

# STAT\*3100: Introductory Mathematical Statistics I

## Fall 2018

**Instructor:** Dr. Zeny Feng, x53294, Office: MACN 540  
Email: zfeng@uoguelph.ca

**Time and Location:** Lecture: Tue and Thur 8:30-9:50am at CRSC 117  
Office hour: Tue 10:00-11:00pm at MACN 540

**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:** 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.
- 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 chi-square distributions.

**Recommended Text:** John E Freund's *Mathematical Statistics with Applications*, 7th ed., by Miller & Miller, Pearson Education Canada.

**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).

**Thursday, Nov. 29, last day of lecture**

**Course TA:** TBA, office hour: TBA

**Evaluation:**

Assignments 20% (4 equally weighted assignments)

Midterm 30% (The week of Oct 22-25)

Final Exam 50% (Saturday, Dec 8, 08:30-10:30AM, Room 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: Tuesday September 25, 4pm.

Assignment 2: Thursday October 11, 4pm

Assignment 3: Tuesday November 6, 4pm

Assignment 4: Thursday November 22, 4pm

**Late Submission:** Assignments are due online through Crowdmark, any submission not submitted by the deadline 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 reweighted to make up the midterm, i.e. the final will be 80%.

**Course Website:**<http://courselink.uoguelph.ca>. Notes, assignments, announcements, course related material will be posted here.

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.

## 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:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml>

**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:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>.

**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:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

**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](mailto:sas@uoguelph.ca) or see the website:

<http://www.uoguelph.ca/csd/>.

**Course Evaluation Information:** The evaluation questions for the Department of Mathematics and Statistics can be found here:

[https://mathstat.uoguelph.ca/sites/uoguelph.ca.mathstat/files/public/TeachevaluationformW16\\_1.pdf](https://mathstat.uoguelph.ca/sites/uoguelph.ca.mathstat/files/public/TeachevaluationformW16_1.pdf).

**Drop date:** The last date to drop one-semester courses, without academic penalty, is Friday, November 2, 2018. For regulations and procedures for Dropping Courses, see the Academic Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>.

**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>.