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Syllabus STA 301
Probability and Statistics
Fall 2023

Course Text: Notes will be provided online throughout the semester. They will include the homework problems for each section of material. (This is a calculus-based course and text.)

Topics

- **Chapter 1:** Calculus Review
- **Chapter 2:** Probability - Sets, probability model, counting techniques, conditional probability, Bayes' Rule, random variables
- **Chapter 3:** Discrete Random Variables - probability mass function, Cumulative Distribution Function, expected value, moment generating functions (MGF), the following distributions: Binomial, Geometric, Hypergeometric, Poisson, Mixture Distributions (Infinite Series is necessary for this chapter)
- **Chapter 4:** Continuous Random Variables - Distribution, expected value, Uniform, Normal, Gamma, Beta (Ability to integrate and differentiate functions is necessary)
- **Chapter 5:** Multivariate Probability - Bivariate distributions, marginal and conditional distributions, expected value, covariance, multivariate discrete distributions
- **Chapter 6:** Functions of Random Variables - Determining the distribution of a function of a random variable and the CDF technique



Course Prerequisites:

1. Calculator Skills - Students should know how to plug in basic calculations on the calculator. The only acceptable calculators are the TI-30 series calculators. There are a few different ones. TI-30Xa does everything you need and is about \$12.
2. Algebra - Students should be able to solve very basic algebraic equations for a given variable.
3. Calculus - Students should know the basics of the exponential function and its inverse differentiation and integration. Other calculus topics are needed, but we will have notes for those.

Course Learning Objectives: The main goals of the course are: Understand probability and random variables, understanding different distributions (discrete and continuous) and their usefulness, improve mathematical knowledge and thought process

Learning Goals:

- The student will understand what probability means.
- The student will understand what a distribution is.
- The student will understand what the mean and standard deviation are.
- The student will understand what makes a distribution useful and what distributions are useful.
- The student will be able to calculate probabilities using a set of charts and formulas.
- The student will be able to read a word problem and determine the implied probability question.
- The student will use calculus (differentiation, integration, and series) to answer probability questions.
- The student will be able to read a word problem and determine which distribution to use on the problem.
- The student will learn to identify the subtle differences and relationships between distributions.

Assessment of Learning Goals: All learning goals will be assessed on homework, quizzes, and exams.

Recitation: Your grade in recitation will be the same grade as the lecture grade, which is based on points earned as described below. Recitation is a time where students can ask questions on assigned homework and is required. I will go over some homework problems during the lecture, but for bulk of homework solutions will be given in recitation. Attendance is expected in recitation and quizzes will likely be given during recitation.

Grading: There will be two in-person exams during the semester and a cumulative final exam given during exam week: **Monday Dec. 18, 2022, at 11:45 - 2:45 in NSC 225.** Everybody will be taking the in-person final exam unless the university is closed. In that case it would be remote.

Test 1: Thursday Oct. 5, 2023: Covers Chapters 2 and 3
Test 2: Thursday Nov. 16, 2023: Covers Chapters 4 and 5

If you miss a test, the make-up will be given the following Tuesday at 6:15 AM in NSC 225. There is no make-up after that. You could lose up to 3 points for taking the test late. The test will be slightly more difficult than the original test. If you take both tests late, **10 points WILL be deducted from your grade.**

Quizzes can be "pop" - quizzes but will usually be announced in the class before we take the quiz or possibly two classes before. Quizzes will likely be given in recitation. An announcement will be made on UB Learns when it is not a pop quiz. Clearly you will need to check for announcements often in this class. The quizzes should take less than 10 minutes. If you miss a quiz, the make-up is the following Tuesday at 7:30 AM. To take the make-up quiz, you must email me by 7:00 AM the day of the make-up with your name and section. Otherwise, you cannot make up a quiz. Since one quiz is dropped, missing a quiz will not affect your grade.

