STAT 4710/7710 - Introduction to Mathematical Statistics
Syllabus - Spring 2021

Instructor: Dr. Shih-Kang Chao
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Office: Middlebush 134H

Class times/location:
Sect. 02: Tu/Th 11 am - 12:15 pm in Middlebush 142 (W J AUD)
Sect. 06: Tu/Th 9:30 am - 10:45 am in ARTS & SCIENCE 110 (ALLEN AUD)

Office hours: by Zoom. Tu/Th 12:30 pm - 2 pm or by appointment
`https://umsystem.zoom.us/j/99334118126?pwd=VUZhdFJBZlkyWmgzbURGUWVnbG1BZz09`
Meeting ID: 993-3411-8126
Passcode: ims21chao

Textbooks: Introduction to Probability and Statistics (4th ed) by J.S. Milton and Jesse C. Arnold ISBN 978-0-07-246836-6.

Course Packets: PDF files can be downloaded from Canvas. Hardcopies are available for purchase at the Mizzou bookstore.
(1) Optional: Statistics 4710/7710 Workbook (bright pink cover)
(2) Required: Statistics 4710/7710 Formula and Tables Booklet (bright green cover)

Canvas: the information hub of this course

Prerequisites: MATH 2300 or equivalent

Important dates:

Last day to register, add, or change sections of a course	Jan. 26, 2021
Last day to drop course without a grade	Feb. 22, 2021
Last day to withdraw from a course	May 3, 2021

Course description: This is an introductory course to the theory of probability and statistics using concepts and methods of calculus. The instructor assumes prerequisite knowledge of calculus at level MATH 2300. Note that this is not an applied statistics course, even though we may sometimes touch on applications in engineering, computer science, or other fields.

Grading: Students will be graded on the letter +/- system.

Homework	15%
Midterm 1-3	51%
Final Exam	34%
Piazza discussion (bonus)	4%

Homework: HW assignments will be completed online using WeBWork. Assignments are typically due on Tuesday at midnight 11:59 PM. Before the due date, you can attempt each problem multiple times. Solutions will be visible online after the due date.

- There will be about 7 homework assignments for this semester.
- Late homework will not be accepted!
- HW will be posted one week in advance of the due date.
- Webwork accounts will not be set up until the second week of class.

Exams: to avoid exchanging papers, all exams are online using Webwork taken at home. Exams must be taken at the scheduled time unless a verifiable documented excuse is presented prior to the exam.
The final exam will be comprehensive with an emphasis toward the last portion of the course.

- Midterm 1: Tuesday, Feb. 16, class time;
- Midterm 2: Tuesday, Mar. 16, class time;
- Midterm 3: Tuesday, Apr. 20, class time;
- Final Exam:
  - **Section 06 (9:30 am)**: Monday, May 10, 3 pm - 5 pm
  - **Section 02 (11:00 am)**: Tuesday, May 11, 7:30 am - 9:30 am

Make-up exam policy: make-up exams will not be approved unless valid supporting documentation is provided at least one week before the exam. If you miss the exams due to an emergency, you must email the instructor with details of your situation as soon as possible, and provide documentation.

Piazza: This is a discussion forum for efficient Q&A that has a nice user interface and supports mathematical notations. Please ask all course-related questions here. Sign up `https://piazza.com/missouri/spring2021/stat4710stat7710`.
Discussion of exam questions during exam time is not allowed.
Bonus credit. If you answer a question asked by someone else, and your answer is endorsed by the instructor, you earn a 0.5% credit toward your final grade. This is effective until your cumulative bonus credits reach 4%.

Academic integrity: Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor.

Academic accommodations: If you anticipate barriers related to the format or requirements of this course, if you have emergency medical information to share with me, or if you need to make arrangements in case the building must be evacuated, please let

me know as soon as possible.
If disability related accommodations are necessary (e.g. a note taker, extended time on exams, captioning), please register with the Disability Center (`http://disabilitycenter.missouri.edu`), S5 Memorial Union, 573- 882-4696, and then notify me of your eligibility for reasonable accommodations. For other MU resources for persons with disabilities, click on "Disability Resources" on the MU homepage.

