Statistical Sciences
UNIVERSITY OF TORONTO

STA237H1F LEC0101/LEC5101/LEC0201/LEC0301/LEC5201
Probability, Statistics and Data Analysis I
Fall 2023

Academic Calendar Description

An introduction to probability using simulation and mathematical frameworks, with emphasis on the probability needed for 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.

Prerequisite: (MAT135H1, MAT136H1)/ MAT137Y1/ MAT157Y1/(MATA30H3, MATA36H3)/(MATA31H3, MATA37H3)/(MAT135H5, MAT136H5)/ MAT137Y5/ MAT157Y5
Corequisite: (CSC108H1/ equivalent programming experience)/ CSC110Y1/ CSC148H1
Exclusion: STA247H1, STA255H1, STA257H1, ECO227Y1, STAB52H3, STA256H5, ECO227Y5

Class Meeting Times

Lectures (start Sept 11-12, 2023)	Instructor	Tutorials (start Sept 18, 2023)
LEC0101 M 1-3pm W 2-3pm	Dr. Bethany White	TUT0101- TUT0104 W 1-2pm
LEC5101 M 5-7pm W 5-6pm	Dr. Selvakkadunko Selvaratnam (Selva)	TUT5101-TUT5104 W 6-7pm
LEC0201 T 9-11am R 10-11am	Dr. Luis Nieto-Barajas	TUT0201- TUT0204 R 9-10am
LEC0301 T 1-3pm R 1-2pm	Dr. Selvakkadunko Selvaratnam (Selva)	TUT0301-TUT0304 R 2-3pm
LEC5201 T 5-7pm R 6-7pm	Dr. Gong (Archer) Zhang	TUT5201-TUT5204 R 5-6pm

NOTES:

- Students must register for *both* a specific LEC section AND an associated TUT section on ACORN by September 20, 2023 (i.e., the last date to enrol in F and Y courses for Fall 2023).
- Your LEC and TUT room information will be available on ACORN. No unofficial switching of LEC or TUT sections is permitted. If you wish to switch, you must do so on ACORN by September 20, 2023 (i.e., the last date to enrol in F and Y courses for Fall 2023).
- STA237H1F lectures will start September 11 or 12, depending on your LEC section. This means there are *no* lectures for sections LEC0201, LEC0301, nor LEC5201 on September 7, 2023. Tutorials will commence the week of September 18, 2023.
- STA237H1F is an ***in-person*** course, so all class meetings are scheduled to take place on campus as per the schedule above. During the term, we may need to move the occasional lecture and/or tutorial online (e.g., due to illness). If so, this will be communicated on Quercus Announcements with as much advance notice as possible.

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COURSE CONTACT INFORMATION AND OFFICE HOURS

Course Quercus Site: https://q.utoronto.ca/courses/316967

All lecture sections share a single Quercus site named "*STA237H1 F (All Sections) 20239:Probability, Statistics and Data Analysis I*". It may also look like the course code of the Quercus site is "*STA237H1 F LEC0101*". This does not reflect the LEC section in which you are officially enrolled; your LEC section is shown on ACORN. Important announcements and information about the course and assessments will be shared on Quercus. Please familiarize yourself with the shared STA237H1 Quercus site and visit often for updates. Check your mail.utoronto.ca email regularly, and make sure your Quercus notifications are set up based on your preferences so you will not miss important announcements.

Outline lecture slides (in .pdf format) will be posted on Quercus at least 12 hours before each lecture. Alternative file formats will not be available. Note that complete slides/lecture material used in class will not be distributed under any circumstances.

Course Support:

Have a question about the course material?

1. Visit STA237H1F instructor and/or TA office hours

See Quercus for schedules and locations.

OR

2. Monitor and post on STA237H1F Quercus Discussions

Before posting, review the syllabus and previous postings to confirm a related question has not already been posted/addressed. If it has not been addressed elsewhere, post your question by clicking on the "**+Discussion**" button, and be sure to use an informative "**Topic Title**" to make the discussion threads easier to follow for everyone. Note that questions about active assessments, or those that are more personal in nature should *not* be posted/answered on Quercus Discussions.

Have a more personal or sensitive course-related question/concern?

