STAT 4201: Introduction to Mathematical Statistics I

Autumn, 2019

Lecture: MWF 8:00 to 8:55 in Pomerene Hall 160

Instructor: Wasiur Rahman Khuda Bukhsh
Jennings Hall 379 (3rd Floor)
1735 Neil Avenue
Columbus OH, 43210
khudabukhsh.2@osu.edu

Office hours: Wednesday 9:00 to 11:00 or by appointment (at least 48 hours in advance)

Recitation instructors: Xiao Zang (T 8:00, 15:00)
zang.58@osu.edu

Hengrui Luo (T 16:10, 17:20)
luo.619@osu.edu

Course description: This is the first course in a two semester sequence on probability and mathematical statistics. The focus will be on basic concepts in mathematical statistics, including probability, discrete and continuous distributions and densities, mathematical expectation, functions of random variables, transformation techniques, sampling distributions, order statistics. After successfully completing the course, students can understand basic concepts of statistics and probability, comprehend methods needed to analyze and critically evaluate statistical arguments, and recognize the importance of statistical ideas.

Prerequisites: C- or better in Math 2153, 2162.xx, 2182H, or 4182H, or permission of instructor. Not open to students with credit for 3201, 4202, 6201, 6301, 6801, Math 4530 or 5530H.

Textbook: John E. Freund's Mathematical Statistics with Applications, 8th Edition, by I. Miller and M. Miller.

Apart from the above textbook, I will be often using examples and/or exercises from the following textbooks: 1) Probability - Pitman; 2) Introduction to Probability & Statistics - Rohatgi and Saleh. Prof. David Sivakoff and Prof. Yuan Zhang, previous instructors of this course, generously shared with me their teaching materials. Many thanks to them. I will use their materials from time to time.

Course website: The course website is carmen.osu.edu; please check it regularly. On the site you will find announcements, the syllabus, homework assignments, solutions, and grades.

Recitations: There will be no recitations in the first week of class. You are strongly encouraged to attend all recitation sessions. Recitations will be used to discuss examples, work on problems and answer questions about homeworks.

Additional help: The Mathematics and Statistics Learning Center provides extra help and tutoring. More information can be found at https://mslc.osu.edu/mslc-free-tutoring.

Email correspondence: All emails must come from your last name.# account; emails from any other domain might be ignored. Please include STAT 4201 in the subject line. The other option is to contact me through Carmen. I am fairly responsive. However, if you have not received an answer within a reasonable amount of time, please resend your email.

Evaluation:

Homework quizzes	15%
Midterm Exam 1	25%
Midterm Exam 2	25%
Final Exam	35%

Homework quizzes: Homework assignments will be posted on the course webpage most weeks (usually Fridays). A short online quiz (about 30 mins) will be set up at the same time based on the home work assignments. You will get one week's time to take the online quiz. Since the online quiz will be directly taken from the homework assignment, *it makes sense to first do the homework assignments before taking the quiz*. Homework will **not** be collected. You are encouraged to discuss homework problems with other students. Your lowest quiz score will be dropped at the end of the semester, so **missed quizzes cannot be made up for any reason.**

Midterms exams: There will be two midterm exams, scheduled *tentatively* on **Wednesday, September 25** and **Monday October 28** Both exams are in-class and closed book. If you miss a Midterm exam, your score will be merged into the final. For example, if X misses Midterm 1, his/her final exam will carry $25\% + 35\% = 60\%$ of the final grade.

Final exam: The final exam will be comprehensive and is on **Monday, December 9 at 8:00–9:45am**.

Ethics: All students are expected to adhere to the Ohio State University code of conduct:

trustees.osu.edu/rules/code-of-student-conduct/

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases

of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct http://studentlife.osu.edu/csc/.

You are encouraged to discuss the homework assignments with your classmates and both offer and receive advice. For quizzes, midterm exams and the final exam, you must work completely independently.

Missed works: Please notify me as soon as possible if you will miss any deadlines or exams due to illness or family emergency. Also, if you know in advance that you will miss an exam due to religious observances or a varsity sport, you must let me know as soon as possible, and at least one week before the exam. Attendance in class is required, and you are responsible for making up for the material covered in class during any absence.

Special accommodations: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614--292--5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614--292--5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1--800--273-TALK or at suicidepreventionlifeline.org.

Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at http://titleix.osu.edu or by contacting the Ohio State Title IX Coordinator, Kellie Brennan, at titleix@osu.edu.

