STA 247 - Probability with Computer Applications L0101
LEC on M @ 3-5 PM ET, TUT on R @ 6-8 PM ET

Instructor: Karen H. Wong - sta247@utoronto.ca

Office Hours: Will be posted on Quercus, held on MS Teams

Meeting Access: All course meetings will take place on MS Teams. You will only be able to access the tools covered under the U of T License by logging into Office 365 with your U of T credentials.

Course Description: An introduction to probability using simulation and mathematical frameworks, with emphasis on the probability needed for computer science applications and more advanced study in statistical practice. Topics covered include probability spaces, random variables, discrete and continuous probability distributions, probability mass, density, and distribution functions, expectation and variance, independence, conditional probability, the law of large numbers, the central limit theorem, sampling distributions. Computer simulation will be taught and used extensively for calculations and to guide the theoretical development.

Prerequisites: See course description here. Prerequisites are strictly enforced by the department and cannot be waived.

Textbooks:

1. *Probability with Applications and R*, 2nd ed. by *Wagaman and Dobrow* with student companion site here.
2. *Modern Mathematical Statistics with Applications*, 2nd ed. by *Devore and Berk* available through the library here.

Course Structure: Due to changing health guidelines, this course will operate differently from the regular sitting. Our course uses asynchronous lectures primarily to introduce new concepts. Synchronous lectures will comprise of guided problem solving, occasional new topics, and used to debrief any questions from lecture videos. Synchronous sessions are hosted on MS Teams, *will be recorded* and made available on our Quercus page after 1-2 business days. Tutorials occur synchronously and consists of R labs and collaborative group work. Tutorials are **mandatory** and cannot be completed asynchronously.

Suggested Weekly Routine

Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Monday
Video lectures posted. Watch at your own pace, take your own notes. Post your questions and answers on discussion board. Attempt 5-10 of suggested practice Qs.		*R lab or group tutorial, review R material of the week.*	*Finish video lectures, and complete your notes. Review R work (lab or sync). Post on discussion boards.*	*REST DAYS and/or Short Review. Revisit any questions you had about the material and flag them for class. Contribute on the discussion boards if you haven't yet.*		*Synchronous lecture on Teams. Come prepared with questions and notes handy, along with any R Markdown files posted.*

Everyone learns at a different pace. In addition to our lecture and tutorial times ($\sim$ 3-4 hours per week), students should expect to commit *at least an additional 3 hours* as self-study, or 6-7 hours per week. Self-study includes: creating course notes for yourself (using your own words!), working on practice problems/assignments, reviewing concepts, posting on the discussion board. This is equivalent to about 30-60 minutes of studying per weekday.

Course Materials: All lecture slides, video recordings, tutorial meetings, and other course material can be navigated from our course home page on Quercus. Course materials provided are for the use of students *currently enrolled in this course only.* **Distributing course materials to anyone outside of the course is considered unauthorized use.**

Grading Scheme: The course is designed to give you plenty of opportunities to demonstrate your learning, make mistakes, track your progress, and receive feedback for improvement. The grading scheme is listed below:

Weekly Discussion	10%	Throughout Fall Term
Syllabus & Pre-Course Quiz	3%	Available from Sept. 10 to 24
Individual Assignments (2)	11% each	Oct. 15, Dec. 3 @ 8 PM
Tutorial Activities (Best 3 of 4)	5% each	**Synchronous** - Near weekly, see tutorial schedule on the last page as well as posted on Quercus
R Labs (4)	2.5% each	
Midterm	15%	Thursday October 28, 6-8 PM
Final Assessment	25%	TBD

Discussion Board: There will be weekly topic threads on the Quercus Discussion Board as a space for students to discuss textbook problems, course topics, and exchange peer support. The instructor and TAs will be monitoring and contributing regularly on the discussion board. Students are expected to contribute by working collaboratively with each other and build upon your understanding of concepts through answering each others' questions. The grading scheme will be provided in the Welcome Slides.

