WEEK 7	Mar 2nd Mar 4th Mar 6th	Coinsurance, deductibles, limits. Discrete distributions. The Poisson distribution.
WEEK 8	Mar 9th Mar 11th Mar 13th	The negative binomial distribution. The Poisson-gamma mixture. The binomial distribution.
WEEK 9	Mar 23rd Mar 25th Mar 27th	<b>No class due to COVID-19.</b> <b>No class due to COVID-19.</b> <b>No class due to COVID-19.</b>
WEEK 10	Mar 30th Apr 1st Apr 3rd	<b>Getting used to Zoom.</b> <b>Problem-solving session: Mixing dist'ns and discrete dist'ns.</b> <b>Problem-solving session: Policy modifications.</b>
WEEK 11	Apr 6th Apr 8th Apr 10th	<b>In-Term Exam II</b> <b>The compound model for aggregate claims.</b> <b>Many compound Poissons.</b>
WEEK 12	Apr 13th Apr 15th Apr 17th	<b>The recursive formula for the distribution of aggregate losses.</b> <b>Aggregate payments.</b> <b>The impact of individual policy modifications.</b>
WEEK 13	Apr 20th Apr 22nd Apr 24th	<b>Maximum Likelihood Estimation (individual, unmodified data).</b> <b>Maximum Likelihood Estimation (grouped data).</b> <b>Maximum Likelihood Estimation (truncated data).</b>
WEEK 14	Apr 27th Apr 29th May 1st	<b>MLE: Bernoulli. Poisson.</b> <b>MLE: Negative binomial. Binomial.</b> <b>Variance and Interval Estimation.</b>
WEEK 15	May 4th May 6th May 8th	<b>The delta method.</b> <b>In-Term Exam III</b> Aftermath

I have read and understood  
the First-Day Handout  
for M339J(unique number: 52920).

Signature

Legibly written: first name, last name, uteid

Date