

Probability

University of Toronto
Department of Statistical Sciences
STA347H1S Summer 2024

Course Email: sta347@course.utoronto.ca

Instructor: Dayi (David) Li

You can call me... David or Dayi (I go by David mostly). I am NOT a Doctor or a Professor, so please do NOT call me these titles.

Instructor Email: dayi.li@mail.utoronto.ca

Lectures: Tue 2:00-5:00PM and Thu 2:00-5:00PM

Lecture Location: SF 1105

Office Hours: Tue 1:00-2:00PM and Thu 1:00-2:00PM (Zoom link will be posted later)

TA: Madhu Gunasingam (madhu.gunasingam@mail.utoronto.ca),
Rafael (Alex) Valencia (alexander.valencia@mail.utoronto.ca),
WeiZheng Zhang (weizheng.zhang@mail.utoronto.ca).

TA Office Hours: TBA

COURSE OVERVIEW

Course Description: An overview of probability from a non-measure theoretic point of view. Random variables/vectors; independence, conditional expectation/probability and consequences. Various types of convergence leading to proofs of the major theorems in basic probability. An introduction to simple stochastic processes such as Poisson and branching processes.

Pre-requisites: Pre-requisites are **strictly enforced by the department, not by the instructor**. If you do not have the equivalent pre-requisites, you will be un-enrolled from the course. The pre-requisites are STA247H1(70%)/STA255H1(70%)/STA237H1(70%)/STA257H1/ECO227Y1/STAB52H3/ STA256H5/MAT223H1/MAT240H1/MATA22H3/MATA23H3/MAT223H5/MAT240H5; MAT235Y1/MAT237Y1/ MAT257Y1/(MATB41H3, MATB42H3)/(MAT232H5, MAT236H5)/(MAT233H5, MAT236H5) (Note: STA257H1, MAT223H1/MAT240H1, MAT237Y1/MAT257Y1 are very strongly recommended)

COURSE MATERIALS

Course Content: All lecture slides and materials will be posted on the Quercus course page for each lecture section. Further, any important announcements will also be posted in Quercus. Please make sure to check it regularly so you don't miss anything.

Textbook: I have compiled a lecture notes for the course, and they will be posted on Quercus after each lecture. There are problems assigned at the end of each lecture but I will not be posting solutions to them. You are more than welcome to come to my Office hour or TAs' Office hour to ask any questions you have for these problems. For additional references and textbooks, here is a non-exhaustive list:

1. Ross, S. (2007). *Introduction to probability models*. [Ch. 1-5]
2. Evans, M. and Rosenthal, J. (2002). *Probability and statistics*. [Ch. 1-4, 11] ([Link](#))

3. Rosenthal, J. (2006). *A first look at rigorous probability theory*. [Ch. 2.1-2.2, 3.1-3.4, 4.1-4.2, 10.1-11.2]
4. Durrett, R. (2013). *Probability: Theory and Examples*. [Ch. 1.2-1.3, 1.6, 2.1-2.4, 3.1-3.4, 5.1-5.2] ([Link](#))
5. Rosenthal, J. (2020). *A first look at Stochastic Processes*. [Ch. 1.1-1.5, 2.1-2.5, 3.1-3.2, 4.1-4.3]
6. Billingsley, P. (1994). *Probability and Measure*. [Ch. 1.2, 1.6, 4.20, 4.21, 4.23, 5.25-27, 7.37]
(This book is an advanced graduate level textbook, it is put here for anyone with additional interests for deeper theoretical results.)

COURSE COMPONENTS

Lectures: Lectures will be held in person in the assigned classrooms. During lectures, we will cover important course materials, as well as cover a number of examples illustrating the uses of these methods. Each lecture builds on the material from previous weeks, so it is recommended that you attend lectures regularly/keep on top of the material.

Office Hours: The TAs and I will hold office hours through Zoom and in person. The office hour schedule will be posted on Quercus after the first week. It is recommended that you visit office hours whenever you have a question about the material. The classes will focus more on describing the concepts, theories and methods. To solve the assigned examples after each class you need to visit the office hours with potential questions.

Piazza: This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com. Find our class page [here](#). We will be using the Piazza as an online discussion forum. **All questions about course material should be posted here** or asked during TA/instructor office hours. The TAs and I will monitor the board and will help answer questions but students are encouraged to answer posts and help their fellow classmates.

GRADING SCHEME

Assessment	Date Due/Occurring	Grading Weight
Assignment 1	Before class (2:00PM) Jul, 16	10%
Midterm	During class Jul, 23	30%
Assignment 2	Before class (2:00PM) Aug, 6	10%
Final Exam	TBA (btw Aug, 15-31)	50%

Please note that the last day to drop the course without penalty is July 29, 2024

EVALUATION BREAKDOWN

Assignments: There will be two assignments, one before the midterm and one before the final.

Term Test: There will be one 150-min midterm held during lecture time. More details will be provided later.

Final Exam: The details about the final exam will be provided during the last week lectures. For the final exam we will be following standard University of Toronto Schedule. The final exam will be 3 hours in duration and will be scheduled by the Faculty of Arts and Science during the final assessment period.

