



Statistical Sciences
UNIVERSITY OF TORONTO

STA 255H1S Section L0101- STATISTICAL THEORY

Winter 2019 (January 7 to April 30, except February 18-22)

- Lectures:** Mondays 10:10-11am and Wednesdays 10:10am-12noon in **BA 1160**
Campus map: <http://osm.utoronto.ca/maps.html>
- Instructor:** Dr. Shivon Sue-Chee (**E-mail:** shivon.sue.chee@utoronto.ca)
Office hours: In **EP 104**; days and times are to be announced (TBA)
or by appointment
- Course website:** Available through <https://q.utoronto.ca> (UT Quercus)
- Teaching Assistants:** Galen, Henry, Nathan and Will
Office hours: In **SS 623B**; days and times are TBA
- Tutorials:** Students are assigned to a tutorial section according to last name.
Each section meets on Mondays 11:10am-12noon at the specific location,
listed in the table below, with their respective Teaching Assistant (TA).

Section	102	104	105	106
Last name	A-Jia	Jin-O	P-We	Wu-Z
Room	GB 248	SF 3202	GB 405	MS 4279
TA	Will	Galen	Henry	Nathan

Course content

This course deals with mathematical and computational aspects of topics, discussed in STA220H1. Students will extend their learning of fundamental concepts of statistics, in both theory and application, by using mathematical and statistical software. In particular, topics include probability, discrete and continuous distributions, conditional probability, expectation, moment generating functions, multivariate distributions, functions of random variables, sampling distributions, methods of estimation, hypothesis testing and linear regression.

Pre-requisite

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

Exclusion: ECO227Y1/STA257H1/STA261H1/STA247H1/STA248H1

NOTE: The prerequisites and co-requisites are strictly enforced for this course by the department, not the instructor. Students who have deferred exams in prerequisite courses or have an equivalent course as a transfer credit should contact our undergrad administrator, Gillis to request to be kept in the course.

Required Textbook

Mathematical Statistics with Applications, 7th edition by Wackerly, Mendenhall and Scheaffer (Brooks / Cole, 2008)

The above textbook packaged with the Student Solutions Manual would be ideal.

Additional References

- *Open Intro Statistics, 3rd edition* by Barr, Diez and Cetinkaya-Rundel (2015). A free download is available from the text's website.
- *Stats, Data and Models, 3rd Canadian edition* by DeVeaux, Bock, Velleman, Vukov and Wong (Pearson 2018)
- *Modern Mathematical Statistics with Applications* Devore and Berk (Springer 2012). The text is available as an electronic resource through the University of Toronto library website.
- *Mathematical Statistics and Data Analysis* by Rice (Brooks/Cole 2007)

Evaluation

	Weight	Date	Time	Location
Tutorial assignments	15%	Jan. 14-Apr. 1	11:10am-12pm	In tutorials
Term Test	35%	Monday, February 25	10:10-11:40pm	TBA
Final Exam	50%	Between April 6-30	(3 hrs)	TBA*

Crowdmark will be used in this class to take test attendance and for grading and returning course work.

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. Test and exam coverage will be posted in advance on Quercus.

*The final exam is scheduled by the Faculty of Arts and Science. This official schedule will be posted by February 28 on the Faculty's website. All concerns about the final exam, such as conflicts, deferred exams, marks, and rereads, must be brought to the Faculty Registrar (SS1006); your instructor will not be able to assist with such matters.

Missed Test Policy

If a test is missed for a valid reason, you must submit proper (original, complete and appropriate) documentation **in person within one week of the test to the instructor**. If documentation is not received in time, your test mark will be zero. If the documentation is validated, an online makeup test will be assigned within two weeks of the original term test date. The makeup test will have the same coverage as the term test and will be worth 7%; the remaining weight of the test will be shifted to the final exam.

Re-grading Policy

Any requests to have marked work re-evaluated must be made in writing (that is, by email or brought to my office) within one week of the date the work was returned to the class. The request must contain a justification for consideration. Be sure to include the course number- STA255, and your UTORid for identification purposes. Regrading requests will be processed within one week of the request date.

Tutorial Assignments

Tutorials meet every Monday 11am-12noon, beginning January 14 and are designed to review the previous week's materials in a small group environment. Tutorial sections are assigned according to student's last name; this may not match your registered section on the timetable. You **must** attend the tutorial that you are assigned to according to this syllabus, unless an accommodation is sought from the instructor, and provided for you to do otherwise. You will not earn credit for attending an unassigned tutorial.

Assignments will be posted at the course website, consisting of a combination of mandatory exercises from the instructor and suggested exercises from the textbook. Bring your solutions to tutorial, along with your

related questions on the week's materials. Expect a short quiz or group work on the material.

Your overall tutorial grade will be calculated by your TA, out of 80% of the total assignments assessed. Due to this flexibility, there are no accommodations for missed tutorial work. If any issues arise regarding your tutorial assignments, please contact your TA first, during his/her tutorial hour or scheduled office hour.

