

STA347H1S - Probability

Summer 2022

Instructor: Ziteng Cheng

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Lecture Hours: Tuesday and Thursday 2:00-5:00pm, BA1160

Office Hours: See Quercus

Prerequisite:¹ STA247H1(70%)/ STA255H1(70%)/ STA237H1(70%)/ STA257H1/ ECO227Y1/ STAB52H3/ STA256H5; MAT223H1/ MAT224H1/ MAT240H1/ MATA22H3/ MATA23H3/ MAT223H5/ MAT240H5/ MATB24H3/ MAT224H5; MAT235Y1/ MAT237Y1/ MAT257Y1/ (MATB41H3, MATB42H3)/ (MAT232H5, MAT236H5)/ (MAT233H5, MAT236H5) (Note: STA257H1, MAT223H1/ MAT240H1, MAT237Y1/ MAT257Y1 are very strongly recommended)

Quercus Discussion Board: We will be using the Quercus Discussion Board as an online discussion forum. All questions related to the content of the course should be posted here or asked during lecture/office hours. The instructor and TAs will monitor the board and will help answer questions but students are encouraged to answer posts and help their fellow classmates.

Course Outline: 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 stochastic processes such as Poisson and branching processes. Topics below are tentative, and subject to shuffling, merging, reduction, expansion and modification. Numbers within parenthesis indicate lecture hours.

- Introduction(6): axioms and basic properties of probability(2), random variables(1), expectation(2), Lebesgue measure and density function(1)
- Convergence of random variables(6): various types of convergences(1), limit theorems(2), relations between convergences(3)
- Independence(3): definition and equivalent definitions(1), Borel-Cantelli lemma(0.5), Fubini-Tonelli theorem(0.5), law of large numbers(1)
- Selections of inequalities(3): Markov, Hoeffding, Efron-Stein, Jensen, Hölder, Minkowski
- Conditional expectation(3): definition(1), basic properties(2)

¹This is strictly enforced by DoS. Students who have deferred assessments/exams in prerequisite course(s) or have an equivalent course as a transfer credit should contact the Statistics Undergraduate Office at ug.statistics@utoronto.ca to request to be kept in the course.

- Weak convergence of probabilities(9): definition and equivalent definitions(4), central limit theorem(1), Slutsky’s theorem(1), selections of important results(3)
- Introduction to stochastic processes(3)

Course Materials: Lecture notes will be posted on Quercus after lecture. Below are some supplementary materials. The supplementary materials are not mandatory for the course; they are used for the reference of results that are out-of-scope but essential to the framework of probability.

[D] R. Durrett, *Probability: Theory and Examples*, 2019. ([Link](#))

[S1] A. N. Shiryaev, *Probability I, Third Edition*, 2016.

[S2] A. N. Shiryaev, *Probability II, Third Edition*, 2019.

[A&B] C. D. Aliprantis and K. C. Border, *Infinite Dimensional Analysis: A Hitchhiker’s Guide, Third Edition*, 2006.

Grading Scheme: See Table 1 for the allocation of points. Regarding homework grades, the highest three will be counted toward your grade; the maximum is capped at 35. Homework will be graded on Crowdmark. Please preview your upload to ensure legibility. Late submissions will not be accepted. If you miss or plan to miss the midterm, please file an absence declaration following the guideline [here](#), and inform the instructor via the course email by August 4th. The weight of the missed midterm will be shifted to the final. If you want to request for a deferred final, please follow the petition guideline [here](#).

(July 4, first day of classes)	
HW#1 (due 11:59pm, July 13)	≥ 10 points
HW#2 (due 11:59pm, July 22)	≥ 10 points
In-class midterm (2:00pm-4:30pm, July 28)	= 30 points
HW#3 (due 11:59pm, Aug. 3)	≥ 10 points
HW#4 (due 11:59pm, Aug. 12)	≥ 10 points
(August 15, last day of classes)	
Comprehensive final (Aug. 17-25, TBA)	= 40 points

Table 1: Allocation of points.

Regrading Policy: To request a regrade, you must send an email to sta347@utoronto.ca:

- more that 24 hours, no more than 5 days after receiving your grade,
- with title ‘Regrade request HW#’ or ‘Regrade request midterm’,
- including your full name and student number in the body of the email,
- specifying a clear and concise reason for each request, referring to a possible error or omission by the grader; regrade requests without a specific reason will not be accepted.

Regrade and point increase are not guaranteed. Requests to increase partial points on incorrect solutions will not be treated favorably.

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. More information available at [here](#).

Academic Integrity: Academic integrity is fundamental to learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the University of Toronto degree that you earn will be valued as a true indication of your individual academic achievement, and will continue to receive the respect and recognition it deserves. Familiarize yourself with the University of Toronto's Code of Behaviour on Academic Matters available at [here](#).