University of Guelph
College of Physical and Engineering Sciences
Department of Mathematics and Statistics

STAT*3100 Introductory Mathematical Statistics I

Course Outline
Fall 2023

INSTRUCTOR: ██████████ ████ OFFICE: ███████ EMAIL: ██████████████

LECTURES: ████████████████████████████████████ This is a face-to-face offering of the course. Some online resources will be provided, but this is first and foremost a face-to-face offering of the course.

OFFICE HOURS: ██
██████████████████████████████ I'll also happily stick around for discussion after class. I may be available for online meetings at other times; contact me for details.

PREREQUISITES: (1 of IPS*1510, MATH*1090, MATH*1210, MATH*2080), (STAT*2040 or STAT*2120)

CREDIT WEIGHT: 0.5 credits.

CALENDAR DESCRIPTION: The topics covered in this course include: Probability spaces; discrete and continuous random variables; multivariate distributions; expectations; moments, Chebyshev's inequality, product moments; sums of random variables, generating functions; Gamma, Beta, t and F distributions; central limit theorem; sampling distributions.

COURSE OBJECTIVES: After successful completion of the course, students will be able to:

- State the axioms of probability, and derive probability theorems from these axioms.
- Answer probability questions using rules of probability.
- Carry out probability calculations for various discrete and continuous probability distributions, and choose the appropriate probability distribution in different scenarios.
- Derive the mean, other moments, and the moment generating function of probability distributions.
- Derive marginal and conditional probability distributions from a joint probability distribution, and interpret their meaning.
- Derive the distributions of functions of random variables.
- State characteristics of various discrete and continuous probability distributions.
- Explain the meaning of various statistical terms, such as random variable, expectation, moments, moment generating function, distribution, density, and independence.
- Describe the mathematical underpinnings of the t, F, and χ^2 distributions.

COURSE WEBSITE: http://courselink.uoguelph.ca.
Notes, announcements, assignments, etc. will be posted here.

REPRESENTATIVE TEXT:
There is no textbook for the course. I will be supplying notes (and *some* supporting videos) as the semester progresses. I may occasionally point to other online resources. If you're looking for additional reading from a text that is in the spirit of the course, you could try:

John E. Freund's Mathematical Statistics with Applications by Miller and Miller. Any edition.

TENTATIVE LECTURE SCHEDULE:

The following is a rough outline of the lecture schedule. We will likely cover all of the following topics, but the ordering of topics and timeline may change.

Week 1: Counting rules (combinations, permutations, the binomial coefficient).
Week 2-3: Probability (sample spaces, events, probability rules, conditional probability, independence, Bayes' theorem).
Week 4–5: Random variables, probability distributions, and probability densities (random variables, probability distributions, probability densities, joint distributions, marginal distributions, conditional distributions).
Week 6: Expectation and moments (expected value, moments, Chebyshev's theorem, moment generating functions, product moments, moments of linear combinations of random variables).
Week 7–8: Special Probability Distributions (the discrete uniform distribution, the Bernoulli distribution, the binomial distribution, the geometric distribution, the negative binomial distribution, the hypergeometric distribution, the Poisson distribution, the multivariate hypergeometric distribution, the multinomial distribution).
Week 9–10: Special Probability Densities (the uniform distribution, the gamma distribution, the exponential distribution, the chi-square distribution, the beta distribution, the normal distribution).
Week 11: Distributions of Functions of Random Variables (the distribution function technique, the transformation technique, the moment generating function technique).
Week 12: Sampling Distributions (the distribution of the sample mean and sample variance, the central limit theorem, the chi-square, t, and F distributions).

GRADING SCHEME:

- 18% Assignments. There will be 3 equally weighted assignments.
- 21% Test 1. During class time (4:00 – 5:20) Thursday October 12.
- 21% Test 2. During class time (4:00 – 5:20) Thursday November 9.
- 40% Final exam. 8:30–10:30 a.m. December 7.

IMPORTANT DATES:

Date	Assessment
Tuesday September 26	Assignment #1 is due.
Thursday October 12	Test 1 (4:00–5:20).
Tuesday October 24	Assignment #2 is due.
Thursday November 9	Test 2 (4:00–5:20).
Tuesday November 21	Assignment #3 is due.
December 7	Final exam 8:30–10:30 a.m.

ASSIGNMENT POLICIES:

- All submission deadlines are at 11:59 pm.

- There is a harsh late penalty: any assignment not submitted by the deadline will not be marked and will receive a grade of 0. (If you are having trouble making a deadline, you are strongly encouraged to discuss the matter with me as soon as possible.)

- While you are encouraged discuss approaches to assignment questions with other students, your submitted assignment must be your own work. Copying any part of another student's work is considered academic misconduct. (Please read the section on academic misconduct in the undergraduate calendar.) I will comment about appropriate and inappropriate use of chatGPT and other LLMs on individual assignments.

University Policies

Email Communication
As per university regulations, all students are required to check their uoguelph.ca email account regularly: email is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement
When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:
https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/

Drop date
Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for Dropping Courses are available in the Undergraduate Calendar: https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/dropping-courses/.

Copies of out-of-class assignments
Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility
The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

More information: https://www.uoguelph.ca/sas

Academic Misconduct
The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community ? faculty, staff, and students ? to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-misconduct/

Recording of Materials
Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources
The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs: http://www.uoguelph.ca/registrar/calendars

Disclaimer
Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, changes in classroom protocols, and academic schedules. Any such changes will be announced via Courselink and/or class email.

This includes on-campus scheduling during the semester, mid-terms and final examination schedules. All University-wide decisions will be posted on the COVID-19 website (https://news.uoguelph.ca/2019-novel-coronavirus-information/) and circulated by email.

Illness
Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).

Safety Protocols
For information on current safety protocols, follow these links:
https://news.uoguelph.ca/covid-19/safety-practices/
https://news.uoguelph.ca/covid-19/spaces-events-services/#ClassroomSpaces
Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

Mental Health Services

One out of every five students in Canada experiences some sort of mental health issue at some point in their academic career. If you find yourself facing a mental health crisis, or just need to talk to someone, please consider taking advantage of one of the following resources available to University of Guelph students:

Counselling Services: Visit the Counselling Services website (https://wellness.uoguelph.ca/counselling) to get information on resources available to you, both online and in-person. You can also visit them at Health Services (J.T. Powell Building, ext 53244) where they offer individual and group counselling sessions by appointment or walk-in.

Student Support Network: is located in the Wellness & Education Promotion Centre in the J.T. Powell Building and offers confidential, peer-based, drop-in support.

Good2Talk: (1-866-925-5454) is a free, 24/7 student hotline that provides professional counselling and referrals for mental health, addictions and well-being.

Here 24/7: (1-844-437-3247) specializes in assessment, referral and appointment booking and is available 24/7 for crisis support.

You are not alone and you will not be judged for asking for help.