No recording lectures without permission: University of Missouri System Executive Order No. 38 lays out principles regarding the sanctity of classroom discussions at the university. The policy is described fully in section 200.015 of the Collected Rules and Regulations. **In this class, students may NOT make audio or video recordings of course activity, except students permitted to record as an accommodation under section 240.040 of the Collected Rules.** All other students who record and/or distribute audio or video recordings of class activity are subject to discipline in accordance with provisions of section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

Those students who are permitted to record are not permitted to redistribute audio or video recordings of statements or comments from the course to individuals who are not students in the course without the express permission of the faculty member and of any students who are recorded. Students found to have violated this policy are subject to discipline in accordance with provisions of section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

Mental Health: The University of Missouri is committed to supporting student well-being through an integrated network of care, with a wide range of services to help students succeed. The MU Counseling Center offers professional mental health care, and can help you find the best approach to treatment based on your needs. Call to make an appointment at 573-882-6601. Any student in crisis may call or go to the MU Counseling Center between 8:00 V 5:00 M-F. After hours phone support is available at 573-882-6601.

Visit our website at `https://wellbeing.missouri.edu` to take an online mental health screening, find out about workshops and resources that can help you thrive, or learn how to support a friend. Download Sanvello, a phone app that teaches skills and strategies to help you maintain good mental health. Log in with your Mizzou e-mail to unlock all the tools available through Sanvello at no cost to you.

Decreasing the Risk of COVID-19 in Classrooms: MU cares about the health and safety of its students, faculty, and staff. To provide safe, high-quality education amid COVID-19, we will follow several specific campus policies in accordance with the advice of the Center for Disease Control and Boone County health authorities.

- If you are experiencing any COVID-related symptoms, or are otherwise feeling unwell, do not attend in-person classes and contact your health care provider and/or student health immediately. COVID symptoms include: fever greater than 100.4 or chills; cough, shortness of breath or difficulty breathing; fatigue; unexplained muscle or body aches; headache; new loss of taste or smell; sore throat; congestion or runny nose; nausea or vomiting; diarrhea.

- Wear face coverings while in the classroom, unless you have a documented exemption due to a disability or medical condition.

- Maintain a 6-foot distance from each other at all times (except in specific lab/studio courses with other specific guidelines for social distancing).
- Enter the classroom and fill the room starting at the front, filing all the way across a row. When class ends, we will exit the row nearest to the door first; the instructor or TA will give the signal for the next row to exit, in the same manner.
- Due to room cleaning between classes, please leave the room "immediately" in orderly fashion after each class.
- This course may be recorded for the sole purpose of sharing the recording with students who cant attend class. The instructor will take care not to disclose personally identifiable information from the student education records during the recorded lesson.

By taking the above measures, we are supporting your health and that of the whole Mizzou community. Thank you in advance for joining me and your peers in adhering to these safety measures.

Course outline

- 1.1: Interpreting Probabilities
- 1.2: Sample Spaces and Events
- 1.3: Permutations & Combinations
- 2.1: Axioms of Probability
- 2.2: Conditional Probability
- 2.3: Independence of the Multiplication Rule
- 2.4: Bayes Theorem
- 3.1: Random Variables
- 3.2: Discrete Probability Densities
- 3.3: Expectation and Distribution Parameters
- 3.4: Geometric Distribution and the Moment Generating Function
- 3.5: Binomial Distribution
- 3.7: Hypergeometric Distribution
- 3.8: Poisson Distribution
- 4.1: Continuous Densities
- 4.2: Expectation and Distribution Parameters
- 4.3: Gamma, Exponential, and Chi-Squared
- 4.4: Normal Distribution
- 4.5: Normal Probability Rule and Chebyshev's Inequality
- 4.6: Normal Approximation to the Binomial
- 6.1: Random Sampling
- 6.2: Picturing the Distribution
- 6.3: Sample Statistics
- 7.1: Point Estimation
- 7.2: The Method of Moments and Maximum
- 7.3: Functions of Random Variables - Distribution
- 7.4: Interval Estimation and the Central Limit
- 8.1: Interval Estimation of Variability

- 8.2: Estimating the Mean and the Student-t
- 8.3: Hypothesis Testing
- 8.4: Significance Testing
- 8.5: Hypothesis and Significance Tests on the Mean
- 9.1: Estimating Proportions
- 9.2: Testing Hypotheses on a Proportion
- 9.3: Comparing Two Proportions: Estimation
- 9.4: Comparing Two Proportions: Hypothesis Testing
- 10.1: Point Estimation: Independent Samples
- 10.2: Comparing Variances: The F Distribution
- 10.3: Comparing Means: Variances Equal (Pooled Test)
- 10.4: Comparing Means: Variances Unequal
- 10.5: Comparing Means: Paired Data