# College of Natural Science
# MICHIGAN STATE UNIVERSITY

# Department of Statistics and Probability

## Construction and Evaluation of Actuarial Models

Course Number: STT 459, Section 001
Credit Hours: 3
Course meeting days and time: M/W/F, 3:00 PM – 3:50 PM
Course location: https://msu.zoom.us/j/2944256773 (Zoom)
Course website: https://d2l.msu.edu
Course Modality: Online

## Instructors

### Instructor Information

| Instructor |
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| Name: Gee Y. Lee |
| Office: Same Zoom meeting room as the classes. |
| Office hours: M/W/F, 11:00 AM – 11:50 AM, or by appointment. |
| Moblie Phone: (608)509-6879 |
| E-mail: leegee@msu.edu |

## Course Information

### Course Description

We will cover continuous and discrete distributions used in actuarial science, coverage modifications, aggregate loss models, estimation, model selection, and other selected topics.

### Required Textbook & Course Materials:

- Loss Models: From Data to Decisions, by Klugman, Panjer, Willmot. 4th or 5th Edition. Wiley.

### Recommended Texts & Other Materials:

- Finan's Online Book: https://faculty.atu.edu/mfinan/actuarieshall/CGUIDE.pdf

- Loss Data Analytics: https://openacttexts.github.io/Loss-Data-Analytics

**Required Technologies:**

- Access to high speed internet. For more information, see:
  https://remote.msu.edu/learning/internet.html
- A web browser (such as Edge, Safari, Firefox, etc.)
- A scanner (the camera on your mobile phone should work)
- If you are unable to complete an assignment on time due to an internet outage, contact your instructor and explain the situation. Extensions on the assignment due date will be considered on a case by case basis.

**Learning Continuity Statement:**

If you are unable to attend class for an extended period of time, please contact the instructor in advance and explain the situation.

**Course Continuity Statement:**

In case the instructor is required to be absent for an extended period of time, a guest instructor may substitute the lectures. If this ever needs to happen, you will be notified in advance.

**Prerequisite:**

Background in STT 442, or concurrent registration.

**Approved Calculators:**

It is recommended that you use one of the following calculators for this course:
- BA-35, BA II Plus, BA II Plus Professional
- TI-30Xa, TI-30X II (IIS solar or IIB battery), TI-30XS MultiView (or XB battery)

**Course platforms/Structure:**

This course will be delivered *online*, and you will need your MSU NetID to login to the course website from the D2L homepage (http://d2l.msu.edu). In D2L, you will be able to access the course materials, and additional resources.

## Course Outline

The table below describes the weekly activities. The first column describes the week. The second column describes the date. The third column describes the topic. The fourth column describes the homework assignment due on that date. The chapter numbers are for the 5th edition of the textbook.