1. Send an email to the STA237H1F instructors at sta237@utoronto.ca

Please use your mail.utoronto.ca email address. Emails sent from addresses other than mail.utoronto.ca address will not be answered. Be sure to include your LEC and TUT sections (i.e., the ones showing on ACORN) in the subject line of your message.

OR

2. Visit STA237H1F instructor office hours

See table below for schedule of weekly instructor office hours and Quercus for locations. If there are other students present, be sure to let the instructor know that you wish to speak with them privately.

Quercus Discussions

Please note that all STA237H1F students (all sections), instructors and TAs have access to our Quercus site. Questions about the course material should be posted here. Inquiries that are more personal or sensitive in nature should *not* be posted on Quercus Discussions; instead, you should contact STA237H1 instructor(s) in their office hours or by sending an email to sta237@utoronto.ca.

Quercus Discussions is an important part of our learning environment, and a place where we can connect with others in our STA237H1 learning community, seek help, and help others in this course. So, it is essential that everyone be respectful and polite with others in our STA237H1 learning community (this goes for all other online and in-person activities as well). When posting/responding on Quercus Discussions, please only type what you would be comfortable saying to someone in-person. Derogatory, discriminatory, or otherwise inappropriate language or topics will be removed at the instructors' discretion and followed up on as appropriate.

STA237H1F course instructors and TAs will be monitoring Quercus Discussions regularly. You are encouraged to follow and contribute to the discussion as well. Someone else may post a question that is helpful to your learning. If you know the answer to someone's question and are able to help out, please respond. Explaining a concept or ways to tackle a problem is a great way to connect with others, support the learning community, and to strengthen your own learning in the course.

Office hours:

The STA237H1F instructors and TAs will hold regular weekly office hours in-person and/or online and will offer additional office hours before exams. Please see below for a schedule of the regular STA237H1F instructor office hours. Locations and formats of instructor office hours as well as details on TA office hours are available on Quercus.

Instructor*	Weekly Office Hours*
Dr. Bethany White	W 11am-1pm
Dr. Selvakkadunko Selvaratnam (Selva)	M 12pm – 1pm M 3pm –4pm R 3pm – 4pm
Dr. Luis Nieto-Barajas	R 11am-1pm
Dr. Gong (Archer) Zhang	T 11am-1pm

* These office hours are *not* LEC section specific. You are welcome to attend another instructor's office hours if they work better for your schedule.

Note that instructors and TAs are *not* available for extra help or appointments outside their scheduled office hours. However, please note that there are other course supports available, depending on the nature of your inquiry (see top of this syllabus section).

Email to Instructors

The STA237H1F instructors can be reached at sta237@utoronto.ca. Questions about the course material should *not* be emailed; instead, you should bring your question to an instructor or TA during their office hours or post to Quercus Discussions. Course-related inquiries that are more personal in nature may be sent to the instructors at sta237@utoronto.ca from your utoronto.ca email address. If you use email to communicate with the instructors, you must use your mail.utoronto.ca account. This is to protect your privacy: if another account is used, there is no way for the instructors to verify the sender's identity. We will aim to respond to emails within 48 hours Monday-Friday.

TEXTBOOK

- Dekking, F.M., Kraaikamp, C., Lopuha, H.P., and Meester, L.E (2005) *A Modern Introduction to Probability and Statistics: Understanding Why and How*, Springer.
- [Optional] Wagaman, A. S., and Dobrow, R. P. (2021) *Probability: With Applications and R*. 2nd Edition. Wiley.

Readings and practice problems will be assigned from Dekking et al. (2005). A digital version of this textbook is available through University of Toronto Libraries - https://link-springer-com.myaccess.library.utoronto.ca/book/10.1007/1-84628-168-7.

Wagaman et al. (2021) is suggested in case you are interested in an additional textbook for different explanations and additional practice problems.

COMPUTING

We will use R (and RStudio) for simulations throughout the term. We strongly recommend using the University of Toronto's JupyterHub at http://r.datatools.utoronto.ca. If you wish to install R (and RStudio) on your own machine, R is freely available for download at http://cran.r-project.org for Windows, MacOS, and Linux operating systems and RStudio is available at https://posit.co/downloads/. In this course, you will interpret R code and output and modify and write R code.

