STA260H5 S
Probability and Statistics II
Summer 2025 Syllabus

Course Meetings

STA260H5 S

Section	Day & Time	Delivery Mode & Location
LEC0101	Monday, 10:00 AM - 1:00 PM	In Person: DV 2072
	Wednesday, 10:00 AM - 1:00 PM	In Person: DV 2072
	Friday, 11:00 AM - 1:00 PM	In Person: ZZ TBA

Refer to ACORN for the most up-to-date information about the location of the course meetings.

Course Contacts

Instructor: Dr. Masoud Ataei
Email: masoud.ataei@utoronto.ca
Office Hours and Location: TBA

Course Overview

A sequel to STA256H5 introducing current statistical theory and methodology. Topics include: Sampling distributions, point estimation, confidence intervals, testing (Neyman-Pearson Theorem, uniformly most powerful test, likelihood ratio tests), unbiasedness, consistency, sufficiency, complete statistics, and exponential family; Fisher Information and the Cramer-Rao inequality; simple linear models.

Theoretical Statistics is a pivotal discipline with wide-reaching applications across fields such as machine learning, time series analysis, finance as well as the natural and social sciences. This course is designed to provide a rigorous understanding of statistical theory, integrating probability and statistical methods to equip students with the tools necessary for advanced data analysis and informed decision-making. Building on probability theory, students will explore key concepts such as sampling distributions, confidence intervals, estimation techniques, and hypothesis testing. By mastering these methods, students will gain the analytical skills needed to navigate complex data-driven environments, whether in academic research or industry applications. Throughout the course, students will

- Recognize and compute sampling distributions related to the normal distribution.
- Construct confidence intervals using the pivotal quantity method.
- Derive and evaluate estimators such as MLE and MOM.
- Verify properties of estimators, including unbiasedness, consistency, and efficiency.
- Identify complete and sufficient statistics for parameters.
- Construct UMVUE and design optimal hypothesis tests, including likelihood ratio tests.

Course Learning Outcomes

The primary goal of this course is methodological, equipping students with the quantitative reasoning tools and methods necessary for advanced studies in statistics and related disciplines. Successful students will be well-prepared for further study in discipline-specific statistics courses. To succeed in this course, you should

- Commit to consistent effort: Allocate 20-30 hours per week to this course. Avoid last-minute cramming, which leads to superficial understanding, and instead, engage in regular practice for deeper, long-lasting learning.
- Use time effectively: Form study groups and focus on concepts rather than procedures when solving problems. Continuously ask questions about the material's underlying principles and seek help early if needed.
- Understand course objectives: Emphasize problem-solving as a key learning outcome. Develop your ability to use conceptual knowledge to tackle unfamiliar questions, prioritizing reasoning quality over memorization.
- Take ownership of your learning: Approach this course as a step towards becoming a skilled probabilist and statistician. Prepare for classes by reading materials in advance and actively participating in discussions and problem-solving activities.

Prerequisites: STA256H5 or ECO227Y5
Corequisites: None
Exclusions: STAB57H3 or STA261H5 or STA261H1 or STAC58H3 or STA238H1
Recommended Preparation: None
Credit Value: 0.5

Course Materials

- **Primary Text:** *Mathematical Statistics with Applications* (7th Edition) by Wackerly, Mendenhall and Scheaffer.
- **Additional Text:** *Introduction to Mathematical Statistics* (8th Edition) by Hogg, McKean and Craig.

For most of the course, we will focus on the primary textbook by Wackerly, Mendenhall and Scheaffer, which concisely describes the course material. However, the additional textbook by Hogg, McKean and Craig delves into more profound aspects of the subject matter. I will use the second text in conjunction with the primary reference of the course and as a complementary resource to help students gain a deeper understanding of the course material.