Course Help (from January 14)

Your primary source of help with difficulties is your TA in the scheduled tutorial, but additional assistance can be obtained from any of the course TAs at the Statistics Aid Centre, Room 623B, in the basement of Sidney Smith Hall. Each TA will be on duty about one hour per week. Schedules will be posted at the course web page. **Note that TAs will not be available by email nor will they be available outside of tutorials or their scheduled office hours.**

For additional assistance, other experienced Stats TAs are available at New College Stats Aid Centre, WH68A. The schedule will be posted at http://utstat.toronto.edu/?page_id=10490.

Further assistance can be sought during instructor office hours or by posting on the discussion board.

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 assignments. Additional help with R will be provided during class, and during TA and instructor office hours.

Course website

The course website is available through Quercus and will be regularly updated with lecture notes, practice problems, assignments, and readings. Quercus will also be used for announcements and your grades. It is your responsibility to check Quercus regularly and enable notifications from the course to your utoronto email.

The discussion board will be open to all and you are encouraged to use it for course-related questions. The discussion board is designed to get help on course content fast and efficiently from classmates. The discussion will be moderated on a weekly basis by the instructor. Additional moderation will be subject to TA availability. Please use the forum in accordance to its design. Inappropriate posts will not be tolerated and will be dealt with accordingly.

Communication

In general, I am not able to answer questions about the course material by e-mail. Students are encouraged to attend classes, Instructor and/or TA office hours, or post questions about the course material on the discussion board. E-mail is appropriate for personal matters only. Use your utoronto.ca or mail.utoronto.ca account and write a proper email including the addressee, your name and UTORid. 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 or <http://www.accessibility.utoronto.ca>.

Academic Integrity and Intellectual Property

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>.

Course materials provided on Quercus are the intellectual property of your instructor and are for the use of students currently enrolled in this course only. **Providing course materials to any person or company outside of the course is unauthorized use.**

Videotaping of lectures will not be permitted under any circumstances. Permission to audio record lectures must be sought in advance. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me. Academic offences will be taken very seriously and dealt with accordingly.

Your responsibility

The lecture and tutorial 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 Lecture Schedule

Week: Dates	Topics	Text Chapter(s)
1: Jan 7-11	Review of some statistical concepts. Basic concepts and axioms of probability.	1-2
2: Jan 14-18	Probability and counting rules. Random variables and expectation. Binomial distribution.	2-3
3: Jan 21-25	Hypergeometric distribution. Poisson distribution. Negative binomial and geometric distribution. Moment generating function (mgf). Chebyshev's rule.	3
4: Jan 28- Feb 1	Continuous distributions. The (cumulative) distribution function and the pdf. Uniform distribution. Normal distribution. Gamma and exponential distributions. Mgf's.	4
5: Feb 4-8	Joint, marginal and conditional distributions. Independence. Expected value, covariance and linear combinations of variables. Multinomial and bivariate normal distributions.	5
6: Feb 11-15	Functions of random variables: the distribution function and transformation methods. The mgf method.	6
Feb 18-22	<i>Reading Week (No classes or tutorials)</i>	
7: Feb 25-Mar1	Term test on Weeks 1-6 materials. Sampling distributions Central Limit Theorem. Normal approximation to Binomial.	7
8: Mar 4-8	Point estimates. Bias and mean square error. Error of estimation. Confidence intervals. Pivotal method. Large sample CIs.	7-8
9: Mar 11-15	CIs for means and proportions. CI for sigma. Methods of estimation: method of moments, maximum likelihood estimation.	8-9
10: Mar 18-22	Tests of hypothesis. Decision errors, and power. P-values. Large sample and small sample tests for means and proportions. Test for variance(s).	10
11: Mar 25-29	Power of tests and Neyman-Pearson Lemma. Likelihood ratio tests. The General Linear Model and least-squares. Simple linear regression.	10-11
12: Apr 1-5	Regression inference. Review.	11

Department of Statistical Sciences

Instructor's Name: Shivon Sue-Chee

Term: Winter 2019 (Jan to April)

Course Codes: STA 303/1002 L0101&L0201, STA255 L0101

Office/ Rm #: EP 104A

Hour	Monday	Tuesday	Wednesday	Thursday
9-10am				
10-11am	STA 255 L0101 Class BA 1160	STA 303/1002 L0101 Class BA 1160	STA 255 L0101 Class BA 1160	STA 303/1002 L0101 Class BA 1160
11-12noon	STA 255 L0101 Tutorials Various places			STA 303/1002 Office hour BA 1160
12-1pm		STA 303/1002 Office hour EP 104	STA 255 Office hour EP 104	STA 303/1002 L0201 Class MP 202
1-2pm				
2-3pm				
3-4pm		STA 303/1002 L0201 Class KP 108		
4-5pm				

STA 255 TA Office hours in SS 623B

TIME	Monday	Tuesday	Wednesday	Thursday	Friday
10:00-11:00					
11:00-12:00					
12:00-1:00					Will
1:00-2:00					Galen
2:00-3:00					Nathan
3:00-4:00					Henry
4:00-5:00					

STA 303/1002 TA Office hours in SS 623B

-Held around the assessments

-See Quercus for details