ASSESSMENTS & MARKING SCHEME

Your STA237H1F grade will be determined based on the following marking scheme:

Assessment	Weight
Weekly course reflections (due each Sunday at 11:59pm)	0.5% each up to 5%
Assignments x 2	7.5 each (15%)
Tutorial quizzes (best 3 out of 4)	5% each (15%)
Midterm	25%
Final Exam	40%

Note: No special rounding rules or individual grade adjustments (e.g., to meet GPA cut-offs, minimum grade requirements for program admission or course prerequisites, etc.) will be applied. No special reweighing of assessments that deviate from the marking scheme or the accommodations described in this syllabus will be applied and no extra work will be accepted. There are no exceptions to these policies.

Weekly course reflections

There will be **12 weekly course reflections** that you will complete through Quercus Quizzes posted on Wednesday each week. Each course reflection will consist of up to 10 questions that will highlight some of the important learning outcomes for that week and give you an opportunity to reflect on your learning and the course. All questions must be attempted after the week's lectures, and the Quercus Quiz must be submitted by the deadline to earn 0.5% for the course reflection. 0% will be recorded for incomplete reflections and those which are not submitted by the deadline.

There **is no accommodation for missed tutorial weekly reflections** available beyond the flexibility built into the grading scheme (i.e., you must complete and submit 10 of the 12 weekly reflections to earn the full 5%).

Assignments

There will be **2xassignments** which will consist of exercises using R so you can gain experience coding as well as related problems to reinforce the knowledge and skills you are learning in the course. *You must complete the assignments independently*. You are encouraged to consult your course notes and visit instructor or TA office hours to ask for hints or guidance as you work through your assignments. However, no working together, sharing code or answers, getting help from others in or outside of the course, nor use of unauthorized aids (e.g., generative AI such as ChatGPT – see "Use of Generative AI in STA237H1F" section below for more information) are permitted. Information about the assignments, as well as submission instructions will be posted on Quercus at least 1 week prior to the deadlines.

There are ***no extensions nor make-ups*** on assignments. You are encouraged to start the assignment as soon as possible and visit STA237H1F instructor or TA office hours if you need guidance. Assignments must be submitted through Crowdmark and/or Quercus Assignments as per the assignment instructions which will be available on Quercus. Assignments submitted in other ways (e.g., via email) will not be accepted. If you miss an assignment deadline, you may submit it up to 5 days late but a **late penalty of 10% per day** will be applied. Specifically, if you submit your assignment 1-24 hours after the deadline, your assignment grade will be **% grade earned – 10%** (e.g., if you earn a grade of 80% on your assignment, your assignment grade will be 70%), submitting 25-48 hours after the deadline will result in a grade of **% grade earned – 20%**, etc., up to 120 hours after the deadline. These late penalties will not be waived, and assignments will not be accepted more than 5 days late.

If you miss an assignment for a legitimate reason and request accommodation that covers the deadline within *one week* of missing your assignment (see "Missed Assessment" section below for information on how to request accommodation), the weighting of your assignment will be shifted to your final exam. However, at most one assignment may be accommodated this way. 0% will be recorded for missed assignments otherwise.

Tutorial quizzes (best 3 out of 4)

There will be **4x45-minute tutorial quizzes** during the term to give you a chance to work on problems on recent course material and receive feedback on your learning. These quizzes *may be completed collaboratively in groups of up to 3 students* enrolled in your TUT section who are present and actively contributing to the tutorial quiz that day. No communication outside your group, nor use of unauthorized aids are permitted. Quizzes must be written in the tutorial section in which you are officially enrolled (i.e., your TUT section showing on ACORN), and you will be asked to show your student identification at tutorials. A grade of 0% will be recorded if you are not present at your tutorial the day of the tutorial quiz or if you write a tutorial quiz in another TUT section.

There **is no accommodation nor make-ups for missed tutorial quizzes** available beyond the flexibility built into the grading scheme (i.e., your lowest tutorial quiz will be automatically dropped).

Midterm

There will be a **2-hour midterm exam (combination of multiple-choice and written answers)** on **5-7pm Friday, Oct 27, 2023**. You must bring your student identification to the midterm exam. Information on midterm will be posted on Quercus in advance. The purpose of this midterm is to assess *your* knowledge and skills in the first part of the course, and to provide you with feedback on your learning, so you *must complete the midterm independently*. Absolutely no communication nor use of unauthorized aids are permitted.

