

Probability and Statistics 1

University of Toronto
Department of Statistical Sciences
STA257H1-F

Instructor:	Katherine Daignault	Class Location:	ES 1050 (all sections)
Email:	katherine.daignault@mail.utoronto.ca	Class Day/Time:	
Office:	HS 372 (155 College St.)	LEC0101:	Mon. 3-5pm, Wed. 3-4pm
Office Hours:	Mon. 1-3pm	LEC5101:	Wed. 7-10pm
Course webpages:	Quercus and Piazza	Tutorials:	W 4-5pm (LEC0101), 6-7pm (LEC5101)

COURSE INFORMATION

Course Description: A mathematically rigorous introduction to probability, with applications chosen to introduce concepts of statistical inference. This course serves as the necessary foundation for many of the core statistics courses that follow. Broadly, this course will cover the following: probability models, random variables, discrete and continuous distributions, multivariate models, large-sample limiting results, some statistical applications

Learning Outcomes: By the end of this course, all students should understand the concepts above, be able to solve straightforward problems regarding the material, as well as be able to approach an unfamiliar problem and recognize how it is solved by an extension of the material presented during lectures.

Pre-/Co-requisites: You must be taking, or have taken and passed, both a second year calculus course and a second year linear algebra course (see [course calendar](#) for details). These concepts are frequently used in both this and the subsequent course (STA261) and students must therefore be comfortable with them. *Students without this background should consider alternative courses.*

Textbook: The **required** textbook for this course is *Mathematical Statistics and Data Analysis*, John Rice, 3rd Ed., ISBN: 9780534399429. We will be covering the first six chapters.

If you feel the need to supplement this textbook with another, I would suggest *Mathematical Statistics with Applications*, by Dennis Wackerly et al. (7th edition, 2008), but this is entirely optional.

Tutorials: Weekly tutorials will begin the **week of September 16**. There will be 4 quizzes taking place during tutorials throughout the term. Each week, TAs will review some of the tougher concepts from class and will work through example problems. Tutorial rooms can be found on the [course calendar](#). TAs will also have office hours, which will be posted on Quercus. Students should take advantage of this time to have their questions answered.

COMMUNICATION

All course materials and announcements will be posted on the Quercus course page. Please check this regularly. We will also be using Piazza as an online discussion forum. **All questions about course material, quizzes and exams should be posted here** or asked during TA/instructor office hours. Posts on Piazza can be done anonymously. The instructor and TAs will monitor Piazza and will help answer questions but students are encouraged to answer posts and help their fellow classmates. **The instructor will only respond to emails of a private or sensitive nature.** When emailing the instructor, please use your official mail.utoronto.ca email and include your full name and student number.

EVALUATION

You will be evaluated on your understanding of the course material through 3 different methods of assessment:

1. **Quizzes:** There will be 4 quizzes throughout the term given during tutorials, worth 5% each, and will last approximately 40 minutes. The quiz schedule is as follows:
 - Quiz 1 during tutorial on September 25
 - Quiz 2 during tutorial on October 9
 - Quiz 3 during tutorial on November 13
 - Quiz 4 during tutorial on November 27

Quizzes will cover material up to the end of the previous week.

2. **Midterm exam:** The midterm will be held **in class** during Week 7. It will be approximately 2 hours long and you must write it in the lecture section in which you are enrolled on the following dates:
 - LEC0101: Monday October 21 from 3-5pm (in class)
 - LEC5101: Wednesday October 23 from 7-9pm (in class)
3. **Final exam:** The final exam will be a 3 hour cumulative and will occur during the exam period (Dec. 7-20). The date of the final will be communicated through Quercus as soon as it is scheduled.

Each component above will receive the following weight in the calculation of the final grade:

Assessment	Scheme 1	Scheme 2
Quizzes	20%	20%
Midterm	30%	10%
Final	50%	70%

Marking scheme 1 is the default scheme for all students. However, if a student does substantially better on their final than on their midterm, a portion of the weight of the midterm will be shifted to the final exam. **The final grade will be determined by whichever scheme results in the higher mark for the student.**

QUIZ/EXAM INFORMATION

Procedures: Quizzes should be written in the tutorial section in which the student is enrolled, unless prior permission has been secured from the instructor. Midterms must be written in the lecture section in which the student is enrolled. No exception will be given. Students must bring and display their University of Toronto T-card at quizzes and exams.

