

STA257H1 F - Probability and Statistics I - Fall 2014

Instructor: Olga Chilina

Office: SS6002

Office hours: Mondays, 2:00 - 3:00 pm and Wednesdays, 5:00 - 6:00 pm

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Lecture time and location:

L0101: Mon 3:00 - 5:00 pm, Wed 3:00 - 4:00 pm in MC102

L5101: Wed 7:00 - 10:00 pm in SS2102

Course Objective

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 are: 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.

Necessary background: You must be taking, or have taken and passed, a 2nd year calculus course as well as 2nd year linear algebra. Students not having this background should consider other alternative courses. Please do not attempt this course without the necessary background.

Textbook

MATHEMATICAL STATISTICS AND DATA ANALYSIS, 3rd Edition, by John Rice

Tutorials

Tutorials begin the week of Sept 15. Tutorials meet every Wednesday.

L0101: 4:10 - 5:00 pm

L5101: 6:10 - 7:00 pm

Tutorial rooms will be posted on the course web site and blackboard prior to Sept 15. Assignments will be posted on the course web site, consisting of suggested exercises, mostly from the textbook. Do not hand them in. Bring your solutions to tutorials, along with your questions about these exercises or the related theory and concepts. Expect a quiz on the material as well.

The first quiz is on Sept. 17!

Evaluation

Tutorial weekly quizzes: 15%

Two-hour midterm test: 35%

Three-hour final exam: 50%

Quizzes

Quizzes will be given in tutorial. A typical quiz will be a multiple choice question, you get either 1 mark (for the correct answer) or 0.3 (for attendance). Your TA will record your mark for each quiz. So be sure to attend the correct tutorial, and to know your TA's name. *If you miss a tutorial/quiz due to illness, late enrolment, etc., please discuss this matter with your TA, and not your lecturer.* If ill, bring some proof.

Midterm Test/Final Exam

The midterm test is on

L0101: Oct 20, 3:00 - 5:00 pm

L5101: Oct 22, 7:00 - 9:00 pm

Programmable calculators are not permitted on test and exam. A one-sided 8-1/2"x 11" aid sheet, hand-written, is allowed on the test (two-sided on final exam). **You must bring your student identification to term tests as well as the final exam.** The day and time for the final exam will be announced later.

Missed Midterm Test

There are **no make-up tests**. Should you miss the term test due to illness, you must submit to your lecturer, within one week, completed by yourself and your doctor, the **'U of T Student Medical Certificate'**, obtainable from your college registrar, the Office of the Faculty Registrar (SS1006), the Stats Dept. office, or the Koffler health service. The test's weight will then be shifted to the final exam. **If proper documentation is not received, your test mark will be zero.**

Additional help

- For continued discussion and questions outside of class, try posting on the Piazza discussion forums. The instructor and TAs will be monitoring them regularly.
- You can visit instructor (SS6002) and TAs (SS1091) during their office hours.
- There is a drop-in Statistics Aid Centre in New College: Wetmore Hall 68A. See http://www.utstat.toronto.edu/wordpress/?page_id=154 for the schedule.
- E-mail should only be used for emergencies or personal matters..

Academic Offences

Academic offences are unacceptable, and harm everyone. Offenders are caught, and **sanctions can be severe** - zero in the course with annotation on the transcript for several years; suspension for a year; even expulsion. Various measures, announced and unannounced, will be taken throughout the year to reduce their incidence and to insure successful prosecution when they do occur (e.g. photocopying of students' tests, multiple versions of multiple choice exams). In addition, please note the following:

- (i) **Oversights in marking on a test paper** (e.g. addition error, overlooked work) must be brought to the attention of the TA **immediately** - during the tutorial class when test papers are returned;
- (ii) **Regrading requests** will only be considered for *term tests* which are written in *ink*.

Tentative Lecture Outline

Week 1: Introduction to probability: set notations, Venn diagrams, probability models. Basic combinatorics.

Week 2: Rules of probability. Conditional probability. Law of total probability. Bayes' rule. Independence.

Week 3: Random variables. Discrete case: Bernoulli, Binomial, Geometric, negative Binomial, Hypergeometric, and Poisson distributions. Distribution function.

Week 4: Continuous case: Uniform, Exponential, Gamma, Beta, and Normal distributions. Density function. Poisson Processes.

Week 5: Expectation. Moments. Variance. Functions of random variables. Indicator functions and random variables.

Week 6: General Normal distribution. Chi-square distribution. Short review for the midterm.

Week 7: TERM TEST on weeks 1- 6 material

Week 8: Conditional probability on a joint distribution. Marginal density function. More on independence of random variables.

Week 9: Conditional densities. Covariance. Correlation. Conditional expectation. Markov's and Chebyshev's inequalities. Laws of large numbers.

Week 10: Convolution. Cauchy distribution. Jacobian, change of variables for two dimensional case. F and t distributions.

Week 11: Order statistics. Probability generating functions. Moment generating functions.

Week 12: Convergence in Distribution. Continuity theorem for mgf's. Central Limit Theorem. Different types of convergence.

Note: This corresponds to parts of Chapters 1-6 of the textbook and some additional material not found in the text.