Diversity: The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Miscellany:

- Learning this material, like anything else, takes time. I strongly encourage you to do a little bit of reading form the textbook and a little bit of problem-solving each day. It is not possible to cover everything written in the book, so it is important that you read the text to fill in the gaps. Also, skimming through the textbook chapters/sections before coming to class can make learning the material a lot easier.
- Check your email and the course website frequently. I will use the website to post homework assignments, information about the exams, rescheduled office hours, etc.
- Please keep cell phones in the silent mode during lectures.
- I may use some of the materials (lecture slides and exercises etc.) provided to me by previous instructors of this course. Redistribution of any class material (lecture slides, exercises, practice, and actual exams) in any form (on some webpage or otherwise) is prohibited without prior permission.

I reserve the right to change any and all items in this syllabus – any changes as well as the official due dates and the exam dates will be announced in class.

Tentative Schedule

Date	Topics	Reading in textbook
Wednesday, August 21, 2019	Intro to probability, review of combinations and permutations	Ch. 1, 2.1 -- 2.4
Friday, August 23, 2019	Rules of probability, Conditional probability	2.4 -- 2.5
Monday, August 26, 2019	Conditional probability, Independent events	2.6--2.7
Wednesday, August 28, 2019	Independent events, Bayes' theorem	2.6 -- 2.8
Friday, August 30, 2019	Random variables, Probability distributions	3.1 -- 3.2
Monday, September 2, 2019	**Labor Day; no class**	
Wednesday, September 4, 2019	Continuous random variables, Probability density functions	3.3--3.4
Friday, September 6, 2019	Multivariate distributions	3.5
Monday, September 9, 2019	Marginal and conditional distributions	3.6--3.7
Wednesday, September 11, 2019	Expected value	4.1--4.2
Friday, September 13, 2019	Moments and Moment-generating functions	4.3--4.5
Monday, September 16, 2019	Moment-generating functions, Product moments	4.5--4.6
Wednesday, September 18, 2019	Product moments, Moments of linear combinations	4.6--4.7
Friday, September 20, 2019	Conditional expectations	4.8
Monday, September 23, 2019	Catch-up, review for Midterm 1	
Wednesday, September 25, 2019	**Midterm exam 1**	
Friday, September 27, 2019	Discrete uniform, Bernoulli distributions	5.1--5.3
Monday, September 30, 2019	Binomial distribution	5.4
Wednesday, October 2, 2019	Negative binomial and geometric distributions	5.5
Friday, October 4, 2019	Hypergeometric distribution	5.6
Monday, October 7, 2019	Poisson distribution	5.7
Wednesday, October 9, 2019	Multinomial distribution	5.8
Friday, October 11, 2019	**Autumn break; no class**	
Monday, October 14, 2019	Continuous density functions, Uniform distribution	6.1--6.2
Wednesday, October 16, 2019	Gamma, Exponential, Chi-square distributions	6.3
Friday, October 18, 2019	Beta, Weibull, Pareto distributions	6.4
Monday, October 21, 2019	Normal distribution	6.5
Wednesday, October 23, 2019	Normal approximation to binomial	6.6
Friday, October 25, 2019	Catch-up, review for Midterm 2	

Date	Topics	Reading in textbook
Monday, October 28, 2019	**Midterm exam 2**	
Wednesday, October 30, 2019	Functions of random variables: distribution function technique	7.1--7.2
Friday, November 1, 2019	Transformation techniques: one variable	7.3
Monday, November 4, 2019	Transformation techniques: one and two variable	7.3--7.4
Wednesday, November 6, 2019	Transformation techniques: two variables	7.4
Friday, November 8, 2019	Moment generating function technique	7.5
Monday, November 11, 2019	Veterans Day	
Wednesday, November 13, 2019	Sampling distributions, Sampling distribution of the mean	8.1--8.2
Friday, November 15, 2019	Sampling distribution of the mean	8.2
Monday, November 18, 2019	Central limit theorem	8.2
Wednesday, November 20, 2019	Distribution of mean in finite populations	8.3
Friday, November 22, 2019	Chi-square distribution	8.4
Monday, November 25, 2019	t-distribution, F-distribution	8.5--8.6
Wednesday, November 27, 2019	**Thanksgiving break; no class**	
Friday, November 29, 2019	**Indigenous Peoples' Day/Columbus Day; no class**	
Monday, December 2, 2019	Order statistics	8.7
Wednesday, December 4, 2019	Catch-up, review for the final exam	
Monday, December 9, 2019	**Final exam**	

N.B. Please keep in mind this is a tentative schedule. It may change as the course progresses.