Calculators: Handheld, non-programmable calculators may be used during quizzes and exams. Any calculator that has a logarithm, square root, and one memory button will suffice for this course, so there is no need to buy an expensive calculator. Phone calculators are not permitted.

Aids: All quizzes and exams are closed-book, however you will be allowed a one single-sided 8.5×11 inch handwritten aid sheet for the quizzes and the midterm, and one double-sided 8.5×11 inch handwritten aid sheet for the final exam. These are useful studying tools, so it is recommended that students spend some time on creating and modifying these throughout the term.

Grading/Regrading: Exams will be graded using Crowdmark. This will allow students to obtain feedback quicker and without the need to hand back paper copies. Regrading requests will only be considered for the midterm and must be made in writing (on paper) within one week of the grade being released. All regrade requests must provide a justification in order to be considered.

Missed Quizzes/Midterm: There are no make-up tests. If a quiz/midterm is missed for a valid reason, the weight of the assessment will be moved to the final exam. Such situations include:

- a valid medical reason: the student must submit a University of Toronto [Verification of Student Illness or Injury form](#) to the instructor in person within one week of the missed quiz/test. The form will only be accepted if it is the original form, completed as per the instructions, and indicates the degree of incapacitation on academic functioning. Forms indicating a negligible or mild degree of incapacitation will not be considered a valid medical reason.
- other valid reason (e.g. death in the family): the student must obtain prior approval to miss the quiz/midterm from the instructor, with supporting documentation as applicable.

If no valid reason is provided, or prior approval of absence is not obtained, the quiz/midterm will receive a grade of 0.

COMPUTATION

R is a very popular statistics software in the department. While it is not required for students to learn in this course, some content may be illustrated using it, so it is worth becoming familiar with its use. It can be downloaded for free at cran.r-project.org for all operating systems. Some students find that RStudio is a more user-friendly platform for beginners. It can also be downloaded for free at www.rstudio.com/products/rstudio. A very helpful introduction to R document can be found [here](#). Future statistics courses may require familiarity with R, so there's no harm giving it a try!

ACADEMIC INTEGRITY

The University treats cases of plagiarism and cheating very seriously. It is the students' responsibility for knowing the content of the University of Toronto's [Code of Behaviour on Academic Matters](#). All suspected cases of academic dishonesty will be investigated following procedures outlined in the above document. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <http://academicintegrity.utoronto.ca/>).

ACCESSIBILITY NEEDS

The University of Toronto offers academic accommodations for students with disabilities. If you require accommodations, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible: accessibility.services@utoronto.ca or <http://accessibility.utoronto.ca>.

CLASS SCHEDULE

Below is a tentative schedule and list of topics to be covered in class. The content corresponds to Chapters 1-6 in the Rice textbook. The instructor reserves the right to modify this schedule as needed due to time constraints.

Tentative Schedule for STA257

Week	Content	Sections in Textbook
1	Set notation, Venn diagrams, probability models, basic combinatorics	1.1-1.4
2	Rules of probability, conditional probability, Law of total probability, Bayes' rule, independence	1.5-1.6
3	Discrete random variables and distributions (Quiz # 1)	2.1
4	Continuous random variables and distributions	2.2
5	Functions of random variables, univariate transformations (Quiz # 2)	2.3
6	Moments and generating functions, Markov's and Chebyshev's inequalities	4.1.1, 4.2, 4.5
7	Midterm exam	–
8	Multivariate distributions, joint, marginal, independent random variables	3.1-3.4
–	READING WEEK ☺	
9	Conditional distributions, covariance, correlation, conditional expectations (Quiz # 3)	3.5, 4.1.1, 4.1.2, 4.3
10	Functions of joint random variables, sums, quotients, Jacobians, extrema and order statistics	3.6-3.7
11	Limit theorems, Law of Large numbers, central limit theorem, convergence, continuity of MGFs (Quiz # 4)	5.1-5.3
12	Distributions derived from the Normal, sample means and variances	6.1-6.3