| Week | Date | Topic | Notes |
|---|---|---|---|
| Week 1 | Jan. 11 (Mon) | **No class** - Reading, reviewing, and reflection | |
| | Jan. 13 (Wed) | | |
| | Jan. 15 (Fri) | | |
| Week 2 | Jan. 18 (Mon) | **No class** - Martin Luther King Jr. Day | |
| | Jan. 20 (Wed) | Ch.2 Random variables | |
| | Jan. 22 (Fri) | Ch.2 Random variables | |
| Week 3 | Jan. 25 (Mon) | Ch.3 Basic distributional quantities | |
| | Jan. 27 (Wed) | Ch.3 Basic distributional quantities | |
| | Jan. 29 (Fri) | Ch.3 Basic distributional quantities | |
| Week 4 | Feb. 1 (Mon) | Ch.3 Basic distributional quantities | |
| | Feb. 3 (Wed) | Ch.4 Characteristics of actuarial models | **HW1 due** |
| | Feb. 5 (Fri) | Ch.5 Continuous models | |
| Week 5 | Feb. 8 (Mon) | Ch.5 Continuous models | |
| | Feb. 10 (Wed) | Ch.5 Continuous models | |
| | Feb. 12 (Fri) | Ch.5 Continuous models | |
| Week 6 | Feb. 15 (Mon) | Ch.5 Continuous models | **HW2 due** |
| | Feb. 17 (Wed) | **Midterm 1 recitation** | |
| | Feb. 19 (Fri) | **Midterm 1** | |
| Week 7 | Feb. 22 (Mon) | Ch.11 Estimation of continuous models | |
| | Feb. 24 (Wed) | Ch.11 Estimation of continuous models | |
| | Feb. 26 (Fri) | Ch.11 Estimation of continuous models | |
| Week 8 | March 1 (Mon) | Ch.11 Estimation of continuous models | |
| | March 3 (Wed) | **No class** - Break Day (March 2 – March 3) | |
| | March 5 (Fri) | Ch.11 Estimation of continuous models | |
| Week 9 | March 8 (Mon) | Ch.6 Discrete models | |
| | March 10 (Wed) | Ch.6 Discrete models | **HW3 due** |
| | March 12 (Fri) | Ch.6 Discrete models | |
| Week 10 | March 15 (Mon) | Ch.12 Estimation of discrete models | |
| | March 17 (Wed) | Ch.12 Estimation of discrete models | |
| | March 19 (Fri) | Ch.8 Coverage modifications | |
| Week 11 | March 22 (Mon) | Ch.8 Coverage modifications | |
| | March 24 (Wed) | Ch.8 Coverage modifications | **HW4 due** |
| | March 26 (Fri) | **Midterm 2 recitation** | |

| Week 12 | March 29 (Mon) | **Midterm 2** | |
| | March 31 (Wed) | Ch.9 Aggregate loss models | |
| | April 2 (Fri) | Ch.9 Aggregate loss models | |
| Week 13 | April 5 (Mon) | Ch.9 Aggregate loss models | |
| | April 7 (Wed) | Ch.9 Aggregate loss models | |
| | April 9 (Fri) | Ch.9 Aggregate loss models | |
| Week 14 | April 12 (Mon) | Ch.15 Model selection | |
| | April 14 (Wed) | Ch.15 Model selection | |
| | April 16 (Fri) | Ch.15 Model selection | |
| Week 15 | April 19 (Mon) | Miscellaneous topics | |
| | April 21 (Wed) | **Final recitation** | **Project due** |
| | April 23 (Fri) | **No class** - Study Days (April 22 – April 23) | |

***Note about the schedule:*** *This is a tentative schedule, and there may be changes to it as needed. If there are changes, the instructor will announce them during class in advance.*

**Important Dates**

- Midterm 1: February 19 (Friday), in-class
- Midterm 2: March 29 (Monday), in-class
- Final Exam: April 28 (Wednesday), 5:45 PM – 7:45 PM

# Grading Policy

The final grade will be determined based on the following graded activities:

| Activity | Description | Weight |
|---|---|---|
| Homework | The homework problem sets must be submitted individually by the given deadline. The homework will be notified through the course website. These problems are designed to help you learn the material. | 20% |
| Exams | There will be two in-class midterm exams, and a final exam. Unless an emergency arises, or the student obtains consent in advance, there will be no make-up exams. | 20% Each |
| Project | Because some of the concepts in this course may be best learned by analyzing real data, you will be completing a data analysis project by the end of the semester. Your goal is to use the R computing environment to solve a given actuarial problem. You are encouraged to discuss the progress of your project with other students, and the instructor. The project may be worked individually or in groups of up to three students. More details of the requirements for the project will be given during class. | 20% |

# Other Course Policies

**Holidays and Breaks:**

- Reading, reviewing, and reflection period: First week of class
- Martin Luther King Jr. Day: January 18
- Break Day: March 2 – March 3
- Study Days: April 22 – April 23

**Attendance Policy:**

In the online course setting, attendance means participating in the real-time class via zoom. Videos of the class sessions will be posted on D2L for those of you who may miss the class sessions. Thus, attendance is not required, but it is strongly recommended in order for the student to be successful in learning the course material.

**Commercialization of Course Material:**

Commercialization of university-provided course materials is not permitted in this course. Also, please do not redistribute the lecture slides provided during the course.