STA237H1-F: Probability, Statistics and Data Analysis I, Summer 2021

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

There will be **synchronous online lecture sessions on every Tuesday and Thursday from 6:10 pm to 9 pm in Toronto Time (EDT) via Zoom**. You will have access to non-annotated lecture slides prior to each lecture session via Quercus. The lecture sessions will be recorded and the recordings will be made available on Quercus within 24 hours after each session. You will also have access to supplementary reading materials at `https://mjmoon.gitlab.io/sta237`.

There will not be any mandatory tutorial sessions. Instead, you will need to participate in regular group tutorial activities and the teaching team will hold drop-in office hour sessions throughout the term.

Learning online is very different from learning in a traditional in-person lecture courses. If you are new to learning online, please check out the university's checklist for learning online at `https://onlinelearning.utoronto.ca/getting-ready-for-online/`.

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/`

Grading Scheme

Item	Available From	Due	Weight
Assignment and Tutorials (45%)			
Syllabus Scavenger Hunt	May 5, 2021	May 11, 2021	2%
Tutorial Activities	Thursdays	Weekly	$5 \times 5\%$ each
Assignment	May 27, 2021	June 12, 2021	18%
Tests (55%)			
Term Test	May 25, 2021		25%
Final Assessment	TBD		30%

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 <u>timed</u> 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.

Tutorial Activities will be group activities using Quercus Discussion Board. You will be assigned a set of questions each week and discuss the questions on Quercus Discussion Board as a group. Details on the grading scheme will be posted on Quercus and discussed during the second lecture.

Assignment will consist of simulation exercises using R as well as computation problems, submitted via Crowdmark. Detailed submission instructions will be available on Quercus with the assignment requirements on May 27, 2021.

Term Test & Final Assessment will both be submitted via Crowdmark. Term Test will be a <u>timed</u> assessment during the lecture hours from 6:10 pm to 9 pm on Tuesday, May 25, 2021, in Toronto time (EDT). Details on Final Assessment will be posted approximately one week prior to the last day of class.

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 discussion your questions or answers on the Assignment, Term Test, or Final Assessment with others and obtaining unauthorized assistance on the Assignment, Term Test, or Final Assessment 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 all Tutorial Activities. For the Assignment and Term Test, please fill out the *STA237 Regrading Request Form* no later than 1 week after receiving the grades at `https://forms.office.com/r/8vH2rNnmB4` 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 online 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 all Tutorial Activities. Extension requests for the Assignment 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 Tutorial Activities will receive 0. Late submissions for Assignment will lose 10% of the earned grade if received within 24 hours of the deadline and otherwise receive 0. Late submissions for Term Test and Final Assessment will lose 10% of the earned grade if received within 3 hours of the deadline and otherwise receive 0.

Exceptions

If you face exceptional circumstances including medical, personal, family, or other unavoidable reasons, please contact the teaching team within one week 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 Tutorial Activity, the missing grades will be redistributed among the tutorials. For documented missed Assignment or Term Test, the missing grades will be redistributed among the Assignment, Term Test, and Final Assessment. Because the Tutorial Activities and assessments are important to the course learning outcomes, **at most one Tutorial Activity** and **at most one of the Assignment or Term Test** will be accommodated. For any subsequent missed Tutorial Activities, you will receive 0. If you miss both the Assignment and Term Test, you will receive 0 for the Assignment.

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, recordings, 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 by topics. The details may change during the term.

Date	Lecture	Assessments Due
May 4, 2021 (T)	Introduction Outcomes, Events, and Probability	
May 6, 2021 (R)	Conditional Probability and Independence	
May 11, 2021 (T)	Discrete Random Variables	Syllabus Scavenger Hunt
May 13, 2021 (R)	Continuous Random Variables	Tutorial Activity 1
May 18, 2021 (T)	Expectation and Variance	
May 20, 2021 (R)	Variable Transformation	Tutorial Activity 2
May 25, 2021 (T)	*(no lecture)*	Term Test
May 27, 2021 (R)	Joint Distribution	Tutorial Activity 3
June 1, 2021 (T)	Covariance and Correlation	
June 3, 2021 (R)	Computation with Random Variables	Tutorial Activity 4
June 8, 2021 (T)	Law of Large Numbers	
June 10, 2021 (R)	Central Limit Theorem	Tutorial Activity 5
June 12, 2021 (S)	*(not a lecture day)*	Assignment