If you miss the midterm for a legitimate reason (e.g., conflict with a lecture or tutorial for another course, illness, etc.), you must report your absence within *one week* by following the steps described in the "Missed Assessment" section below to be eligible to write the make-up midterm which will take place shortly after Reading Week (i.e., early in the week of Nov 13-17). The date, time and location of the make-up will be sent by email to those eligible to write it.

If you miss both the midterm and the make-up midterm for legitimate reasons and request accommodation for both by following the steps in the "Missed Assessment" section below, the weight of your midterm will be shifted to your final exam. If no request for accommodation is received for your missed midterm and/or make-up midterm (or it is incomplete), your midterm grade will be recorded as 0%.

Final Exam

There will be a **3-hour cumulative final exam (combination of multiple-choice and written answers)** scheduled by the Faculty of Arts and Science during the December exam period. You must bring your student identification to the final exam. Information about the exam, along with some sample questions will be posted on Quercus in advance. The purpose of this exam is to assess *your* knowledge and skills in the course so you must complete the final exam independently. Absolutely no communication nor use of unauthorized aids are permitted.

Final exam conflicts and petitions for a deferred exam must be brought to the Faculty of Arts and Science, not your instructors.

- Information on exam conflicts is available at https://www.artsci.utoronto.ca/current/faculty-registrar/exams-assessments/exam-conflicts.
- 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.

Missed Assessments

There are no accommodations nor make-ups for missed weekly course reflections and tutorial quizzes beyond the flexibility built into the marking scheme. Please refer to the previous section for more information on the available accommodations for the remaining assessments.

To request accommodation for a missed assignment or midterm, you must **complete the "Missed STA237H1F Assessment Form" (available on Quercus) within *one week* of missing the assignment or midterm**. In this form, you will need to upload/submit one of the following supporting documents that covers the date(s) of your missed assessments:

- Absence declaration via ACORN (see https://www.artsci.utoronto.ca/current/academics/student-absences for important information on eligibility)
- U of T Verification of Illness or Injury Form (VOI) - see http://www.illnessverification.utoronto.ca/index.php
- College Registrar's letter
- Letter of Academic Accommodation from Accessibility Services

If you need to miss the midterm due to a conflict with another course, uploading a screenshot of your timetable and a copy of the syllabus for your other course with a regularly scheduled class meeting that overlaps with the STA237H1F midterm as supporting documentation through the "Missed STA237H1 Assessment Form" will be sufficient.

If you are absent for an extended period of time, please contact your College Registrar's Office as soon as possible to seek advising and support.

Regrade Policy

There are no regrades for weekly course reflections, and requests for final exam regrades must be made through the Faculty of Arts & Science (please see below). Any requests to have an assignment, tutorial quiz or midterm regraded **must be made in writing through completion of the "STA237H1F Regrade Request Form" (available on Quercus) within *one week* of the date the marks are posted on Quercus**. To be considered, you must clearly identify the question you have concerns about, provide a detailed justification for your concern and make specific references to your answer, the feedback you received and to the relevant course material. Keep in mind that it is possible for your grade to go down if the regraded mark is lower than your original grade: your grade may increase, stay the same, or it may go down based on the regrade. Late requests or requests submitted in other ways (e.g., email, in office hours, etc.) will not be considered.

Final exam viewing and regrade request must be made to the Faculty of Arts and Science. Please refer to https://www.artsci.utoronto.ca/current/faculty-registrar/exams-assessments/exam-viewing and https://www.artsci.utoronto.ca/current/faculty-registrar/exams-assessments/exam-recheck-or-reread.

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Equity, Diversity, and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

Accommodations

If you have a consideration that may require accommodations, please contact Accessibility Services: https://www.studentlife.utoronto.ca/as, 416-978-8060 or accessibility.services@utoronto.ca

Mental Health Resources and Services

Your mental health and well-being is important. If you have an urgent concern about school, health or life in general, the U of T Telus Health Student Support (formally known as U of T MySSP) offers confidential support 24/7 via phone or chat. Please see https://mentalhealth.utoronto.ca/ for information on this and other supports and services available to you at the University of Toronto.

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. You are encouraged to visit https://www.academicintegrity.utoronto.ca/ for more information on Academic Integrity at the University of Toronto.

