UNIVERSITY OF TORONTO
DEPARTMENT OF STATISTICAL SCIENCES

## STA257 H1 F – Probability and Statistics I
## Course Outline – Summer 2014

lectures: (L5101) Mon, 7:10-10 pm, Wed, 7:10-10 pm   SS2135
tutorials: (T5101) Mon, 6:10-7 pm, Wed, 6:10-7 pm   SS2135

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| **Instructor:** | J.G. Pitt |
| **Office Location:** | SS 6017   (subject to change) |
| **Office Telephone:** | 416-978-3490   (subject to change) |
| **Email:** | greg.pitt@utoronto.ca |
| **Office Hours:** | Monday  2:05-2:55 pm,  SS 6017 |
| | Tuesday  2:05-2:55 pm,  SS 6017 |
| | Wednesday  2:05-2:55 pm,  SS 6017 |
| **TAs:** | Reihaneh Entezari |
| | Mark Koudstaal |
| | Victor Veitch |

### official course description

STA257H1                              Probability and Statistics I  [36L/12T]
This course, and its sequel, STA261H1, are mathematically quite challenging, the target audience  includes anyone
proceeding directly to a specialist degree in statistics, as well as anyone with serious and special interest in some other of
the identifiably statistical-physical sciences.  Topics, albeit very rigorously covered, are, nevertheless, very standard
introductory ones: abstract probability and expectation, discrete and continuous random variables and vectors, with the
special mathematics of distribution and density functions, all realized in the special examples of ordinary statistical
practice: the binomial, Poisson and geometric group, and the Gaussian (normal), gamma, chi-squared complex.

Prerequisite: MAT135Y1/MAT137Y1/MAT157Y1 (MAT137Y1/MAT157Y1 is strongly recommended)
Corequisite: MAT235Y1/MAT237Y1/MAT257Y1 (MAT237Y1/MAT257Y1 is strongly recommended), MAT223H1/MAT240H1
Exclusion: ECO227Y1/STA247H1
Distribution Requirement Status: This is a "None" course
Breadth Requirement: The Physical and Mathematical Universes (5)

### course objectives

The successful student will learn the basics of probability.  A variety of distributions and counting
methods will be explored.  The course should be helpful in preparing for STA261.

### main text

Rice: *Mathematical Statistics and Data Analysis*, 3rd ed., 2007

### supplementary books

Wackerly, Mendenhall, Scheaffer: *Mathematical Statistics with Applications*, 7th ed., 2008
Larsen & Marx: *An Introduction to Mathematical Statistics*, 4th ed., Pearson, 2006
Shao: *Mathematical Statistics*, Springer, 1999     (advanced)

## determination of grades

| assignments | 5%, 5% | May 26, June 09 |
| quizzes | 8% | 4 in total (2% each) |
| tests | 23%, 25% | May 28, June 11 |
| final exam | 34% | June ?? (t.b.a. by department) |
| TOTAL | 100% | |

clean drop: 2014/06/09 - last day to drop this course from academic record and GPA .

course grades: After courses have been submitted to the records people, they will not be changed unless there was a clerical mistake. Students' access to see their final exam papers is through an appeal process with the Faculty of Arts and Science, not with the instructor.

marking issues: The TAs and the instructor are well aware of the importance of grades to most students, and great care will be taken in the marking of assignments, quizzes, and exams. In the unlikely event that you feel a question has been mis-marked, or the marks have been added up incorrectly, you can submit your test back to the instructor with a note explaining what you believe requires further examination. This must be done promptly after the marked paper is returned to you.

**tests, quizzes, etc.**
The term tests will NOT be administered during class hours. They will be during the tutorial time period, in room EX100. They may include any material covered up to the end of the previous lecture, unless stated otherwise in class.

The final exam will be cumulative, and will include questions from all parts of the course. It may emphasize material that did not appear not on the tests.

For the various tests, students will be permitted to use a non-programmable, non-plotting calculator. If there is any doubt about the permissibility of your particular calculator, please consult in advance.

*Students must bring their U of T student ID to all quizzes, tests, and exams.*

Because of crowding in the classroom, multiple versions of the tests may be administered. The differences between versions will be slight and should not affect the difficulty of particular problems. The printed tests may contain a superset of questions, from which your specific questions will be determined on the basis of you student number.

**How to present your work:** Show your work (i.e., document your thought processes). Some wrong answers may be awarded partial credit, but not unless you show your work. **Careless rounding and similar sloppiness will result in deductions.**

Online quizzes may be offered, approximately once per week. The quizzes will be time limited. Multiple attempts may be offered.

Printed quizzes, if any, may contain a superset of questions, from which your specific questions will be determined on the basis of your student number.

**assignments**
Two assignments will be collected. You may consult with your fellow students, but each student must submit individual answers and document his/her thought processes.

**problem sets**
Problem sets, consisting of questions assigned from the book as well as supplementary questions, will be posted from time to time. These questions are for practice and discussion and not for handing in and grading.

**absences/missed tests:** In the event a student misses a test exam due to illness or domestic situation, the student must contact the Statistics departmental office immediately, and submit a medical certificate indicating type of illness and date of illness (or other applicable documentation for domestic situations) to the instructor. This should be done within 48 hours of the test date, if possible.

If a student misses a test for legitimate reasons, the missing points will be earned by shifting the weight to the next test or exam.

**lectures**
Ordinary classroom etiquette is expected of all of the students. This includes arriving on time, turning off cell phones and similar devices, and respect for fellow students.

Leaving the classroom while a lecture is in progress is disruptive and should be avoided. If you feel that you will need to leave class before it ends, please sit close to the exit and alert the instructor to your situation.

The class time will be used for lectures and discussion, based mostly on the material in the textbook. However, the instructor may assign additional reading and/or exercises to supplement the book.