Assignments: Submission on **Crowdmark** only. Select problems on the assignments will be evaluated. Late submission receive a penalty of 5% for every hour of lateness unless prior arrangements have been made. E.g., if an assignment is submitted 10 minutes late, there would be a penalty of 5% on the assignment grade (i.e. 90% $\rightarrow$ 85%).

Tutorials Times: Most Thursdays with your enrolled tutorial section. Online sections: Students must attend the session for your assigned tutorial to ensure equitable TA support. Tutorials will alternate between R labs led by TAs, and collaborative group work with TA support.

- **R Labs:** TAs will lead you through using tools or performing simple analysis in R. The remaining tutorial time is dedicated to independent or pair (recommended) work to complete the R exercise. All R Labs are worth 2.5%, **with .rmd and knit files submitted on Quercus**.

- **Collaborative Group Work:** You will work with 2-3 other classmates on various tutorial activities. These activities are designed to guide you through tackling more challenging problems, or explore a concept we have been discussing in class. One submission per group on Quercus, with the best 3 of 4 tutorials counted towards your course grade.

Midterm & Final Assessment: Assessment information will be posted on Quercus approximately 1 week prior to the date of the assessment. The midterm will be a timed assessment. **Any time conflicts with the midterm** must be communicated as soon as you are aware, and **no later than 2 weeks prior to the midterm**. Accommodations cannot be provided for late notice of time conflicts.

Minimum Passing Requirement: Students must complete and submit at minimum:

- 2 R Labs and 2 group tutorials
- 1 assignment
- Both the midterm and the final assessment.

If you miss more than these minimum passing requirements, even with accommodation, you will not be eligible to pass this course. There are no make-up tutorials. If there are extenuating circumstances that will affect your performance in the course in the long term, please connect your college registrar and the instructor as early as possible.

Accommodation Requests: Accommodation requests for assignments must be made by email to the course instructor at least 24 hours before the assessment due date. Extensions will be arranged where possible.

Missed Work: Missed term work (tutorials and R labs up to a maximum of 2, and midterm) due to legitimate reasons (e.g., injury, illness, or other exceptional circumstances) should be communicated to the instructor within 1 week following the assessment **and** have the absence declaration form on ACORN completed. For documented missed work:

- Missed tutorial work will be redistributed among the tutorials, R labs among the other labs.
- Missed assignment will be distributed among the other assignment, midterm, and final assessment.
- Missed midterm: A make-up midterm will be scheduled during the fall Reading Break for students who missed the midterm with documentation.

Reread Requests: Marking schemes/solutions will be provided for all assessments except the final assessment. These must be reviewed before requesting a reread. If you still have concerns about your grading, complete this MS Forms to request a reread **no later than 1 week** after the assessments have been released back to you. Requests after this window, or without reviewing the provided solutions, or made in any other form will not be considered.

Course Conduct:

- **Email:** Any administrative or personal concerns regarding the course, or questions about active assessments should be discussed privately with the course instructor, either over email or during office hours. Private breakout rooms will be provided in the latter case. Questions regarding course material and concepts are best addressed during open office hours or the discussion board.

- **Programming Languages:** We will be using R statistical software and R Studio, both free to download. R Studio is an Integrated Development Environment for R, so you will need to install both locally for R Studio to operate. An installation guide will be provided at the start of term. You will also need to knit your Markdown documents to .pdf which requires local installation of LaTeX https://www.latex-project.org/get/.

  - If you have problems with any of the local installations, we strongly recommend that you access R Studio through the version hosted on JupyterHub (https://jupyter.utoronto.ca)
  - Log in with your U of T credentials, select 'R Studio'. If that's unavailable, click 'New', and 'R Studio' on drop down menu in the upper right hand corner of the landing page
  - Any R work required of you will be covered during our synchronous sections or by your TAs during the R Labs. R components are an important part of the course content, and you are expected to participate and practice as you would with any other course content

  It is expected that you have both installed, or have accessed the cloud version by the R lab #0, and definitely by R Lab #1. Knitted R markdown files will be required for all R work for the rest of the course, so be sure to address any knit-issues during your R Lab #0 or during office hours before your first R Lab!

