Statistical Sciences
UNIVERSITY OF TORONTO

STA 437H1S / 2005HS
METHODS FOR MULTIVARIATE DATA/APPLIED MULTIVARIATE ANALYSIS
WINTER 2019: January 6 - April 30, 2020 (except Feb. 17-21)

Classes:	Mondays 13:10-15:00 in **NF003** and Wednesdays 14:10-15:00 in **OI G162** (except February 17 - 21 during Reading Week) Campus map: http://map.utoronto.ca/utsg
Course website:	Available through https://q.utoronto.ca (UofT Quercus)
Instructor:	Shivon Sue-Chee **E-mail**: shivon.sue.chee@utoronto.ca Office: HS 384
(Drop-in) Office hours:	[Instructor] Mondays 16:00-17:00 or by appointment (beginning Jan. 20) [TAs] *Will be held in the HS 380 space; times will be announced.*

Course description
The course covers some important and useful techniques for the analysis of multivariate data: multivariate normal distribution, basic estimation and hypothesis testing for multivariate means and variances, multivariate analysis of variance, repeated measurements, classification and linear discriminate analysis, principal components, canonical correlation and factor analysis.

The main learning objective of this course is to gain a solid understanding of multivariate data methods.

Pre-requisites
Students must have STA 302H1/1001H or equivalent preparation. Additionally, MAT 223H1 / MAT 240H1 is strongly recommended.

Background in **linear algebra**, calculus, basic probability theory (including normal, Student's t, Chi-square, and F distributions), and mathematical statistics (including point and interval estimation, maximum likelihood, hypothesis test, linear regression and one-way analysis of variance).

Pre-requisites will be strictly enforced by the department, not the instructor.

Textbook
- *Applied Multivariate Statistical Analysis, 6th edition* by R. A Johnson and D. W. Wichern (Prentice Hall)

  We will cover most of the text. As we proceed, I will highlight the sections covered in depth, briefly or skipped entirely. The text will be available for purchase at the UofT Bookstore and as a course reserve in the Gerstein and Mathematics libraries.

  Practice problems from the textbook(s) will be posted in the notes and on the course website. They are to help you prepare for the tests and exam and are not to be handed in.

Evaluation
Students will be evaluated based on the following scheme.

	Weight	Date	Time	Location
Test 1	17.5%	Wed., February 5	14:10-15:00	TBA
Test 2	17.5%	Wed., March 18	14:10-15:00	TBA
Project	15%	*Mon., March 30	due by 10pm	online
Final Exam	50%	Between April 6-25	(3 hours)	TBA (by FAS)

* Project due date is subject to change with sufficient notice. Graduate students will be evaluated at the graduate level based according to the University Assessment and Grading Practices Policy.

Crowdmark is a management system that efficiently facilitates large-scale assessment. It will be used in this class to take test attendance, and for grading and returning course work electronically.

The tests will be written in location(s) to be announced (TBA). The tests and final exam will be closed-book and closed-notes; relevant formulas and tables will be provided. You will need a basic, non-programmable, scientific calculator. Calculators on phones and other devices equipped with remote access will not be permitted during the term test or final exam.

The project details will be announced at the beginning of March.

Missed Test Policy
If the 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, the test weight will be shift 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 and the corresponding marks you think you deserve.

- Students are encouraged to review the grading scheme and solutions before submitting a regrade request.

- Electronic requests must be sent to regradesta437@gmail.com. Be sure to include your official name and student number for identification purposes.

- Regrading requests should be processed by the teaching team within two weeks of the request date. Review of question parts can be subjected to a full review of the entire test paper. Finally, unsuccessful disputes will result in a deduction of two test points.

Computing
We will use R and RStudio for statistical computing.
Support for downloading and learning R (and RStudio) will be provided by the teaching team (Instructor and TAs). Additional resources will be given in our website. In lectures, examples with R syntax will be provided, which should be sufficient for you to do your homework and project.

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 `https://www.studentlife.utoronto.ca/as`.

Lecture Notes and Intellectual Property

Course materials provided on Quercus, such as lecture slides, assignments, tests and solutions 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.** Lecture notes will contain unsolved examples and proofs. The lecture notes will be completed in class. Annotated slides will not be posted, unless a classroom emergency occurs.

Videotaping of lectures will not be permitted under any circumstances. Permission to audio record lectures must be sought in advance. Failure to comply can result in legal action against all parties involved.

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`. It is academic dishonesty to present someone else's work as your own, or to allow your work to be copied for this purpose.
Failure to comply with the Code of Behaviour is a **serious** academic offence; offences will be investigated and dealt with accordingly.

Communication

E-mail is appropriate for emergencies or private matters. Use your *`utoronto.ca` account. You will not get a response if you email from other email addresses. Write a proper email including the course number, section number, a subject in the subject line. The email should contain the addressee, your official name and UTORid for identification purposes. I will generally answer e-mail within two business days.

Announcements will be posted on Quercus. Please check there regularly. If an urgent matter arises, I may contact the entire class by e-mail. In order to receive these messages, ensure that your account is connected to your *`utoronto.ca` email and email notifications are enabled.

The TAs and instructor are here to help you. Ask questions and let me know promptly if there are any concerns.

Need additional help?

Here are some options:

- Visit the instructor and/or teaching assistants during office hours.

- Email the instructor in cases of emergencies or personal matters.

Your responsibilities

It is your responsibility to be an active learner by staying connected via our course website, being involved in classroom sessions and diligently completing assessments. Class times will be designed to actively engage you in the course material. In order for these sessions to be effective, coming prepared, by learning about the week's concepts through the textbook, is essential.