

## Course Syllabus



**Course** STAT 4352.001  
**Course Title** Mathematical Statistics  
**Professor** Hyunwoong “Woody” Chang  
**Term** Fall 2024 (August 19, 2024-December 4, 2024)  
**Meetings** MW 10:00 am–11:15 am @ AD 3.218

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### Professor’s Contact Information

**Office Location** FO 2.610A  
**Office Hours** MW 11:30 am – 12:30 am / by appointment  
**Email Address** hwchang@utdallas.edu

*Note: You must include [STAT 4352] in front of the subject. Please do not use the eLearning system to send me an email. You may use “Discussion Board” tab in eLearning for course-related questions.*

**TA** Fuksman Lirit  
**Office Hours** TR 2:00 pm – 3:00 pm (FO 2.402H)  
**Email** Lirit.Fuksman@utdallas.edu

### General Course Information

**Pre-requisites** STAT 4351, MATH 2418, MATH 3351

**Textbook** Lecture notes

**Suggested Texts** • Hogg and Craig, Introduction to Mathematical Statistics, 8th Ed. Prentice Hall.  
(<https://minerva.it.manchester.ac.uk/~saralees/statbook2.pdf>)

**Important dates** First day of class: Aug 19, 2024  
Last day of class: Dec 4, 2024

Midterm: **Oct 2, 2024** (the same location/time of the regular class)  
Final exam: time and location TBA

Homeworks: weekly on **Mondays** (due next Mondays at 11:59 PM Central Time for full credit)

No class: 9/2 (Labor day), 11/25, 11/27 (Fall break)

## Course description and learning outcome

- Mathematical statistics is a core course in the field of statistics. Once the data-generating model is established with assumptions, usually aided by domain scientific knowledge, our goal is to extract information from the model and the data by inferring meaningful parameters of the population through estimation and hypothesis testing. Mathematical statistics enables us to assess and compare methods of inference based on certain criteria.
- We learn some basic elements of mathematical statistics: estimation and hypothesis testing. In the first half of the course, we study methods of estimation and their (asymptotic) properties, such as unbiasedness and consistency. Among various estimation methods, we learn how to derive the method of moments estimator (MME) and **the maximum likelihood estimator (MLE)**. While introducing the exponential family, which generalizes many useful distributions, we learn about the sufficiency and completeness of a statistic for parameters. We will learn that MLE is an asymptotically efficient estimator under certain distributional assumptions (Cramer-Rao lower bound). The second half of the course is concerned with hypothesis testing. We study statistical decision theory and learn admissible decision rules (Bayes or minimax rule). We prove that the likelihood ratio test becomes the uniformly most powerful test under certain circumstances (**The Neyman–Pearson lemma**). The asymptotic distribution of test statistics (Rao or Wald statistics) and their properties will be examined. If time allows, we will explore the concepts of linear regression and Bayesian inference.

## Course Policies

<b>Class Attendance</b>	Attendance is required. Refer to the <a href="#">Student Code of Conduct</a> .
<b>Grading (credit) Criteria</b>	Attendance: 10% (If absent, provide the proof of the reason.) Homeworks: 30% (Homework will be mostly weekly, One lowest homework mark will be dropped) Midterm: 20% Final exam: 40%
<b>Grading Scheme</b>	<b>The course grade is based on the overall course score:</b> A+ 98-100; A 93-97.9999; A- 90-92.9999; B+ 87-89.9999; B 83-86.9999; B- 80-82.9999; C+ 77-79.9999; C 73-76.9999; C- 65-72.9999; D+ 60-64.9999; D 55-59.9999; D- 50-54.9999; F 0-49.9999
<b>Make-up Exams</b>	<b><u>No make-up exam will be given unless there is a documented emergency.</u></b>
<b>Extra Credit</b>	Special assignments will be assigned. TBA
<b>Late Homework</b>	No late homework will be accepted. You will be allowed to take <b>Makeup</b> homework based on the university excused absence. If you believe this applies to you, <b>you must let me know by 5:00 pm</b> on the assignment due date (Monday).
<b>Classroom Citizenship</b>	You are encouraged to ask questions and participate in discussions in the class.

