



College of Natural Science
MICHIGAN STATE UNIVERSITY

Department of Statistics and Probability

Theory of Probability and Statistics II, Spring 2021

Course Number: STT 862, Section 001

Credit Hours: 3

Course meeting days and time: M/W/F, 9:10 AM – 10:00 AM

Course location: <https://msu.zoom.us/j/2944256773> (Zoom)

Course website: <https://d2l.msu.edu>

Course Modality: Online

Instructors

Instructor information

Instructor
Name: Gee Y. Lee
Office: Same Zoom meeting room as the classes.
Office hours: M/W/F, 1:00 PM – 2:00 PM, or by appointment.
Mobile Phone: (608)509-6879
E-mail: leegee@msu.edu

Course information

Course description

We will cover topics in statistical inference including sufficiency, estimation, confidence intervals and testing of hypotheses, linear models and the Gauss-Markov Theorem.

Required textbook & course materials:

- Statistical Inference, Second Edition, by George Casella and Roger L. Berger.
- Lecture videos and notes will be posted on the course website.

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)

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:

STT 861

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.

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.

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

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 assignment due on that date. The chapter numbers are for the 2nd edition of the textbook.

Week	Date	Topic	Reading & Assignment
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)	Random samples, sums of random variables	5.1, 5.2
	Jan. 22 (Fri)	Properties of the sample mean and variance	5.3.1
Week 3	Jan. 25 (Mon)	Student's t and Snedecor's F	5.3.2
	Jan. 27 (Wed)	Order statistics	5.4
	Jan. 29 (Fri)	Convergence concepts	5.5.1, 5.5.2, 5.5.3
Week 4	Feb. 1 (Mon)	Delta method	5.5.4
	Feb. 3 (Wed)	Introduction to data reduction	6.1, HW1 due
	Feb. 5 (Fri)	Sufficient statistics	6.2.1
Week 5	Feb. 8 (Mon)	Minimal sufficient statistics, ancillary statistics	6.2.2, 6.2.3
	Feb. 10 (Wed)	Complete statistics	6.3.4
	Feb. 12 (Fri)	Method of moments	7.1, 7.2.1
Week 6	Feb. 15 (Mon)	Maximum likelihood estimation	7.2.2, HW2 due
	Feb. 17 (Wed)	Recitation 1	-
	Feb. 19 (Fri)	Midterm 1	-
Week 7	Feb. 22 (Mon)	Mean squared error	7.3.1
	Feb. 24 (Wed)	Best unbiased estimators	7.3.2
	Feb. 26 (Fri)	Sufficiency and unbiasedness	7.3.3
Week 8	March 1 (Mon)	Likelihood ratio test	8.1, 8.2.1, HW3 due
	March 3 (Wed)	No class - Break Day (3/2 - 3/3)	-
	March 5 (Fri)	Union-intersection and intersection-union tests	8.2.3
Week 9	March 8 (Mon)	Error probabilities and the power function	8.3.1
	March 10 (Wed)	Most powerful tests	8.3.2
	March 12 (Fri)	p-values	8.3.4
Week 10	March 15 (Mon)	Inverting a test statistic	9.1, 9.2.1, HW4 due
	March 17 (Wed)	Pivotal quantities	9.2.2
	March 19 (Fri)	Pivoting the CDF	9.2.3
Week 11	March 22 (Mon)	Size and coverage probability	9.3.1
	March 24 (Wed)	Recitation 2	HW5 due
	March 26 (Fri)	Midterm 2	-
Week 12	March 29 (Mon)	Consistency and efficiency	10.1.1, 10.1.2, 10.1.3
	March 31 (Wed)	Robustness	10.2
	April 2 (Fri)	Asymptotic distribution of the LRT	10.3
Week 13	April 5 (Mon)	Approximate maximum likelihood intervals	10.4.1
	April 7 (Wed)	Introduction to ANOVA	11.2.1-3, HW6 due
	April 9 (Fri)	Simple linear regression	11.3.1, 11.3.2
Week 14	April 12 (Mon)	Conditional normal model	11.3.3, 11.3.4
	April 14 (Wed)	Prediction intervals	11.3.5
	April 16 (Fri)	Generalized linear models	12.3.1
Week 15	April 19 (Mon)	Logistic regression	12.3.2, HW7 due
	April 21 (Wed)	Final Recitation	-
	April 23 (Fri)	No class - Study Days (4/22 - 4/23)	-

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.

Grading policy

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

Activity	Description	Weight
Homework	Homework must be submitted individually by the deadline. The homework problems will be announced on the course website.	25%
Midterm 1	Tentative topics: Ch. 5 properties of a random sample, Ch. 6 principles of data reduction, and some of Ch. 7 on MoM and MLE.	25%
Midterm 2	Tentative topics: Ch. 7 point estimation, Ch. 8 hypothesis testing, and Ch. 9 interval estimation.	25%
Final Exam	Tentative topics: Ch. 10 asymptotic evaluations, and Ch. 11/12 on linear and logistic regression.	25%

Each exam will focus on the topics listed in the table above, but will be cumulative in a sense that the new material will necessarily depend on the previous chapters.

Important dates

- Midterm 1: February 19 (Friday), in class
- Midterm 2: March 26 (Friday), in class
- Final Exam: April 27 (Tuesday), 12:45 PM – 2:45 PM

Homework due dates

Scan (using the camera on your phone is fine) and submit your work via D2L by midnight on:

- Homework 1: February 3 (Wednesday)
- Homework 2: February 15 (Monday)
- Homework 3: March 1 (Monday)
- Homework 4: March 15 (Monday)
- Homework 5: March 24 (Wednesday)
- Homework 6: April 7 (Wednesday)
- Homework 7: April 19 (Monday)