

## STA 257H1 F - PROBABILITY AND STATISTICS I

Section L0101, Fall 2015 (September 14 to December 22)

- Lectures:** Mondays 3-5pm and Wednesdays 3-4pm in MC 102
- Instructor:** Dr. Shivon Sue-Chee (E-mail: shivon.sue.chee@utoronto.ca)  
**Office hours:** Mondays and Wednesdays 5-6pm in SS 6026
- Course website:** Available through <https://portal.utoronto.ca> (UT Blackboard)
- Tutorial Info:** Students are assigned to a tutorial section according to last name. Sections meet on Wednesdays 4-5pm at specific locations (TBA) with their respective Teaching Assistant (TA).

### Course description

This course and its sequel, STA 261H1, 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, although very rigorously covered, are nevertheless very standard introductory ones: abstract probability and expectation, discrete and continuous random variables and vectors, with special mathematics of distribution and density functions. These topics are realized in the special examples of ordinary statistic practice: the Binomial, Poisson and Geometric group, and the Gaussian(Normal), Gamma and Chi-square complex.

### Pre-requisite

MAT135H1 and MAT136H1 (with a minimum grade of 70% in MAT136H1) or MAT137Y1 or MAT157Y1 (MAT137Y1 or MAT157Y1 is **strongly recommended**)

### Co-requisite

MAT235Y1 or MAT237Y1 or MAT257Y1 (MAT237Y1 or MAT257Y1 is **strongly recommended**), MAT223H1 or MAT240H1

### Required Textbook

*Mathematical Statistics and Data Analysis, 3rd edition* by John Rice (Brooks / Cole)

Answers to selected problems are included in the text's Appendix.

### Evaluation

	Weight	Date	Time	Location
Weekly tutorial quizzes	15%	Sept. 23- Dec. 2	(10 mins)	In tutorials
Term Test	35%*	Wednesday, Oct. 21	3:10-5:00pm	TBA
Final Exam	50%*	Between Dec. 11-22	(3 hrs)	TBA

\*If your final exam mark is better than your term test mark then the exam weight will be 65% and the term test weight will be 20%.

### Tutorial exercises and quizzes

Tutorials begin on September 23. Tutorials meet weekly every Wednesday 4-5pm. Tutorial sections will be posted in this course outline or the course website prior to September 23. Tutorials are designed to discuss weekly assigned textbook exercises (posted at the course website) and any other relevant questions students may have. Also, short quizzes (about 10 minutes in duration) on the week's material will be given

beginning September 23 to November 26.

There will be a total of 8 quizzes, of which the best 6 quizzes will count towards your tutorial grade. If a tutorial is missed for any reason, there will be no 'make-up' quiz. A missed quiz may count as a dropped quiz. If you have any concerns about your tutorial such as late enrolment, illness, quiz regrade or your overall tutorial grade, please discuss the matter with your TA. TAs have full responsibility for their respective tutorial group.

### **Test and Exam Policy**

Non-programmable calculators are permitted on the test and exam. A one-sided, handwritten 8-1/2" x 11" aid sheet is allowed in the test (two-sided on the final exam). You must bring your student identification to the term test as well as the final exam.

If the midterm test is missed for a valid reason, you must submit appropriate documentation within one week of the test. If documentation is not received in time, your test mark will be zero. If the test is missed for a valid reason, its weight will be shifted to the final exam (that is, your final exam would account for 85% of your overall grade).

Requests for test remarking must be submitted at the time the test is returned back to you. The request must contain a justification and will only be considered for tests which were written in ink.

The final exam is cumulative.

### **Where to get help?**

Your primary source of help with difficulties is your TA in the scheduled tutorial, but additional assistance can be obtained at the Statistics Aid Centre, Room 1091, in Sidney Smith Hall from the week of September 21. Your own TA will be on duty about one hour per week on average, but you may drop in on any of the TAs for the course. Schedules will be posted at the course web site. For additional assistance, use the course's online discussion forum via Piazza or the New College Stats Aid Centre at NC 68A.

### **Computing**

This course requires some basic statistical computing. We will use the R computing package for all examples and provide sample code that would be sufficient for you to complete homeworks. Additional help with R will be provided during lectures, and during TA and instructor office hours.

If you wish to use R through UofT, you will need to sign up for a CQUEST account. To find out more, go to <http://www.cquest.utoronto.ca>.

### **Course website**

The course website is available through portal and will be regularly updated with lecture notes, practice problems, assignments, and readings. Blackboard will also be used for announcements and your grades. The discussion board will be available via Piazza for course-related questions. TAs will moderate the discussion and will respond to questions within one business day.

### **Communication**

In general, I am not able to answer questions about the course material by e-mail. Students are encouraged to attend lectures, Instructor and/or TA office hours, or post questions about the course material on the discussion board on Blackboard. E-mail is appropriate for personal matters only. Use your [utoronto.ca](mailto:utoronto.ca) or [mail.utoronto.ca](mailto:mail.utoronto.ca) account and write a proper email including the addressee, your name and student number. I will generally answer e-mail within two business days.

### Accessibility Needs

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible at [accessibility.services@utoronto.ca](mailto:accessibility.services@utoronto.ca) or <http://www.accessibility.utoronto.ca>.

### Academic Integrity

You are responsible for knowing the content of the University of Toronto's Code of Behaviour on Academic Matters at <http://www.artsci.utoronto.ca/osai/students>. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me.

### Your responsibility

The classroom sessions for this class are designed to actively engage you in the course material. I hope you'll find them interesting, challenging, and fun, and an excellent opportunity to truly learn the material. In order for these sessions to be effective, coming prepared, by learning about the week's concepts through the textbook, is essential.

### Tentative Lecture Schedule

Day	Topics	Text Chp.
Sept. 14,16	Introduction to probability: sample space, probability measure, set notation, Venn diagrams, probability models. Basic combinatorics.	1
Sept. 21,23	Rules of probability. Conditional probability. Law of total probability. Bayes' rule. Independence.	1
Sept. 28,30	Random variables (univariate). Discrete distributions: Bernoulli, Binomial, Geometric, Negative binomial, Hypergeometric, and Poisson distributions. The cumulative distribution function (cdf).	2
Oct. 5, 7	Continuous distributions: Uniform, Exponential, Gamma, Beta, and Normal distributions. The density function. Poisson processes.	2
Oct. 14	Expectation. Moments. Variance. Functions of random variables.	2-4
Oct. 19	Indicator functions. Order statistics. Review for midterm.	1-4
Oct. 21	<b>TERM TEST on Sept. 14 to Oct. 19 materials.</b>	
Oct. 26,28	Conditional probability. Joint distribution. Marginal density. More on independence of random variables.	3
Nov. 2, 4	Conditional densities. Covariance. Correlation. Conditional expectation.	4
Nov. 11	Markov's and Chebyshev's inequalities. Law of large numbers (LLN).	4-5
Nov. 16,18	Convolution. Cauchy distribution. Jacobian transformation.	3-4
Nov. 23,25	More on order statistics. Probability generating functions. Moment generating functions.	4
Nov. 30, Dec.2	Convergence in distribution. Continuity theorem for mgf's. Central Limit Theorem (CLT). Different types of convergence.	5
Dec. 7,9	Multivariate Normal distribution. Chi-square distribution. $F$ and $t$ distributions. Review for final exam.	5-6
Dec. 11-22	<b>FINAL EXAM (cumulative)</b>	