Homework: The regular (book) homework assignments are due the class after the material is covered. Each homework assignment is labeled by the section that it covers. When we have covered enough material to do the next assignment, you are expected to do it. Homework from the textbook is generally not graded and just for practice that you desperately need. Occasionally, I will ask you to post an answer from a question from the back of the book during lecture (on Top Hat). I will post solutions to many book HW assignments on UB Learns. If you wish to check answers to the rest, attend recitation.

Graded HW assignments will be posted on UBlearns and will be submitted on Top Hat. Assignments will have a due date and time that cannot be extended.

Your grade will be determined by points earned on the items below.

Graded Homework Assignments: 105-115 points available (*)	(100 total points)
Quizzes: Up to 6 quizzes @ 5 points each (drop 1)	(25 total points)
2 In Class Exams: 100 point each	(200 total points)
Final Exam: 100 or 200 points (**) (Below 45 % on Exam = F in course)	(200 total points)

(*) There will be 105-115 points worth of graded homework throughout the semester. Your homework grade will be a number between 0 and 100, depending on how many graded homework points you got correct. If you get 90 out of 110, your grade will be 90 out of 100. If you get 104 out of 110, your grade will record as 100 out of 100. Graded homework is NOT accepted late. Graded homework will be submitted on Top Hat.

(**) I will calculate your grade counting the final exam worth 100 points and then again counting it worth 200 points. Your final grade is the better of the two calculations.

Extra Credit: Some extra credit **WILL** be offered during the semester. **Extra credit turned in late or emailed will not be graded - no exceptions!** Extra credit will be on Top Hat. Some extra credit is given during lecture and recitation and the rest is to be done out of class. Your earned extra credit points are added directly to your semester point total. Earned extra credit are extra credit points that you have above 5. Example: If your total extra credit points are 16, then you have 11 Earned Extra Credit Points.

Top Hat: Top Hat will be used in this course. It is used for attendance, classroom participation, some graded homework assignments and possibly for some quizzes. Top Hat can be used on a smart phone or a computer as long as you have internet access. It can also be used on a normal cell phone via texting. You need to sign up for Top Hat by the end of week 1. This will be discussed in class week 1 and you will get email reminders and information. Top Hat will be used in class and out. It will be used for homework, extra credit, reading assignments and possibly for one or two quizzes. Top Hat is required for the course.

Class Attendance:

Attendance is expected at every lecture. I will be taking attendance during each lecture. The first two missed are free. The next two missed lectures cost 2-points each. The next two missed lectures cost 7-points each. Missed lecture number 7 costs 100-points, ensuring your failure.

It is **YOUR** responsibility to determine what you missed and any announcements that were made. Be sure you have the phone number or e-mail address of somebody in the class.

Grading Scale (%): Ties (without rounding) get the higher grade. (Based on the 445 points above)

94 - 100	A	78 - 81	C+	Below 55	F
91 - 94	A-	81 - 84	B-		
88 - 91	B+	68 - 71	C-		
84 - 88	B	60 - 68	D+		
71 - 78	C	55 - 60	D		

My Office Hours: Tuesday and Thursday in NSC 225 from 7:05 AM - 7:50 AM

Additionally, I will hold a review (homework) session most Sunday mornings (sometimes Saturday) in room NSC 225 or possibly online using Zoom. I will announce the exact time (it is usually around 10:30) in class Thursday and send an email. These usually last 45 - 90 minutes.

Identification: During the second week of class, you will be given a class number. This number can also be found on UBlerns under "Course Information". This class number is how you will be identified for grading and e-mail correspondence. You must put this number on all assignments, quizzes, tests, and e-mails. Your class number will be written as follows: The letter S, then a dash and then a two or three-digit number. **Any e-mail sent without your class number in the subject line will be deleted before I even read it.**

Example: Your class number might be S-31. Assignments and quizzes without the proper class number will not be recorded (you get a zero). Class numbers will be assigned in week 2.

Academic Dishonesty: Students caught cheating on exams will be penalized based upon the severity of the infraction, as determined by me. You may lose a letter grade on the exam or in the course. If the infraction is severe enough, you will get an F in the course and the dean will be notified.