MISSED ASSESSMENT POLICY FOR THE TERM TEST

You are responsible to attend the assessments. **If you miss an assessment without a valid reason, you will receive a zero on that assessment.**

For me to agree that you missed an assessment for a **valid reason**, you must email me directly and the email:

- must be received within 48 hours after assessment is due
- must include the course code in the subject line
- must include your full name and student number
- must include the following sentences:
 - “I affirm that I am experiencing an illness or personal emergency and I understand that to falsely claim so is an offense under the Code of Behaviour on Academic Matters.”
 - “I understand that the weight of this assessment (term test) will be shifted to the assignments (other term tests) and to the final exam.”

If you miss an assessment and do not email me, you will receive a zero on that assessment.

For every day (24 hours) that the assignments are late with a **valid reason**, 5% of the assessments will be deducted. If the assignments are late by a week, **it will be given zero no matter if you have a valid reason.**

There will not be make-up midterm if you miss it. The weight of midterm will be shifted to the final if you miss it with a valid reason.

Regrade Requests

Mistakes can happen when marking. If you feel there is an issue with the marking of an assessment, you may request a regrade. However, since the marking will be done by your TAs, you need to communicate your issues with them first (you can cc' me in the email). **If you only email me without contacting the TAs, your regrade request will not be granted.** Given such a request, the TAs and I reserve the rights to regrade your entire assessment, and your mark may decrease, increase, or stay the same.

For the TAs and me to agree to a regrade, you must email the TA/me:

- more than 24 hours after receiving your grade (do NOT email the TAs or me immediately),
- within a week of receiving your grade,
- with the subject line “STA347:[Assessment] Regrade” with the appropriate assessment title,
- including your full name and student number in the body of the email,
- providing your assessment (crowdmark link) in the body of the email, and
- specifying a clear, concise, and justified reason for each request (in bullet points), referring to each possible error or omission by the marker.

Given that the TAs and I all have limited time on our hands, **if you fail at following one point of the previous rubric, your request will not be granted.**

COMMUNICATION

Please do not email me with questions related to the content of the course. These types of questions are much easier to answer through the discussion board or during office hours or posted on Piazza. **ONLY contact me through my personal email if your concerns or issues are sensitive or personal.** If you need to email the instructor for personal reasons, please use your official University of Toronto email address, include STA347H1 S 20245 in the subject and also include your full name and UTORid in the body of the email (in case we need to look anything up).

INTELLECTUAL PROPERTY

Course materials provided on Quercus, such as lecture slides, assignments, tests and solutions are the intellectual property of the 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.** This includes providing materials to predatory tutoring companies.

ACADEMIC INTEGRITY

The University treats cases of plagiarism and cheating very seriously. It is the students’ responsibility for knowing the content of the University of Toronto’s Code of Behaviour on Academic Matters. All suspected cases of academic dishonesty will be investigated following procedures outlined in the above document. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <http://academicintegrity.utoronto.ca/>). Here are a few guidelines regarding academic integrity:

- Students must complete all assessments individually. Working together is not allowed.
- Having anyone else to complete your assessments for you is academic misconduct.
- Sharing answers/work/code for STA347 assessments with any other student is academic misconduct.
- Looking up solutions to assessments problems online or in textbooks and copying any part of what you find is an academic offense.

- All work that you submit must be your own! You must not copy mathematical derivations, computer output and input, or written answers from anyone or anywhere else or must not have possession/use of unauthorized aids or assistance associated with tests during the tests. Unacknowledged copying or unauthorized collaboration will lead to severe disciplinary action, beginning with an automatic grade of zero for all involved and escalating from there. Please read the University of Toronto Policy on Cheating and Plagiarism, and don't plagiarize.

USE OF GENERATIVE AI

Students are allowed to use generative AI (chatGPT 3.5/4.0/Bing) to help with study but it is absolutely **NOT allowed** to copy solutions from these AI tools to complete the assessments, as this is considered academic offense.

Note: Since this course is proof-dominant, it is **not** recommended to study using generative AI such as chatGPT. AI tools at the current stage are extremely bad at coming up with proofs, so consult them at your own discretion.

ACCESSIBILITY NEEDS

The University of Toronto offers academic accommodations for students with disabilities. If you require accommodations, or have any accessibility concerns about the course, the classroom, or course materials, please contact Accessibility Services as soon as possible: accessibility.services@utoronto.ca or <http://accessibility.utoronto.ca>.

TOPICS COVERAGE

The main topics covered in the course are listed below. Some materials will or will not be covered depending on the progression of the course.

Week	Date	Topics
1	Jul, 2	Probability Measures, Independence and Conditional Probability
	Jul, 6	Random Variables, Distributions
2	Jul, 9	Borel-Cantelli Lemma, Convergence, Expectations
	Jul, 10	Conditional Expectations, Limit Theorems
3	Jul, 16	Limit Theorems (continued), Concentration of Measures (HW 1 Due)
	Jul, 18	Inequalities
4	Jul, 23	Midterm
	Jul, 25	Law of Large Numbers
5	Jul, 30	Weak Convergence
	Aug, 1	Weak Convergence (continued), Central Limit Theorem
6	Aug, 6	Stochastic Process, Poisson process (HW 2 Due)
	Aug, 8	Poisson Process (continued), review