Marking Scheme

Assessment	Percent	Details	Due Date
Term Test 1	25%		2025-07-18
Term Test 2	25%		2025-07-25
Final Assessment	50%		Final Exam Period

Test 1

- **Date**: Friday, July 18, 2025
- **Time**: 11:10 AM - 12:40 PM
- **Location**: KN 137

Test 2

- **Date**: Friday, July 25, 2025
- **Time**: 11:10 AM - 12:40 PM
- **Location**: KN 137

More details about the material coverage and other instructions will be provided roughly one week before each test.

Late Assessment Submissions Policy

Missed Term Work

- **For a Single Missed Test:**
    - Students who miss one term test do not need to provide any documentation.
    - Using the ACORN absence declaration is **optional** and can be used only once per term. However, it is **not a requirement** for this course.
    - **No makeup test** will be provided for a single missed term test. The weight of the missed test will automatically be reallocated to the final exam. Meaning that the final exam will weigh 75% in this case.
    - Students are advised to refrain from sending confirmation emails in this scenario, as the weight shift is granted automatically.

- **For Missing Both Tests:**
    - If **both** term tests are missed, a **makeup test** will be scheduled as follows:
        - **Makeup Test:**
            - **Date**: Friday, August 8, 2025
            - **Time**: 11:10 AM - 12:40 PM
            - **Location**: IB 140
    - The makeup test will be **comprehensive**, covering **all** the material taught in the course.
    - The makeup test will carry a weight of 25%. Any remaining unallocated weight (25%) from the missed term tests will be added to the final exam, meaning that the final exam will weigh 75% in this case.

- Failure to attend the makeup test will normally result in a score of **zero** for the test. In such cases, the weight of the final exam will be adjusted to 75%.

Policies & Statements

Academic Integrity

The Code of Behaviour on Academic Matters states that:

The University and its members have a responsibility to ensure that a climate that might encourage, or conditions that might enable, cheating, misrepresentation, or unfairness is not tolerated. To this end, all must acknowledge that seeking credit or other advantages by fraud or misrepresentation, or seeking to disadvantage others by disruptive behaviour, is unacceptable, as is any dishonesty or unfairness in dealing with the work or record of a student.

It is your responsibility as a student at the University of Toronto to familiarize yourself with, and adhere to, both the Code of Student Conduct and the Code of Behaviour on Academic Matters.
This means, first and foremost, that you should read them carefully.

Code of Student Conduct and the Code of Behaviour on Academic Matters are available from the U of T website.

Religious Accommodations

Information about the University's Policy on Scheduling of Classes and Examinations and Other Accommodations for Religious Observances is at https://www.viceprovoststudents.utoronto.ca/student-resources/rights-responsibilities/accommodation-religious/

Declaration of Temporary Absence

Students who miss an academic obligation during the term (i.e., in-class assessment, quiz, paper or lab report) may use the ACORN Absence Declaration Tool to record an absence in one or more courses. Students may utilize this option once per term for a single absence period of up to seven consecutive days. The declaration period must include the day of declaration and may include past and/or future dates, for a total of up to 7 calendar days.

Use of the ACORN Absence Declaration does not require supporting documentation and should be used in addition to the missed term work policy outlined in the course syllabus. It remains the student's responsibility to initiate the process for missed academic obligations by following the instructions in the course syllabus.

Re-grading Term Work

A student who believes that their written term work has been unfairly marked may ask the person who marked the work for re-evaluation. Students have up to one month from the date of return of an item of term work to inquire about the mark. If the student is not satisfied with this re-evaluation, they may appeal to the instructor in charge of the course if the work was not marked by the instructor (e.g., was marked by a TA). Such re-marking may involve the entire piece of work and may raise or lower the mark. For more information on policies regarding re-marking of term work, please refer to Re-marking Pieces of Term Work in the Academic Calendar.

Accommodations for Students with Disabilities

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 as soon as possible. Accessibility staff (located in room 2240, Student Services Hub, Davis Building) are available by appointment to assess specific needs, provide referrals, and arrange appropriate accommodations. Please call 905-569-4699 or email access.utm@utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

Code of Student Conduct

All students are expected to adhere to the Code of Student Conduct (Code of Student Conduct [December 13, 2019] | The Office of the Governing Council, Secretariat).