## Assignments & Academic Calendar

Class session	Date	Topic	Readings	Note
1	8/19	Course overview and logistics		HW 1
2	8/21	Review: change of variables		
3	8/26	Sampling distribution		
4	8/28	Sampling distribution		
5	9/4	Order statistics		No class on 9/2 HW 2
6	9/9	Asymptotic distribution		HW 3
7	9/11	Asymptotic distribution		
8	9/16	The method of moment estimator		HW 4, HW 5
9	9/18	The maximum likelihood estimator		
10	9/23	The maximum likelihood estimator		
11	9/25	Exponential family, MLE, sufficiency		HW 6
12	9/30	Midterm review		
13	10/2	<b>Midterm</b>		<b>In class</b>
14	10/7	Exponential family, MLE, sufficiency		HW 7
15	10/9	Comparison of estimators		
16	10/14	Comparison of estimators		
17	10/16	Comparison of estimators		
18	10/21	Statistical decision theory		HW 8, HW 9
19	10/23	Likelihood ratio test		
20	10/28	Likelihood ratio test		HW 10
21	10/30	Comparison of tests		
22	11/4	Comparison of tests		
23	11/6	Comparison of tests		
24	11/11	Regression		HW 11
25	11/13	Linear regression (estimation)		
26	11/18	Linear regression (testing)		HW 12
27	11/20	Introduction to Bayesian statistics		
28	12/2	Introduction to Bayesian statistics		No class on 11/25 and 11/27
29	12/4	Final exam review		Last class
		<b>Final exam</b>		Time/Location TBD

## **Technical Requirements**

In addition to a confident level of computer and Internet literacy, certain minimum technical requirements must be met to enable a successful learning experience. Please review the important technical requirements on the [Getting Started with eLearning](#) webpage.

## **Course Access and Navigation**

This course can be accessed using your UT Dallas NetID account on the [eLearning](#) website. Please see the course access and navigation section of the [Getting Started with eLearning](#) webpage for more information. To become familiar with the eLearning tool, please see the [Student eLearning Tutorials](#) webpage.

UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The [eLearning Support Center](#) includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service.

## **Communication**

This course utilizes online tools for interaction and communication. Some external communication tools such as regular email and a web conferencing tool may also be used during the semester. For more details, please visit the [Student eLearning Tutorials](#) webpage for video demonstrations on eLearning tools.

Student emails and discussion board messages will be answered within 3 working days under normal circumstances. If not, please send it again.

## **Distance Learning Student Resources**

Online students have access to resources including the McDermott Library, Academic Advising, The Office of Student AccessAbility, and many others. Please see the [eLearning Current Students](#) webpage for more information.

## **Server Unavailability or Other Technical Difficulties**

The University is committed to providing a reliable learning management system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty, which prevents students from completing a time sensitive assessment activity, the instructor will provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and also contact the online [eLearning Help Desk](#). The instructor and the eLearning Help Desk will work with the student to resolve any issues at the earliest possible time.

## **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.”*

## **Accommodations for Students with Disabilities**

The University of Texas at Dallas is committed to providing reasonable accommodations for all persons with disabilities. The syllabus is available in alternate formats upon request. If you are seeking classroom accommodations under the Americans with Disabilities Act (2008), you are required to register with the AccessAbility Resource Center, located in the Administration Building (AD), Suite 2.224. Their phone number is 972-883-2098, email: [accessability@utdallas.edu](mailto:accessability@utdallas.edu) (opens in a new tab) and website is <https://accessability.utdallas.edu> (opens in a new tab). To receive academic accommodations for this class, please obtain the proper AccessAbility Resource Center letter of accommodation and meet with me at the beginning of the semester.

## **Academic Support Resources**

The information contained in the following link lists the University's academic support resources for all students. Please go to the [Academic Support Resources](#) webpage for these policies.

## **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 [UT Dallas Syllabus Policies](#) webpage for these policies.

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