In STA237H1F, potential offences include, but are not limited to, sharing or discussing your questions or answers on Assignments, tutorial quizzes, midterm or final exam with others or obtaining unauthorized assistance from online sources, generative AI (e.g., ChatGPT – see the "Use of Generative AI in STA237H1F" section below), your peers, or tutoring services. Details on the supports available in this course are listed in the "Course Contact Information and Office Hours" section of this syllabus, and information on the nature of each assessment is included in the "Assessments and Marking Scheme" section.

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 at sta237@utoronto.ca.

Use of Generative AI in STA237H1F

This course policy has been designed to promote your learning and intellectual development and to help you achieve course learning outcomes.

The use of generative artificial intelligence tools and apps is **strictly prohibited** in all course assessments (i.e., course reflections, tutorial quizzes, assignments, midterm and final exam) unless explicitly stated otherwise by the course instructors on assessment instructions. This includes ChatGPT and other AI writing and coding assistants. Students may not copy or paraphrase from any generative artificial intelligence applications, including ChatGPT and other AI writing and coding assistants, for the purpose of completing assessments in this course. Use of generative AI in this course is considered use of an unauthorized aid, which is a form of cheating.

Intellectual Property Statement

The University considers an instructor's lectures and course materials to be the instructor's intellectual property covered by the Canadian Copyright Act.

STA237H1F lectures and tutorials will not be recorded, and no video recording of lectures or tutorials will be permitted under any circumstances. Students wishing to record audio or take photos in lectures or tutorials or other course material in any way must ask for the instructors' explicit permission and may not do so unless permission is granted. In STA237H1F, this permission must be requested in writing and in advance by sending an email to sta237@utoronto.ca. If permission is granted, this applies only for that individual student's own study purposes and does not include permission to "publish", share or distribute them in any way.

Note too that it is forbidden to publish, share, or distribute any other STA237H1F materials and assessments that are shared on Quercus or Crowdmark. 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

This is our tentative schedule for course topics. Some adjustments may be made as the course progresses, depending on the rate at which individual topics are covered. Refer to the recommended textbook readings and problems posted on Quercus which will be released each week.

Week	**Dates**	**Tentative topic schedule (See Quercus for up-to-date weekly topics and resources)**	**Important reminders & Due Dates**
	Sept 7-Sept 10	--	No lecture/tutorial on Sept 7 for LEC0201, LEC0301 and LEC5201
Week 1	Sept 11-17	Introduction to the course, Outcomes, events and probability	STA237H1F lectures start Reflection 1 due 11:59pm Sept 17
Week 2	Sept 18-24	First principles & Conditional probability and independence	Last day to enrol Sept 20 STA237H1F tutorials start Reflection 2 due 11:59pm Sept 24
Week 3	Sept 25-Oct 1	Discrete random variables	Tutorial quiz 1 Reflection 3 due 11:59pm Oct 1
Week 4	Oct 2-Oct 8	Discrete random variables	Assignment 1 due 5pm, Friday, Oct 6 Reflection 4 due 11:59pm Oct 8
Week 5	Oct 9-Oct 15	Continuous random variables	Oct 9 – Holiday (Thanksgiving Day) No lectures on Oct 9-10 (all sections) Tutorial quiz 2 Reflection 5 due 11:59pm Oct 15
Week 6	Oct 16-Oct 22	Continuous random variables	Reflection 6 due 11:59pm Oct 22
Week 7	Oct 23-Oct 29	Joint distributions	Midterm 5-7pm Oct 27 Reflection 7 due 11:59pm Oct 29
Week 8	Oct 30-Nov 5	Joint distributions	Reflection 8 due 11:59pm Nov 5
--	*Nov 6-Nov 12*		*Reading Week*
Week 9	Nov 13-Nov 19	Functions of random variables	Tutorial quiz 3 Reflection 9 due 11:59pm Nov 19
Week 10	Nov 20-Nov 26	Functions of random variables	Assignment 2 due 5pm, Friday, Nov 24 Reflection 10 due 11:59pm Nov 26
Week 11	Nov 27-Dec 3	Law of large numbers & Central Limit Theorem	Tutorial quiz 4 Reflection 11 due 11:59pm Dec 3
Week 12	Dec 4-Dec 8	Wrap-up	No lecture/tutorial on Dec 6 or 7 Reflection 12 due 11:59pm Dec 10
Final assessment period	Dec 9-20		Final exam (date-TBA)