Additional Content

Lectures:

- The delivery mode for our course is in person.
- **Attending all the lectures, taking notes, engaging in class discussions**, and not leaving any questions behind is essential. Students will need all the lecture time and regular practice to learn the material well. **Crunching before tests/exams is unlikely to be helpful.**

Tutorials:

- The course has 12 in-person tutorials, starting on **Wednesday, July 2, 2025**.
- The tutorial session is intended to be a unique chance to learn and practice statistics. Selected homework problems will be demonstrated during lecture time and tutorial sessions. They will be available on the course website.
- **Attendance** is very important in the tutorial sessions to practice and discuss the assigned statistics problems with your TA and peers. Attending tutorials will help students gain a deeper understanding of the course material and become more skilled in problem-solving.
- The tutorials emphasize the development of statistical concepts and reasoning skills.

Office Hours:

- You should visit office hours whenever you have questions about the material or concerns regarding course organization.
- It is essential to clarify the material as quickly as possible and not wait until the last minute to ask your questions.
- **All questions are good**, and there is no such thing as an "obvious" or "stupid question" in mathematics.

Piazza:

- This is a student-led discussion platform. Students should post questions related to the course material on Piazza or ask them during instructor/TA office hours.
- The instructor and TAs will monitor the board regularly and help answer questions, but students are encouraged to engage in answering the posts and sharing their opinions anonymously.

GENERATIVE AI:

- Students are **permitted** to utilize advanced technological resources, including generative artificial intelligence platforms such as ChatGPT, to augment their comprehension of the course material. However, it is imperative to recognize that these generative AI tools have not undergone formal evaluation by the university with respect to privacy and security protocols.
- The utilization of generative AI tools will be expressly **prohibited during assessments**, including both periodic tests, makeup test and the culminating final examination. Therefore, students must be proficient in independently solving exercises and problems. Given this constraint, it is strongly advised that generative AI serve solely as a supplementary learning resource. Any academic work generated through these AI platforms should be meticulously reviewed to ensure that it accurately represents your own understanding and capabilities.

RE-GRADE POLICY:

- If you believe your test has been mismarked, please email the instructor for a regrade request within **three days** of the grades being posted.
- In the case of a mismarked question, explain in a **maximum of two lines** what the mistake was.
- If you wish to dispute the marking guideline, please visit the instructor during his office hours to explain what you believe should change in the marking scheme. If the marking scheme is modified, everyone's work will be re-evaluated, and a public announcement will be made to provide an explanation of why grades changed.
- Note that the course re-mark policy exists only to correct mistakes, which rarely occur. For instance, it is possible that the grader has not fully understood your solutions, missed a page when marking or incorrectly calculated the total.
- Please ensure to compare your solution with the solutions key for the tests posted on the Quercus page before requesting a revision request. If your answer is missing steps, it is less likely that you've lost marks due to graders' mistakes.

INTELLECTUAL PROPERTY:

- Course materials provided on Quercus, such as lecture slides, assignments, tests and solutions, are the intellectual property of your instructor and are for the use of students currently enrolled in this course only. Providing course materials to any person or company outside the course is considered unauthorized. This includes providing materials to predatory tutoring companies.

EMAIL POLICY:

- Your email must originate from your University of Toronto email account when you contact your instructor by email. The subject line must contain **[STA260]** and a relevant subject (indicating what the email is about).
- Be sure to include your **full name** and **student ID** number in the body of the message.
- Before you send an email, make sure that you are not asking for information that is already available from the course outline/website/announcements or questions about the course material that are more appropriate for discussion during office hours or on the discussion board on Piazza.
- In general, your instructor **cannot** answer technical questions about the course material by email.
- Please **refrain** from using ChatGPT and instead write an authentic email in your own voice in a few lines.