STA237H1-F: Probability, Statistics and Data Analysis I, Summer 2022

MON & WED 9:00 AM to 12:00 PM in Toronto Time (EDT)
Lecture Room: BA1160
Course Instructor: Michael J. Moon (`sta237@utoronto.ca`)
TAs & Office Hours: To be announced on Quercus

Course Description

This course will provide an introduction to probability using simulation and mathematical frameworks with emphasis on the probability concepts needed for more advanced study in statistical practice. Topics covered include:

- probability spaces and random variables;
- discrete and continuous probability distributions;
- probability mass, density, and distribution functions;
- expectation and variance;
- independence and conditional probability; and
- the law of large numbers, the central limit theorem, and sampling distributions.

Computer simulation in R will be taught and used extensively for calculations and to guide the theoretical development.

Course Structure

We will meet **in person** on Mondays and Wednesdays from 9:00 AM to noon in Toronto time (EDT) in BA 1160, Bahen Centre. In-person tutorials will be offered in smaller groups following the lectures. Slides will be made available prior to the lectures.

Textbook

We will use **A Modern Introduction to Probability and Statistics: Understanding Why and How. 2005.** (MIPS) by F.M. Dekking, C. Kraaikamp, H.P. Lopuhaa, and L.E. Meester as the primary textbook. You can get access to the textbook at `https://librarysearch.library.utoronto.ca/permalink/01UTORONTO_INST/14bjeso/alma991106910545806196` via the University of Toronto Library.

You may also find the errata helpful available at `https://www.tudelft.nl/en/eemcs/the-faculty/departments/applied-mathematics/applied-probability/education/mips/`.

For additional references and practice problems, see the following textbooks.

- **Modern Mathematical Statistics with Applications. 2012.** by Jay L. Devore and Kenneth N. Berk. Available online at `https://librarysearch.library.utoronto.ca/permalink/01UTORONTO_INST/14bjeso/alma991106895484906196` via the University of Toronto Library.

- **Probability and Statistics: The Science of Uncertainty. 2010.** by Michael J. Evans and Jeffrey S. Rosenthal. Available online at `http://www.utstat.toronto.edu/mikevans/jeffrosenthal/`

- **R for Data Science.** by Hadley Wickham and Garrett Grolemund. Available online at `https://r4ds.had.co.nz/`

Grading Scheme

Item	Available From	Due	Weight
Syllabus Scavenger Hunt & Weekly Activities (27%)			
Syllabus Scavenger Hunt	May 9, 2022	May 17, 2022	2%
Activity 1	May 11, 2022	May 17, 2022	5%
Activity 2	May 18, 2022	May 21, 2022	5%
Activity 3	May 25, 2022	May 28, 2022	5%
Activity 4	June 8, 2022	June 11, 2022	5%
Activity 5	June 15, 2022	June 18, 2022	5%
Assignments (28%)			
Assignment 1	May 30, 2022	June 6, 2022	13%
Assignment 2	June 13, 2022	June 18, 2022	15%
Tests (45%)			
Term Test	May 30, 2022		20%
Final Exam	TBD		25%

All dates listed are in Toronto time (EDT).

Syllabus Scavenger Hunt will be available on Quercus during the first week of the class. It will be a timed quiz on Quercus based on this syllabus. You will have unlimited number of trials for the quiz and the latest trial will be used for your grade. Please ensure you have a clear understanding of this syllabus for the quiz.

Weekly Activities will consist of problem sets covering materials up to the previous week. All Weekly Activities will should be completed individually and submitted by midnight on the due dates listed above. Sample solutions will be shared during tutorials on Mondays.

Assignments will consist of exercises using R as well as computation problems.

Term Test & Final Exam will both be in person. Term Test will take place during the lecture hours from 9:00 am to 12 pm on Monday, May 30, 2022, in Toronto time (EDT). Final Exam will also be 3-hours long and will be scheduled by the Faculty of Arts and Science during the final assessment period in June.

Computing

We will use R for simulations. R is freely available for download at `http://cran.r-project.org` for Windows, MacOS, and Linux operating systems. For the Assignment and Tutorial Activities, students will need to know how to interpret output from R and write your own R codes. We strongly recommend using the University of Toronto's JupyterHub `https://jupyter.utoronto.ca/` or RStudio Desktop `https://www.rstudio.com/products/rstudio/`.

Communication Policy

Please contact the teaching team at `sta237@utoronto.ca` for administrative inquiries including deadline extensions. Emails sent from addresses other than *utoronto.ca* address will be ignored. For questions on course materials, we encourage students to use Quercus Discussion Board.