  By the end of the course, you are expected to be able to run simple simulations on your own, write your own functions, and more generally, explain how various code demonstrates a probability concept or result, apply/adapt starter code to solve problems, and predict the output that will be generated. Check the weekly pages to see if you will need to have R ready to use during the synchronous meeting times.

Accessibility Services: Students with diverse learning styles and needs are welcome in this course. If you have an acute or ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) at the beginning of the academic year by visiting here. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will assess your situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your needs or condition with any instructor, and your instructors will not reveal that you are registered with AS.

Specific Medical/Personal Circumstances For 2021 S-term, a Verification of Illness (also known as a "doctor?s note") is temporarily not required. Students who are absent from academic participation for any reason (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration. The declaration is available on ACORN under the Profile and Settings menu. **Students should also advise their instructor of their absence.**

If an absence extends beyond 14 consecutive days, or if you have a non-medical personal situation preventing you from completing your academic work, you should connect with your College Registrar. They can provide advice and assistance reaching out to instructors on your behalf. If you get a concussion, break your hand, or suffer some other acute injury, you should register with Accessibility Services as soon as possible.

Academic Integrity: All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism?representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program?is a serious offence that can result in sanctions. Speak to the instructor for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at http://www.writing.utoronto.ca. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity and http://academicintegrity.utoronto.ca

Potential offences include, but are not limited to:

- Obtaining or providing unauthorized assistance on any test/assignment/tutorial including:
  - working in groups on individual assessments, including giving hints to the answer!
  - having someone rewrite, edit, or add material to your independent work
  - researching for inspiration, hints, or answers to any graded problem
  - posting active assessment questions on discussion boards/private tutoring companies for hints/solutions
  - collaborating with members outside of your assigned groups
  - plagiarizing by passing off someone's work or ideas as your own
- Lending your work to a classmate who submits it as their own with or without your permission

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. **If you have any questions about what is or is not permitted in this course, please do not hesitate to contact the instructor.** If you are experiencing personal challenges that are having an impact on your academic work, please reach out to the instructor or seek the advice of your college registrar.

Tentative Schedule:

Week Of	Topics	Tutorial	Coverage (Up To)
1: Sept. 13	Important Terminology, Events ($\cup, \cap, ^c$), Probability: Axioms	–	–
2: Sept. 20	Event Probabilities, Independence vs. Mutually Exclusive	R Lab #0	Getting Started
3: Sept. 27	Counting	R Lab #1	Intro counting
4: Oct. 4	Conditional Probability, Law of Total Probability, Bayes' Rule	Tutorial #1	Counting & $A\|B$
5: Oct. 11	THANKSGIVING & Discrete RVs	R Lab #2	LTT & $A\|B$
6: Oct. 18	Discrete RVs and Distributions	Tutorial #2	Distn Properties
7: Oct. 25	Discrete Distributions & Intro to Continuous RVs	MIDTERM	Includes Oct. 21
8: Nov. 1	Continuous RVs and Distributions	R Lab #3	Cont. RVs
Nov. 8 - 12: FALL READING BREAK			
9: Nov. 15	Continuous RVs, Moment Generating Functions	Tutorial #3	Cont. Distn.
10: Nov. 22	Transformations of RVs, Intro to Discrete Bivariate Dist^n	R Lab #4	Transformations
11: Nov. 29	Bivariate Dist^{n}s: Discrete and Continuous	Tutorial #4	Bivariate Distn.
12: Dec. 6	Bivariate Dist^{n}s: Continuous, Central Limit Theorem	–	–
Dec. 9	Make-Up Monday: CLT Wrap-Up	–	–