

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings 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 and circulated by email.

This is a face-to-face teaching and learning course. Students coming to campus are obligated to follow the procedures/recommendations posted on the Covid-19 Info for Students website.

STAT*3100: Introductory Mathematical Statistics I

Fall 2021

Instructor:

Dr. Zeny Feng, Phone: Ext. 53294, Office: MACN 540
Email: zfeng@uoguelph.ca

Time and Location: Face-to-face learning

Lecture: Tue and Thur 11:30am-12:50pm at MACN 113

Office hour: Tue 9:00-10:00am at Zoom

Teaching Assistants:

Chong Gan (ganc@uoguelph.ca)

Caitlin Kral (ckral@uoguelph.ca)

TA Office Hour: TBA (could be online via Zoom or face-to-face)

Credit Weight: 0.5 credits.

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

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 Objective: The objective of this course is to provide students with a solid foundation in mathematical statistics. After successful completion of the course, students should be able to:

- State the axioms of probability, and derive probability theorems from these axioms.
- Answer probability questions using rules of probability.
- Define random variables association with outcomes of an experiment or a study.
- Carry out probability calculations for various discrete and continuous probability distributions, and choose the appropriate probability distribution in different scenarios.
- Derive the mean, moments, and the moment generating function of a given probability distribution.
- 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.
- Understand and apply Chebyshev's inequality, central limit theorem, and the sampling distributions.
- Describe the mathematical underpinnings of the t , F , and chi-square distributions.

Text: There is no required textbook for this course, as the course notes will serve as the primary resource for students. However, students are encouraged to access the following online textbooks or hard copies (and corresponding chapters), available through the University of Guelph Library, as additional resources:

- John E Freund's *Mathematical Statistics with Applications*, 8th ed., by Miller & Miller, Pearson Education Canada.

Lecture Notes: An (in)complete set of lecture notes is available from the bookstore for purchase in advance of lectures. It is expected that students will bring a copy that can be completed during lectures. The Lecture Notes are not allowed to be re-distributed in any form.

Computer Software: The primary statistical software package that will be used in this course is R, which is freely available for download. Students are strongly encouraged to install R on their personal computers.

Lecture Content and Tentative Schedule: The course covers topics from Chapter 1-8 of the text book.

Week 1-2.5: Introduction, counting rules (combination, permutations, binomial coefficient).

Week 2.5-3: Probability theory and concepts (sample spaces, experiment outcomes, events, probability rules, conditional probability, independency, Bayes' theorem).

week 4-5: Random variables, probability distributions and probability density.

Week 6: Expectations, moments, and moment generating function.

Week 7-8: Special probability distribution (discrete uniform, Bernoulli, binomial, geometric, negative binomial, hypergeometric, Poisson, multinomial, multivariate hypergeometric).

Week 9-10: Special probability densities (Uniform, exponential, gamma, chi-square, beta, and normal).

Week 11: Distribution function of random variables.

Week 12: Sampling distributions (distribution of sample mean and sample

variance, central limited theorem, t -distribution, chi-square, F distribution).

Last Lecture: Thursday, Dec 2, class rescheduled from Tuesday, Oct 12.

Course Performance Evaluations:

Assignments 25% (5 equally weighted assignments)

Midterm 30% (Thursday, Oct 28, in class)

Final Exam 45% (Friday, Dec 17, 11:30AM-1:30PM, location TBA)

While you are encouraged to discuss the assignment problems with other students, each student must hand in an individual solution which is the result of his/her own effort. Students are expected to be familiar with the section on Academic Misconduct in the Undergraduate Calendar.

Assignment Deadline:

Assignment 1: Thursday September 23, 11:59pm.

Assignment 2: Thursday October 7, 11:59pm

Assignment 3: Thursday October 21, 11:59pm

Assignment 4: Thursday November 11, 11:59pm

Assignment 5: Thursday November 25, 11:59pm

Assignment Submission: Assignments are due online through Crowdmark, any late assignment submission will receive a mark of 0.

Policy for a missed midterm exam: If you miss midterm for a valid reason (with appropriate documentation), then your final exam will be reweighed to make up the midterm, i.e. the final will be 75%.

Course Website: Notes, assignments, announcements, course related material will be posted in CourseLink.

If you miss the final exam for any reason, you must see your program counselor. University regulations require specific procedures to be followed regarding the conduct of final examinations, including resource, if any, for missed final examinations. These procedures are out of my control.

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 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.

University Policy

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.

Academic Accommodation of Religious Obligations: If you are unable to complete a course requirement due to religious obligations, please let the instructor know within the first two weeks of class. See the academic calendar for more information about Accommodation of Religious Obligations.

Academic Consideration: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id, and email contact. See the academic calendar for information on regulations and procedures for Academic Consideration. 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 the links for: [safe return](#) and [class room safety](#).

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

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.

Accessibility: The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact Student Accessibilities Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email: sas@uoguelph.ca or see the website.

Drop date: The last date to drop one-semester courses, without academic penalty, is the last day of classes, Friday Dec 3, 2021. For regulations and procedures for Dropping Courses, see the Academic Calendar.

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.