

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

STAT\*3100 Introductory Mathematical Statistics I  
Course Outline  
Fall 2017

INSTRUCTOR: Jeremy Balka x54481 OFFICE: 550 MacN EMAIL: jbalka@uoguelph.ca  
OFFICE HOURS: 10:00 – 11:00 Monday, Tuesday, Thursday in 550 MacN. (I may be late getting back to my office after lecture, depending on how long it takes to answer questions after class.)  
LECTURES: 8:30–9:50 Tuesday and Thursday in MINS 300.  
PREREQUISITES: (1 of IPS\*1510, 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  $\chi^2$  distributions.

RECOMMENDED TEXT: *John E. Freund's Mathematical Statistics with Applications* by Miller and Miller. 8th edition. Pearson Education, 2014. (A copy of this textbook will be available on reserve at the library.)

LECTURE CONTENT:

We will work through topics from Chapters 1–8 of the textbook. Tentative schedule:

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:

- 20% Assignments. There will be 4 equally weighted assignments.
- 30% Midterm exam. 8:30–9:50 Tuesday October 24. Location TBA.
- 50% Final exam. 11:30–13:30 Thursday December 14. Location TBA.

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 at the end of this document and in the undergraduate calendar.)

**POLICY FOR A MISSED MIDTERM EXAM:** If you miss the midterm exam due to medical illness or another valid (and documented) reason, your final exam will be reweighted to make up for the missed exam.

**LATE SUBMISSION:** Any assignment not submitted by the deadline will receive a mark of 0.

#### IMPORTANT DATES:

Date	Assessment
Tuesday September 26	Assignment #1 is due (The deadline is 1:00 pm)
Thursday October 12	Assignment #2 is due (The deadline is 1:00 pm)
Tuesday October 24	Midterm examination (8:30–9:50)
Tuesday November 7	Assignment #3 is due (The deadline is 1:00 pm)
Tuesday November 21	Assignment #4 is due (The deadline is 1:00 pm)
Thursday December 14	Final exam 11:30–13:30

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

## 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.

### **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 3, 2017. 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>