University of Toronto
Department of Statistical Sciences

STA 255H1S – Statistical Theory
Course Outline – Summer 2017

Lectures:	Tuesdays and Thursdays 7:00 pm to 10:00 pm in **SS 2118**
Instructor:	Dr. Armin Hatefi **E-mail**: armin.hatefi@utoronto.ca †**Office hours**: Tuesdays and Thursdays 4:00pm – 5:00pm in **SS 6002A**
Tutorials	Tuesdays and Thursdays 6:00 pm to 7:00 pm in **ES 4000** (**SL5101A; A–Ji**), or **AB 107** (**SL5101B; Jj–Si**) or **AP 120** (**SL5101C; Sj–Z**)
Teaching Assistants	Yang (SL5101A), Lei (SL5101B) and Qianyi (SL5101C) **Office hours**: M 6–7pm, T 5–6pm, R 5–6pm in **SS 1091**
Course website:	Available through https://portal.utoronto.ca (UT Blackboard)

†Subject to change.

Course content
This courses deals with the mathematical aspects of some of the topics discussed in STA250H1. Topics include discrete and continuous probability distributions, conditional probability, expectation, sampling distributions, estimation and testing, the linear model.

Prerequisite
STA220H1/STA221H1 (ECO220Y1 may be taken as a co-requisite), MAT133Y1(70%)/ (MAT135H1,MAT136H1)/MAT137Y1/MAT157Y1

Exclusion: ECO227Y1/STA257H1/STA261H1/STA247H1/STA248H1

The prerequisites are **strictly** enforced in this course. Special permission to take STA255 will **NOT** be granted to anyone without the required statistics and calculus courses (or equivalent transfer credits).

Required Textbook
Mathematical Statistics with Applications, 7$^{\text{th}}$ edition by Wackerly, Mendenhall and Scheaffer (Brooks / Cole).
The above textbook packaged with the Student Solution Manual would be ideal.

Evaluation:

	Weight	Date	Time	Location
Tutorial quizzes	10%*	See the following Table	(10–15 mins)	In tutorials
Term Test	35%*	Thursday, July 20	6:00 pm –8:00 pm	TBA
Final Exam	55%*	TBA	(3 hrs)	TBA

*Note: If your final exam mark is better than your term test mark then weight will be 65% and the term test weight will be 25%. Your lowest quiz score will be dropped and the rest will be averaged for 10% of the final grade.

Tutorial quizzes	Date	Time	Location
quiz 1	Tuesday, July 11	(10–15 mins)	In tutorial
quiz 2	Tuesday, July 18	(10–15 mins)	In tutorial
quiz 3	Thursday, July 27	(10–15 mins)	In tutorial
quiz 4	Thursday, August 3	(10–15 mins)	In tutorial

Non-programmable calculators will be permitted for 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 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. 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.

Tutorials
Tutorials begin July 6. Tutorials meet every Tuesday and Thursday 6–7pm. Practice problems will be assigned and will be posted on the website. They are not to be handed in. They will be appropriate preparation for the tutorial discussion, quizzes, test and exam. Bring your solutions to tutorial, along with your questions about these exercises or the related theory and concepts. There will be four short quizzes at the end of four tutorials (See Table of tutorial quizzes).

Statistical Aid Centre
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, SS 1091, in Sidney Smith Hall. Your own TA will be on duty one hour per week, but you may drop in on any of the TAs for the course. Schedules will be posted at the course web page. For additional assistance, try using the course's online discussion forum.

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

R is a popular open source statistical package that is widely used in both academia and industry.

It is available for free download from: http://cran.ca.r-project.org for use on Windows, Mac OS X, and Linux.

Course website
The course website is available through portal and will be regularly updated with lecture notes, practice problems and readings. Blackboard will also be used for announcements and your grades. The discussion board will be open to all and you are encouraged to use it for course-related questions. TAs will moderate the discussion and will respond to questions.

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 U of T email account and write a proper email including your email address, your name and student number.

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 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. We 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 Course Schedule
The weekly coverage might change as it depends on the progress of the class.

Day	Topics	Text Chapter
July 4	Review of some statistical concepts from last term. Basic concepts and axioms of probability.	1-2
July 6	Probability and counting rules. Random variables and expectation. Binomial distribution.	2-3
July 11	Hypergeometric distribution. Poisson distribution. Negative binomial and geometric distribution. Moment generating function (mgf). Chebyshev's rule.	3
July 13	Continuous distributions. The cumulative distribution function and the pdf. Uniform distribution. Normal distribution. Gamma and exponential distributions. Beta distribution. Mgf's again	4
July 18	Joint, marginal and conditional distributions. Independence. Expected value, covariance and linear combinations of variables. Multinomial and bivariate.	5
July 20	**Term test.** Abbreviated lecture on functions of random variables. the distribution function and transformation methods. The mgf method.	6
July 25	Sampling distributions related to the Normal distribution. Central Limit Theorem. Normal approximation to the binomial.	7
July 27	Point estimates. Bias and mean square error. Error of estimation. Confidence intervals. Pivotal method. Large-sample CIs.	7-8
August 1	CIs for mean and proportions. CI for sigma. Method of estimation: method of moments, maximum likelihood estimation.	8-9
August 3	Test of hypothesis. Decision errors, and power. P-values. Large sample and small sample tests for means and proportions. Test for variance(s).	10
August 8	Power of tests and Neyman-Pearson Lemma. Likelihood ratio tests. The general linear Model and least-squares. Simple linear regression	10-11
August 10	Regression inference. Review.	11