Academic Integrity

The University of Toronto treats cases of academic misconduct very seriously. Academic integrity is a fundamental value of learning and scholarship at the university. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that your degree is valued and respected as a true signifier of your individual academic achievement.

The University of Toronto's Code of Behaviour on Academic Matters `https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019` outlines the behaviours that constitute academic misconduct, the processes for addressing academic offences, and the penalties that may be imposed. You are expected to be familiar with the contents of this document.

Specifically for this course, potential offences include, but are not limited to sharing or discussing your questions or answers on Weekly Activities, Assignments, Term Test, or Final Exam with others and obtaining unauthorized assistance on Weekly Activities, Assignments, Term Test, or Final Exam from online sources, your peers or tutoring services. You may seek assistance from your peers and the teaching team via Quercus Discussion Board.

All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code of Behaviour on Academic Matters. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact the teaching team.

Regrading Policy

There will be no regrading for Syllabus Scavenger Hunt and Weekly Activities. For Assignments and Term Test, please fill out the *STA237 2022 Summer Regrading Request Form* no later than 1 week after receiving the grades at `https://forms.office.com/r/9mJnrvfpkT` for each assessment question. Any regrading requests made later or not using the form will be ignored without a notice. The course instructor may ask for a one-to-one meeting if more details are required. Keep in mind that it is possible for your assessment grade to go down if the regraded mark is lower.

Extension, Late Submission, and Missed Work

No extensions will be given for Syllabus Scavenger Hunt and Weekly Activities. Extension requests for Assignments with valid reasons will only be considered if they are submitted in writing to the teaching team at least 24 hours prior to the due dates. Any extension requests made later or not adhered to the course's Communication Policy will be ignored without a notice. A valid extension request will receive up to 3 days of extension.

All late submissions for Syllabus Scavenger Hunt and Weekly Activities will receive a grade of 0. Late submissions for Assignments will lose 10% of the earned grade if received within 24 hours of the deadline and otherwise receive a grade of 0.

Final exam conflicts and petitions for a deferred exam must be brought to the Faculty of Arts and Science, not your instructor. Information on how to request a deferred exam due to illness or another valid reason is available at `https://www.artsci.utoronto.ca/current/faculty-registrar/petitions/deferred-exams`.

Exceptions

If you face exceptional circumstances including medical, personal, family, or other unavoidable reasons, please contact the teaching team <u>within 1 week</u> following the assessment with the absence declaration from on ACORN completed and attached. If you do not contact the teaching team within 1 week after the deadline, you will receive a 0 grade for the assessment. If you are experience an exceptional circumstances that will affect your performance in the course in the long term, it is your responsibility to contact your college registrar and the teaching team as early as possible.

For one documented missed Weekly Activity, the missing grades will be redistributed among the other Weekly Activities. For documented missed Assignments or Term Test, the missing grades will be redistributed among Assignments, Term Test, and Final Exam. Because the Weekly Activities and assessments are important to the course learning outcomes, **at most one Weekly Activities** and **at most one of the two Assignments or Term Test** will be accommodated. For any subsequent missed Weekly Activities, you will receive a grade of 0. If you miss more than 2 out of the Assignments and Term Test, you will receive 0 for the missed assessment(s) with lower weight(s).

Religious Accommodations

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of cultural and religious traditions. If you anticipate being absent from class or missing a major course activity due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two weeks), so that we can work together to make alternate arrangements.

Accommodations for Disability

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or Accessibility Services at (416) 978 8060; `https://studentlife.utoronto.ca/as`.

Intellectual Property Statement

Course material - including but not limited to lecture slides, assignments, test questions, and other supplementary course material available on Quercus - is the intellectual property of the teaching team and is made available to you for your personal use in this course. Sharing, posting, selling, or using this material outside of your personal use in this course is **not** permitted under any circumstances and is considered an infringement of intellectual property rights.

Course Schedule

Below is a tentative lecture schedule and weekly activity coverage by topic. The details may change during the term.

Date	Topic	Weekly Activity
May 9, 2022 (M)	Outcomes, Events, and Probability	Activity 1
May 11, 2022 (W)	Conditional Probability and Independence	
May 16, 2022 (M)	Discrete Random Variables	Activity 2
May 18, 2022 (W)	Continuous Random Variables	
May 25, 2022 (W)	Expectation and Variance	Activity 3
May 30, 2022 (M)	*Term Test*	
June 1, 2022 (W)	Variable Transformation	Activity 4
June 6, 2022 (M)	Joint Distribution	
June 8, 2022 (W)	Covariance and Correlation	
June 13, 2022 (M)	Computation with Random Variables	Activity 5
June 15, 2022 (W)	Law of Large Numbers	
June 20, 2022 (M)	Central Limit Theorem	