Class participation is strongly encouraged: asking questions, comments that relate this course to others that you are taking, pointing out mistakes on the chalkboard, etc.

**cancellation policy:** In the event of inclement weather, instructor illness, or similar circumstances resulting in class cancellation, any test or assignment due date will be postponed for one week until the next class. Minor adjustments to the overall course schedule might be necessary, and these will be posted.

Formal rules are in place regarding the rescheduling of final exams, and these will be followed if necessary.

**tutorials**
Students are expected to attend the tutorial sessions. Tests will be administered during some of the tutorial time slots. Also, marked papers will be returned during tutorials. Occasionally, some new material may be presented during a tutorial if regular lecture time has not been sufficient.

**The Statistics Aid Centre** can be an important source of help with difficulties. It is located in Sidney Smith 1091. Your designated TA will be on duty at least one hour per week, but you may drop in at any time if you are willing to wait for other students to be served. Schedules will be posted

as soon as they become available. Some additional information may be available at
http://www.utstat.utoronto.ca - click on Statistics Aid Centres for the schedule.

In the fall and winter terms, an additional centre at New College Wetmore 68A is open.

**communication**
The course website will be the centre for communication from the instructor to the students. The
students are urged to complete the recommended problem sets. Solutions to some of these problems
may be posted on the course web-site.

If we experience a Portal/Blackboard outage, the instructor will attempt to post essential material at
http://utstat.utoronto.ca/~pitt/sta257

The instructor and the TAs may be contacted by email at any time. In general, the TAs should be
contacted regarding subject matter, and the instructor regarding administrative matters. Please
include the course code (sta257) in the subject line of all email messages. Note that if message traffic
becomes excessive, the course email policy may be revised at any time during the term.

**accessibility:** Students with diverse learning styles and needs are welcome in this course. In
particular, if you have a disability or health consideration that may require accommodations, please
feel free to approach the instructor and/or the Accessibility Services Office as soon as possible. The
Accessibility Services staff are available by appointment to assess specific needs, provide referrals
and arrange appropriate accommodations. The sooner you let them and the instructor know your
needs, the quicker they can assist you in achieving your learning goals in this course.

For more information, please refer to   http://www.accessibility.utoronto.ca/

**academic integrity** is fundamental to learning and scholarship at the University of Toronto.
Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that
the U of T degree that you earn will be valued as a true indication of your individual academic
achievement, and will continue to receive the respect and recognition it deserves.

Familiarize yourself with the University of Toronto's *Code of Behaviour on Academic Matters*
(http://www.governingcouncil.utoronto.ca/policies/behaveac.htm). It is the rule book for academic
behaviour at the U of T, and you are expected to know the rules. Potential offences include, but are
not limited to:

In papers and assignments:
- Using someone else's ideas or words without appropriate acknowledgement.
- Copying material word-for-word from a source (including lecture and study group notes)
  and not placing the words within quotation marks.
- Submitting your own work in more than one course without the permission of the
  instructor.
- Making up sources or facts.
- Including references to sources that you did not use.
- Obtaining or providing unauthorized assistance on any assignment including

       o   working in groups on assignments that are supposed to be individual work,

       o   having someone rewrite or add material to your work while "editing".

- Lending your work to a classmate who submits it as his/her own without your permission.

On tests and exams:
- Using or possessing any unauthorized aid, including a cell phone.
- Looking at someone else's answers
- Letting someone else look at your answers.
- Misrepresenting your identity.
- Submitting an altered test for re-grading.

Misrepresentation:
- Falsifying or altering any documentation required by the University, including doctor's notes.
- Falsifying institutional documents or grades.

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the *Code*. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact the instructor. If you have questions about appropriate research and citation methods, seek out additional information from the instructor, or from other available campus resources like the U of T Writing Website. If you are experiencing personal challenges that are having an impact on your academic work, please speak to the instructor or seek the advice of your college registrar.

Note that because of crowding in the classroom, multiple versions of quizzes and tests may be administered. The differences between versions will be slight and should not affect the difficulty of particular problems.

**summer courses**
Students should note that summer courses present additional challenges that are not found in regular-term courses. The pace will be brisk, and those of you who are accustomed to short lectures during the day may find it difficult to adjust to long lectures in the evenings. Additionally, because of time constraints, students will be asked to learn a few topics via independent study.

**Topics:**

I.  probability basics
I.A.  basic probability rules
I.B.  selections / counting rules
I.C.  more than one variable

II.  random variables
II.A.  random variables (RVs), intro
II.B.  discrete random variables
  1-5.  Bernoulli, binomial, negative binomial, hypergeometric, Poisson
II.C.  continuous random variables
  1-4.  exponential, gamma, normal, beta (including uniform)

II.D. functions of a random variable

III. joint distributions
III.A. joint distributions, intro
III.B. joint distributions, discrete RVs
III.C. joint distributions, continuous RVs
III.D. independence
III.E. conditional distributions
III.F. functions of jointly distributed RVs
III.G. extrema and order statistics

IV. expectation, variance, correlation
IV.A. expected value and moments
 1-3. expectation, raw moment, central moment
IV.B. variance and standard deviation
IV.C. covariance and correlation
IV.D. conditional expectation and prediction; conditional variance

V. moment-generating functions and related
V.A moment-generating functions
V.B characteristic functions
V.C approximate methods

VI. limit theorems
VI.A. introduction
VI.B. the laws of large numbers
VI.C. convergence in distribution
VI.D. the central limit theorem

VII. distributions derived from the normal distribution
VII.A. introduction
VII.B. chi-Squared, t, and F distributions
VII.C. the sample mean and sample variance

VIII. survey sampling
VIII.A. Introduction
VIII.B. Population Parameters