

UNIVERSITY OF TORONTO
DEPARTMENT OF STATISTICAL SCIENCES

STA247 H1 F – Probability with Computer Applications
Course Outline – Summer 2014

lectures: (L5101) Tue & Thu, 7:10-10 pm, SS 1085
optional tutorials: (T0101) Tue, 3:10-4 pm SS1087; (T0102) Thu, 6:10-7 pm SS1085

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: Matt Chang-Kit matthew.changkit@mail.utoronto.ca
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official course description

STA247H1 Probability with Computer Applications [36L/12T]

Introduction to the theory of probability, with emphasis on applications in computer science. The topics covered include random variables, discrete and continuous probability distributions, expectation and variance, independence, conditional probability, normal, exponential, binomial, and Poisson distributions, the central limit theorem, sampling distributions, estimation and testing, applications to the analysis of algorithms, and simulating systems such as queues
(Note: STA247H1 does not count as a distribution requirement course).

Prerequisite: MAT135Y1/MAT137Y1/MAT157Y1; CSCI108H1/CSCI148H1

Exclusion: ECO227Y1/STA257H1

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. These concepts will be applied to a wide variety of settings, including the business and economics environments. The course should be helpful in preparing for STA248.

main text

Scheaffer & Young: *Introduction to Probability and Its Applications*, 3rd ed., Brooks/Cole, 2010

supplementary books

Grinstead & Snell: *Introduction to Probability*, 2nd revised ed., AMS, 1997 (a past textbook)

Higgins & Keller: *Concepts in Probability and Stochastic Modeling*, 1994 (a past textbook)

Lawler: *Introduction to Stochastic Processes*, 2nd ed., 2006 (advanced)

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

Ross: *Introduction to Probability Models*, 10th ed., Academic Press, 2010

determination of grades

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|-------------|----------|--------------------------------|
| assignments | 5%, 5% | May 27, June 10 |
| quizzes | 8% | 4 in total (2% each) |
| tests | 23%, 25% | May 29, June 12 |
| 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 be administered during class hours, in room SF3202. The tests 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 your 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.

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/sta247>

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 (sta247) 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.

programming languages: The official primary programming language for this course is R, and the official secondary language is Python. Both languages are available on numerous campus computers, and they are free to install on a student's personal computer. Students should use R for assignments, projects, etc., and should use Python only when a task is seemingly impossible or incredibly inconvenient in R. No other languages will be supported by the instructor and TAs.

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
 - 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.

topic outline - The following topics will be covered, and in approximately this order:

- I.A. basic probability rules
- I.B. selections (counting rules)
- I.C. conditional, joint, marginal probability
- I.D. mutual exclusivity and independence

- II. discrete probability distributions
 - II.A. common probability functions
 - II.B. expectation
 - II.C. Bernoulli
 - II.D. binomial
 - II.E. negative binomial
 - II.F. Poisson

II.G. hypergeometric
II.H. moment-generating functions and characteristic functions

III. continuous probability distributions \\
III.A. reconsideration of some discrete probability topics
III.B. uniform
III.C. exponential
III.D. gamma
III.E. normal
III.F. beta
III.G. Weibull

IV. multivariate probability
IV.A. bivariate joint and marginal
IV.B. conditional distributions
IV.C. independence, revisited
IV.D. expectation of functions of RVs
IV.E. conditional expectation & variance
IV.F. multinomial

V. functions of random variables
V.A. transformation
V.B. random number generation

VI. limit theorems and convergence

VII. stochastic processes
VII.A. Poisson processes, revisited